TOWN OF FRIDAY HARBOR

Public Works Department

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Friday Harbor, Washington

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WASTEWATER FACILITIES PLAN

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November 2019

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WASTEWATER FACILITIES PLAN

Prepared for:

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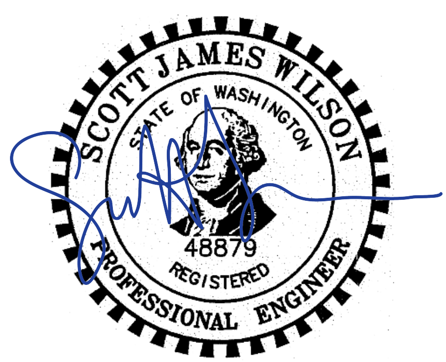

November 2019

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Executive Summary

Background

This report evaluates the Town of Friday Harbor's wastewater facility needs based on current performance and projected residential population growth through the year 2040. The purpose of this report is to provide a recommended plan for required improvements to the existing wastewater treatment plant to address performance issues, aging equipment, future flow and loading capacity, and current standards for redundancy and reliability.

The Town of Friday Harbor Wastewater Treatment Plant (WWTP) serves a population of approximately 2,420 (2019) plus wastewater from the UW laboratories. The most recent major upgrades to the plant occurred in 2004 when the plant was converted to a Sequencing Batch Reactor (SBR), 2018 when a Tertiary Filter was installed, and present day when a new headworks is being constructed. The primary components of the existing WWTP consist of new dual mechanical screens and grit removal basins, two individual SBR basins, two post-equalization basins, and UV disinfection.

Regulatory Requirements

As a municipal wastewater treatment plant, the Town of Friday Harbor is regulated by the NPDES permit issues by the Department of Ecology. The Town's current NPDES permit (Appendix A), No. WA-0023582, was issued on August 21, 2017 and expires August 31, 2022. This report is in response to performance issues and numerous TSS effluent violations. This report includes an evaluation of the WWTP existing conditions and provides recommendations for improving and maintaining adequate capacity to ensure long-term NPDES permit compliance.

Flow and Loadings

The existing and future flows and loadings to the wastewater treatment plant were studied through a 21-year planning period (2040). This planning period was used based on the assumption that significant treatment plant upgrades would be completed in the year 2023.

Existing influent flows are 0.27 MGD (Annual Average). The maximum monthly influent flows average 0.43 MGD. This average flow is approximately 62% of the 0.69 MGD permit limit for max month flow.

Influent BOD levels have averaged 517 lbs/day (Average Daily) and 746 lbs/day (Max Month) over the last 14 years. Influent TSS levels have averaged 401 lbs/day (Average Daily) and 574 lbs/day (Max Month). These values are well below the permit limits of 1600 lbs/day BOD and 1110 lbs/day TSS.

Projected flows and loadings were determined based on yearly growth of existing flows and loadings as well as population growth expected by the Town over the next 21 years (2040). A population growth rate of 1.7% was used to project future flows and loadings. Projected Peak Month flow in 2040 is estimated to be 0.67 MGD. Projected Peak Day flow in 2040 is estimated to be 1.44 MGD.

Evaluation of Existing Facilities

TSS violations are the primary concern of the Town and reason for this engineering report. These violations are the result of multiple design and equipment failures at the treatment plant as well as a lack of treatment capacity during peak flows. In addition, many other components of the plant are aging and need replacing. All equipment and infrastructure was evaluated for capacity and performance for the life of this plan to year 2040.

The SBR system is does not have adequate redundancy or capacity at peak flows. If one basin is in need of maintenance for more than 4 hours, the SBR process cannot be completed in a single basin. Additionally, the SBR basins are not sized adequately to handle peak flows. As a result, the SBR system is forced to shorten the cycle times and use the "filled decant" cycle which results in short circuiting and solids being sent to disinfection without proper treatment.

In addition, various components of the existing treatment facilities will require capacity and process upgrades to meet current standards for wastewater treatment.

<u>Treatment Facility Location</u>

The Friday Harbor Wastewater Treatment Facility is not in the proximity of the twenty-five-year flood zone nor the hundred-year-flood zone, per the FEMA Flood Hazard Boundary Map. The lowest point at the treatment facility is located at an elevation of approximately 40-ft and the total water elevations predicted by the FEMA Flood Insurance Study (No.530149CV001A), for the 100-yr flood is 13.1-ft. This provides a buffer of approximately 27 vertical feet.

The proposed facility upgrades are planned to be constructed within the existing WWTP site boundary; there is adequate space available on the existing site for the installation of the planned equipment. No other site has been considered, as there is no need to expand the footprint of the facility or purchase new property. However, if expansion is necessary, the Town owns an adjacent parcel to the west of the existing treatment plant site which could be used for expansion.

The zoning areas around the existing site are:

North - Single Family Residential, across Harbor St.

West - Multi-Family Residential & Professional Service

South - Single Family Residential & Public Service

East - Single and Multi-Family Residential & Professional Service

Treatment Process Alternatives & Recommendation

Three treatment processes and configurations were evaluated as potential solutions for the Friday Harbor WWTP. These process alternatives include:

1. Sequencing Batch Reactor Expansion
2. Conventional Extended Aeration
3. Membrane Bioreactor

After a thorough study of the potential alternatives, the Conventional Extended Aeration process was determined to be the best solution for the Town based on its ability to treat the expected flows and loadings to the permit conditions, as well as its low construction and operations costs.

Additional recommended improvements are presented in Chapter 6.

Scope of Plan

This document is organized into the following chapters:

Chapter 1: Background Information. This chapter contains background of the project, purpose, and scope of the report.

Chapter 2: Regulatory Requirements. The purpose of this section is to identify the federal, state, and local regulations that affect the planning and design of facility improvements.

Chapter 3: Flows and Loadings. This section describes and analyzes the existing and future flows and loadings to the wastewater treatment facility through a 20-year planning period (2040).

Chapter 4: Wastewater Treatment Facility Evaluation. The purpose of this section is to evaluate the existing WWTP and its components with respect to capacity, reliability, and redundancy.

Chapter 5: Wastewater Treatment Alternatives. The purpose of this section is to identify and describe the treatment alternatives to the existing facilities.

Chapter 6: Recommended Improvements. The purpose of this section is to identify and describe the recommended improvements to the existing facilities.

Chapter 7: Financial Information. The purpose of this section is to identify and describe the construction and operation costs associated with the recommended facility improvements.

Chapter 8: Water Reclamation and Reuse Evaluation. The purpose of this section is to evaluate water reclamation and reuse potential, requirements and alternatives for the Town of Friday Harbor WWTP.

1.0 - BACKGROUND INFORMATION

Purpose

This Facilities Plan for the Town of Friday Harbor (Town) has been prepared at the request of the Director of Public Works and Wastewater Treatment Plant Superintendent.

The purpose of this Facilities Plan is to provide a recommended plan for required improvements to the existing wastewater treatment facility to address aging & challenging equipment, future flow and loading capacity, and current standards for redundancy and reliability. This report evaluates the Town's wastewater facility needs based on projected residential population growth and commercial and industrial demands on the treatment system through 2040.

This report is a replacement to the 1996 Wastewater Facilities Engineering Report and the 2001 Update.

The authorized representative for the Town of Friday Harbor, Washington is listed below.

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Background

The Town of Friday Harbor Wastewater Treatment Plant (WWTP) serves a population of approximately 2,420 (2019, Town of Friday Harbor) plus the University of Washington Laboratories. The UW Labs population is approximately 150 people during the summer months and 30 people during the winter months. The wastewater flow to the WWTP is primarily domestic sewage from residential areas within the Town of Friday Harbor. There are no significant sources of commercial or industrial wastewater.

<u>Service Area</u>

The service area within the Town boundaries is approximately 717 acres. The Town of Friday Harbor currently serves all users within the Town limits plus the UW Laboratories. A map showing the service area is provided in Appendix D. The Town is currently establishing its urban growth boundaries in compliance with the Growth Management Act (GMA).

The WWTP is located in the Town of Friday Harbor on San Juan Island and in San Juan County. A location map is shown in Figure 1-1.

An aerial map of the existing WWTP site is shown in Figure 1-2.

Figure 1-1: Friday Harbor WWTP Location Map

Figure 1-2: Friday Harbor WWTP Aerial Map

Land Use & Service Area

General Town Boundary Information

The Town of Friday Harbor boundary is located on the south east side of San Juan Island within San Juan County. The extents of the Town's existing boundaries are shown on Figure 1-1 and in Appendix D. The Town boundaries encompass a total area of approximately 717 acres. An additional 6 acres are identified as Urban Growth Area (UGA). The Town's population is estimated at 2,420 (2019). A 2040 population projection of 3,372, including both the Friday Harbor Town limits and unincorporated Urban Growth Area, has been used in this study based on an observed growth rate of 1.7 percent. The community consists of a mix of residential, commercial, and industrial land uses.

The Town land use and zoning maps that are presented in Appendix D are up-to-date as of the publication of this plan and are included in this plan for convenience only. The official Comprehensive Plan Map and the official Town of Friday Harbor Zoning Map are maintained by the Town's Land Use Administrator and current versions are available from him.

Sewer Service Areas

The Town of Friday Harbor's sewer service area includes all users located within the Town limits plus 6 homes in the UGA on the west side of town at Harbor View Place. The Town municipal code prohibits the extension of public sewer connections outside of the Town limits of Friday Harbor, including the unincorporated Urban Growth Area, with the exception of emergencies (Town Code 13.20.040, 17.76.040). Areas must complete the annexation process before they can be served by Town sewer. No areas outside the Town limits or UGA are anticipated for future sewer service.

2.0 - REGULATORY REQUIREMENTS

The purpose of this section is to identify the federal, state, and local regulations that affect the planning and design of facility improvements. The Town of Friday Harbor's existing WWTP and outfall are located in Washington State and are therefore regulated by the Department of Ecology.

Federal Clean Water Act – NPDES

The National Pollutant Discharge Elimination System (NPDES) is part of the Clean Water Act. Most NPDES permits have a five-year life span, and they place limits on the quantity and quality of discharged pollutants. As a municipal wastewater treatment facility, the Town of Friday Harbor's WWTP is regulated by the NPDES issued by the Department of Ecology. The Town's current NPDES permit (Appendix A), No. WA-0023582, was issued on August 21, 2017 and expires August 31, 2022.

The NPDES permit requires a facility plan when flows or waste loads entering the WWTP exceed 85% of design criteria or the projected plant flow or loading would reach design capacity within five years or if significant improvements are needed to keep the plant in compliance. This Facility Plan includes an evaluation of the WWTP existing conditions and provides recommendations for improving and maintaining adequate capacity to ensure long-term NPDES permit compliance. The current NPDES permit facility loading design criteria is:

Maximum Month Design Flow (MMDF)	0.69 MGD
BOD_5 Influent Loading for Maximum Month	1,600 lb/day
TSS Influent Loading for Maximum Month	1,110 lb/day

National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires assessing the environmental impacts of actions affecting federal lands, considering those impacts while making decisions, and disclosing those impacts to the public. An environmental review has been completed to satisfy the NEPA requirements.

State Environmental Policy Act (SEPA)

The State Environmental Policy Act (SEPA), as presented in WAC 197-11-960, requires all governmental agencies to ensure that applicable environmental concerns are addressed in the process of project planning and documentation. Projects that have potential environmental impacts must complete a SEPA Checklist to satisfy planning and disclosure requirements. The Town of Friday Harbor is a SEPA lead agency for projects occurring within Town limits. It is anticipated that a SEPA Checklist will be required to be submitted for review by the Town. The checklist will be submitted during the design phase of each project presented in this facilities plan.

Archaeological and Cultural Resources Survey

In November 2005, the Governor of Washington signed Executive Order 05-05 which requires state agencies to review capital construction projects for potential impacts to cultural resources. This review is to be done in conjunction with the Department of Archaeological and Historic Preservation (DAHP) and any affected Tribes. It is anticipated that an archaeological and cultural resources review will be completed during the design phase of the WWTP improvements project. During design, the Town of Friday Harbor will contract with a state approved archaeologist to perform the survey and to consult with the DAHP and affected Tribes. The archaeologist's report will include survey findings as well as any recommended mitigations such as construction monitoring.

Stormwater Permitting in the State of Washington

As part of the federal Clean Water Act, the Department of Ecology administers the State of Washington's Construction Stormwater General Permit. Stormwater is considered a point source of water pollution and therefore an NPDES permit is required. The State of Washington has developed a General Permit for Construction Stormwater.

Stormwater permit coverage is required if the project disturbs more than one-acre of land and the possibility exists of stormwater runoff entering waters of the state or conveyance systems that deliver stormwater to waters of the state.

It is anticipated that the construction of the improvements to the WWTP will disturb less than one-acre of land.

Town of Friday Harbor Codes

The Town of Friday Harbor's treatment facility is located entirely within its incorporated limits. It is anticipated that the following permits will be required by the Town of Friday Harbor:

- Building Permit (to include plumbing and electrical)
- Land Disturbance Permit
- SEPA Checklist

Regulatory Summary

A summary of the regulatory requirements for improvements to the Town of Friday Harbor WWTP is presented in Table 2-1.

Table 2-1: Summary of Regulatory Requirements

Permit/Report	Agency	Comments
NPDES Permit	Department of Ecology	The design of future improvements will meet current and future NPDES requirements.
NEPA	Council on Environmental Quality (CEQ) - Federal	To be submitted during design phase if necessary.
SEPA	Town of Friday Harbor	To be submitted during design phase.
Cultural/Archaeological Survey	DAHP	To be completed during design phase.
Shoreline Permit	Town of Friday Harbor	To be submitted during design phase.
HPA	WDFW / USAC	Not required for wastewater treatment plant. Will likely be required for Outfall project.
Construction Stormwater Permit	Ecology	To be submitted during design phase.
Building, Electrical and Plumbing Permits	Town of Friday Harbor	To be submitted during design phase.
State Environmental Review Process (SERP)	Department of Ecology	Will be completed to satisfy requirements of the water pollution control revolving fund WAC 173-98-720

3.0 - FLOWS AND LOADINGS

This section describes and analyzes the existing and future flows and loadings to the wastewater treatment facility through a 21-year planning period (2040). Quantifying the existing loading to the WWTP is necessary to determine the level at which future flows and loadings will be used to size upgrades to the WWTP that will be required to meet the demands of future growth and regulatory requirements.

Existing Wastewater Flows

Wastewater flow is continuously measured at the WWTP through the effluent Parshall flume. An influent Parshall flume was also installed for flow measurement in 2004. However, the influent Parshall flume was never calibrated or verified and the Town deemed the influent flow measurement data as unusable. The effluent Parshall flume is the only flow measurement used to provide flow data presented through 2018. In January 2019 the influent Parshall flume was modified to allow routine access to the level measurement device. The device was calibrated and data was collected starting in 2019 and until fall 2019. Beginning Fall 2019 a new flow meter was installed as part of headworks improvements.

The influent flows and loadings vary with seasonal populations increases due to tourism during the summer months. Summer population increases begin in April, peak in August, and end after September.

Annual Average

Table 3-1 presents the annual average wastewater flows as recorded at the Town WWTP effluent during the years 2004 through 2018. Also, presented in Table 3-1 are estimated populations and the calculated annual average per capita flow rates.

Table 3-1: Friday Harbor WWTP Annual Average Flow

Year	Flow (MGD)	Population*	Per Capita (GPCD)
2004	0.30	2051	148
2005	0.29	2073	139
2006	0.31	2098	149
2007	0.33	2091	158
2008	0.27	2154	123
2009	0.22	2152	100
2010	0.25	2162	116
2011	0.29	2160	136
2012	0.36	2140	167
2013	0.32	2185	145
2014	0.28	2190	127
2015	0.24	2215	109
2016	0.23	2250	103
2017	0.24	2288	105
2018	0.24	2327	103
Average =	0.27		129

*The Town of Friday Harbor also collects wastewater from the University of Washington Laboratories. This facility has a population of approximately 150 people during the summer and 30 people during the winter and accounts for roughly 0.022 MGD of the Annual Average Flow.

Monthly Average

Table 3-2 presents monthly average flow measured at the WWTP effluent Parshall flume for the years 2004 through 2018. It also shows wet weather (November – May) and dry weather (June – October) averages for each year. The annual average of monthly wastewater flows vary from 0.22 MGD to 0.36 MGD.

Table 3-2: Friday Harbor WWTP Monthly Average Flow

Month/ Year	Flow (MGD)														
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Jan	0.38	0.50	0.47	0.58	0.35	0.35	0.37	0.49	0.36	0.45	0.35	0.37	0.25	0.23	0.39
Feb	0.34	0.38	0.33	0.41	0.37	0.20	0.27	0.36	0.43	0.39	0.41	0.31	0.41	0.32	0.43
Mar	0.33	0.28	0.27	0.45	0.37	0.18	0.22	0.36	0.43	0.44	0.45	0.29	0.28	0.33	0.27
Apr	0.21	0.28	0.27	0.32	0.36	0.22	0.30	0.36	0.38	0.39	0.25	0.19	0.21	0.29	0.33
May	0.22	0.26	0.24	0.28	0.33	0.18	0.20	0.31	0.34	0.32	0.22	0.17	0.16	0.23	0.18
Jun	0.22	0.23	0.26	0.27	0.29	0.16	0.19	0.24	0.34	0.22	0.23	0.17	0.20	0.17	0.16
Jul	0.25	0.24	0.25	0.29	0.19	0.18	0.18	0.23	0.35	0.25	0.26	0.19	0.19	0.20	0.17
Aug	0.30	0.26	0.27	0.34	0.17	0.18	0.18	0.23	0.33	0.26	0.23	0.19	0.19	0.20	0.18
Sep	0.29	0.21	0.24	0.26	0.15	0.16	0.25	0.22	0.28	0.26	0.22	0.17	0.17	0.18	0.16
Oct	0.27	0.24	0.22	0.23	0.13	0.19	0.20	0.21	0.25	0.25	0.19	0.17	0.20	0.18	0.14
Nov	0.38	0.31	0.42	0.20	0.22	0.33	0.24	0.26	0.36	0.28	0.24	0.32	0.22	0.21	0.20
Dec	0.45	0.29	0.49	0.35	0.25	0.25	0.40	0.25	0.45	0.28	0.30	0.37	0.32	0.31	0.26
Annual Average :	**0.30**	**0.29**	**0.31**	**0.33**	**0.27**	**0.22**	**0.25**	**0.29**	**0.36**	**0.32**	**0.28**	**0.24**	**0.23**	**0.24**	**0.24**
Wet Weather (Nov-May) Average	**0.33**	**0.33**	**0.36**	**0.37**	**0.32**	**0.24**	**0.29**	**0.34**	**0.39**	**0.36**	**0.32**	**0.29**	**0.26**	**0.27**	**0.29**
Dry Weather (June-Oct) Average	**0.27**	**0.24**	**0.25**	**0.28**	**0.19**	**0.17**	**0.20**	**0.23**	**0.31**	**0.25**	**0.23**	**0.18**	**0.19**	**0.19**	**0.16**

Peak Month, Peak Day and Peak Hour

Table 3-3 summarizes peak month and peak day flows as recorded at the WWTP effluent for the years 2004 through 2018. The average annual peak month flow for the period is 0.43 MGD and the average annual peak day flow is 0.95 MGD. Peak month and peak day flows consistently occur during the winter months coinciding with rain events and inflow and infiltration (I&I) in the collection system.

Table 3-3: Friday Harbor WWTP Peak Month and Peak Day Flows

Year	Peak Month Flow (MGD)	Month	Peak Day Flow (MGD)	Month
2004	0.45	DECEMBER	0.86	DECEMBER
2005	0.50	JANUARY	1.08	JANUARY
2006	0.49	DECEMBER	0.80	DECEMBER
2007	0.58	JANUARY	1.09	JANUARY
2008	0.37	FEBRUARY	0.66	APRIL
2009	0.35	JANUARY	0.80	JANUARY
2010	0.40	DECEMBER	1.22	DECEMBER
2011	0.49	JANUARY	0.67	JANUARY
2012	0.45	DECEMBER	1.15	DECEMBER
2013	0.45	JANUARY	1.01	JANUARY
2014	0.45	MARCH	0.89	FEBRUARY
2015	0.37	DECEMBER	0.89	JANUARY
2016	0.41	FEBRUARY	1.38	FEBRURARY
2017	0.33	MARCH	0.91	DECEMBER
2018	0.43	FEBRUARY	0.87	JANUARY
Average =	0.43	Average =	0.95	
Maximum =	0.58	Maximum =	1.38	
Percent of Limit =	84%		--	
Permit Limit =	0.69		--	

Existing Wastewater Loadings (BOD, TSS)

The WWTP's influent wastewater quality is characterized below in Table 3-4 and Table 3-5 in terms of 5-day Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). BOD and TSS are the primary concern due to their influence on sizing and selection of wastewater treatment facilities.

Table 3-4: Friday Harbor WWTP Influent BOD and TSS Loading

Year	Average Daily BOD (lb/day)	Peak Month BOD (lb/day)	Average Daily TSS (lb/day)	Peak Month TSS (lb/day)
2004	500	742	401	510
2005	584	1,077	427	693
2006	540	637	396	581
2007	575	918	420	527
2008	544	830	429	652
2009	556	711	475	614
2010	560	838	464	708
2011	461	647	465	682
2012	600	961	467	716
2013	520	640	418	556
2014	510	760	340	445
2015	416	581	293	389
2016	450	559	322	488
2017	433	521	327	474
2018	503	762	375	580
Average =	**517**	**746**	**401**	**574**
Maximum =	**600**	**1,077**	**475**	**716**
Percent of Limit =	**38%**	**67%**	**43%**	**65%**
Permit Limit =	**1,600**	**1,600**	**1,110**	**1,110**

Table 3-5: Friday Harbor WWTP Influent BOD and TSS Loading, Wet and Dry Weather

Year	Wet Weather (Nov-May) Average Daily BOD (lb/day)	Dry Weather (Jun-Oct) Average Daily BOD (lb/day)	Wet Weather (Nov-May) Average Daily TSS (lb/day)	Dry Weather (Jun-Oct) Average Daily TSS (lb/day)
2004	361	618	379	432
2005	521	749	427	480
2006	526	555	380	414
2007	503	669	399	446
2008	580	526	444	411
2009	550	579	468	486
2010	576	560	484	441
2011	393	564	497	482
2012	464	788	392	567
2013	322	520	445	383
2014	431	607	315	367
2015	367	481	285	304
2016	410	508	289	325
2017	410	464	359	282
2018	475	541	418	315
Average =	459	582	399	409

Peak month influent BOD loading is currently about 1,077 lb/day or about 67% of the permit limit 1,600 lb/day. Peak month influent TSS loading is currently about 716 lb/day or about 65% of the permit limit 1,110 lb/day.

Future Projected Wastewater Flows

Wastewater Average Daily Flow is projected to increase at a growth rate of 1.7% which is equivalent to the projected population growth rate the Town has determined for population growth. Table 3-6 displays the existing and projected average and peak flows to the WWTP from the collection system. Note that existing data presented in Table 3-6 are projected at 1.7% growth from the averages through 2016, and is conservative because incorporating 2017 and 2018 data lowers the averages slightly.

Table 3-6: Friday Harbor WWTP Projected Flows

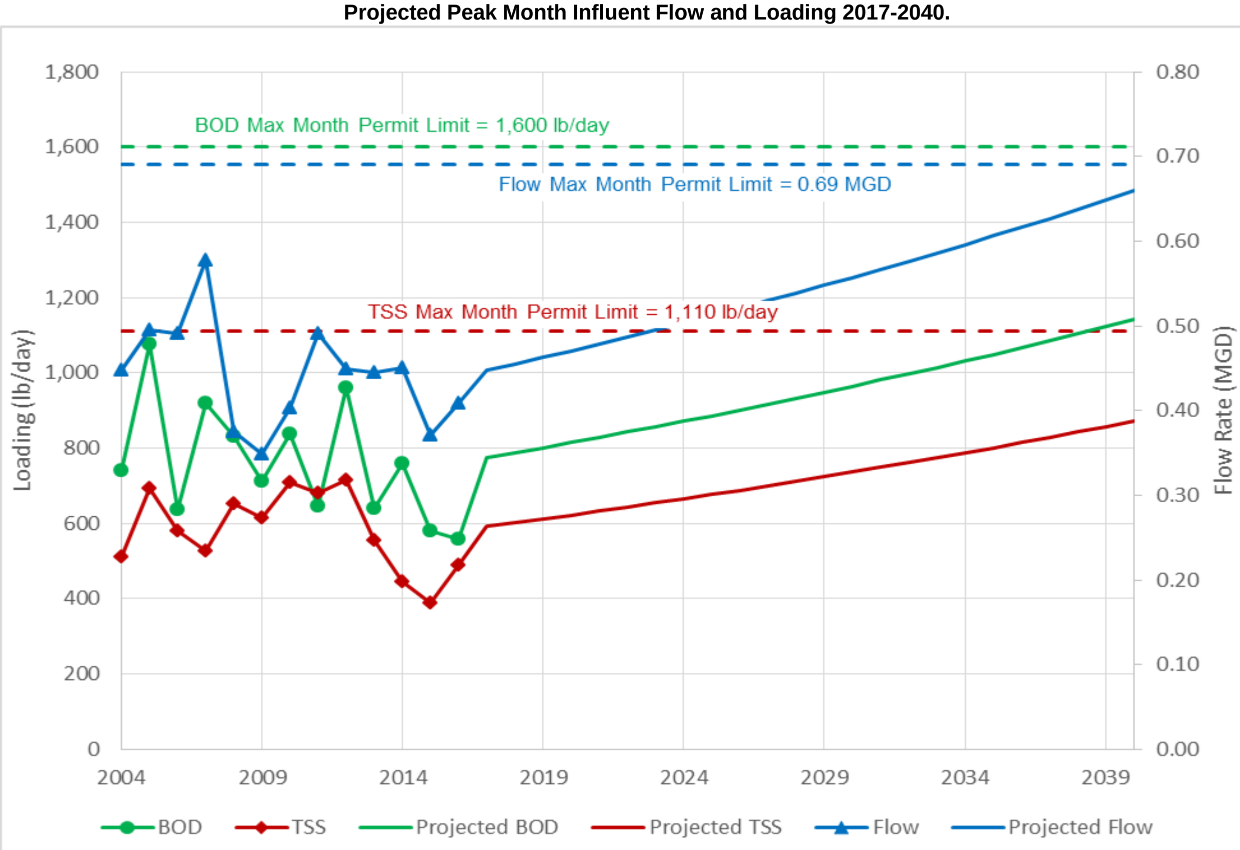
	2016	Projected 21 years 2040
Population	2250	3372
Average Daily Flow (MGD)	0.28	0.42
Peak Month Flow (MGD)	0.44	0.67
Peak Week Flow (MGD)	0.62	0.90
Peak Day Flow (MGD)	0.96	1.44
Peak Hour Flow (MGD)	2.2	2.88
Peak Instantaneous*	2.7	3.0

Peak instantaneous flow is currently restricted by the pumping rate of the influent pump station. The projected instantaneous flow is estimated based on meeting the need of the peak hourly flow rate.

Figure 3-1 shows the existing and projected influent flows and loadings to 2040. Based on the 1.7% growth rate, neither the flow nor loadings are projected to reach the permit limit before 2040. However, the projected flow would reach 85% of the permit limit (0.59 MGD) by year 2033.

Also, because 2016 was not the highest year for flow or influent loading max month values, an average value from 2004 to 2016 was used as the starting point for the 1.7% growth. These values are 762 mg/L BOD, 582 mg/L TSS, and 0.44 MGD influent flow.

Figure 3-1: Existing Peak Month Influent Loading and Flow 2004-2016. Projected Peak Month Influent Flow and Loading 2017-2040.



Future Projected Wastewater Loadings (BOD, TSS)

Influent loadings of BOD and TSS are expected to increase proportionally with increase in flow. Table 3-7 displays the projected loadings to the WWTP compared to the permit limits.

This Facility Plan details the alternatives and the selected approach to upgrading the WWTP. The planned date for completion of the WWTP upgrade is 2023.

Table 3-7: Friday Harbor WWTP Projected Loadings

	Permit Limits	2016 Average	21 years (2040)
Population Estimate	--	2,250	3,372
Projected Average BOD (lb/day)	--	524	785
Projected Peak Month BOD (lb/day)	1,600	762	1,117
Projected Average TSS (lb/day)	--	409	613
Projected Peak Month TSS (lb/day)	1,110	582	861

4.0 - WASTEWATER TREATMENT FACILITY EVALUATION

The purpose of this section is to evaluate the existing WWTP and its components with respect to capacity, reliability, and redundancy.

Wastewater Treatment Plant Performance

Treatment Process

A schematic diagram and hydraulic profile of the existing WWTP process is included in Figures 4-1 and 4-2. Wastewater influent enters the facility at the influent pump station (IPS) and is lifted to the headworks by one of three pumps in the influent pump station. The influent pump station capacity is designed for 2.62 MGD with two duty pumps and one additional pump as backup. With this capacity the IPS would meet the majority of future peak flows, but would require all three pumps under future peak hourly flows.

The influent raw wastewater flows by forcemain to the new headworks placed online September 2019. Before entering the headworks flow passes through an electromagnetic flow meter. At the beginning of the headworks flow is split to two aerated grit chambers. The IPS will typically operate with one pump running, and flow rates will be between 1380 and 1060 gpm. At these flow rates, which are approximately equal to the peak day flow rate, the grit chambers are sized such that the detention time is always greater than 3 minutes with only one chamber in service. This will allow for taking one chamber offline for cleaning and maintenance. At the peak hour flow rate, two of the IPS pumps will be running, and the detention time with both basins online is 5 minutes. With one basin online at the peak hour flow rate, the detention time is 2.1 minutes, which is still acceptable in the rare circumstance one of the basins needs to be offline during peak hour flow.

Air flow along the interior of each chamber creates a spiral liquid flow pattern through the chamber to remove grit but keep organic particles in suspension to be treated in downstream processes. Air flow can be adjusted to change the velocity of the spiral flow pattern and optimize removal of specific sizes of particles. The chambers and air flow rates are designed to remove grit of 65-mesh size and larger.

Each grit chamber is 6 ft wide and 18 ft long with a minimum liquid depth of 7 ft and a maximum liquid depth of 8.34 ft. This meets recommended width:depth and length:width ratios. The bottom is sloped to a trough where grit will collect. Grit is collected by pumps, runs through a new cyclone concentrator, and deposited via a chute to a dumpster.

After grit removal wastewater flows by gravity to two new cylindrical mechanical fine screens each rated for 2.88 MGD. The screens are in independent channels and have 3 mm openings. In the event of an extremely high flow event or failure of both mechanical screens, a manual bar screen with 3/8” spacing with a capacity over 5 MGD is located in a third independent channel.

Details of the headworks improvements completed fall 2019 are described in the 2017 Wastewater Treatment Plant Headworks Improvements and Tertiary Treatment Report.

After screening and grit removal, wastewater flows by gravity to the Sequencing Batch Reactor (SBR) treatment system. The SBR system consists to two SBR basins which operate in alternating sequencing. While one tank is filling, the other tank is reacting, settling, and decanting. Two basins are never filling at the same time. The tanks fill by gravity via the influent distribution manifold at the bottom of each tank. During the fill stage, no aeration is provided, allowing a biomass to develop. Once the desired liquid level is reached in the first tank, flow is diverted to tank 2, and aeration starts in tank 1 which is known as the react stage. A biochemical reaction occurs during the react stage while no new influent or BOD is entering the basin. Aeration is provided by three blowers. A single blower is dedicated to each basin, allowing the third blower as a spare. However, typically two blowers are used to meet the aeration demand during the react stage. The react stage is followed by the settle stage and the decant stage. The control software is programmed to allocate appropriate time for each stage and allow enough time to settle and decant before tank 2 fills. After settling, decant begins by automatically opening the decant valve. The floating decanters are set approximately 18-inches below the liquid level to ensure only clear liquid enters and not scum. An idle stage follows the decant stage. During this stage the basin waits for the fill to complete in tank 2. Wasting occurs at the beginning of the idle stage.

After wastewater leaves the SBR system it flows by gravity to two post equalization basins. The purpose of these basins is to control the flow rate through tertiary treatment and the disinfection system. The flow is pumped via submersible pumps in each basin to the tertiary treatment filter system.

In 2018 a new tertiary treatment system was installed prior to UV disinfection. The system is a Kruger Hydrotech DiscFilter. Under normal conditions (TSS approximately 50 mg/L), the effluent filter is able to reduce the TSS concentration by 50%.

The last treatment step consists of disinfection. The treated wastewater under normal conditions flows through the UV disinfection system, but can be diverted to a chlorine contact basin if necessary. The UV system consists of 1 UV channel containing 2 banks of lamps. Each bank contains 2 modules each with 6 lamps. This provides a total of 24 lamps. As effluent passes around each lamp the bacteria is exposed to UV light for disinfection.

Effluent normally discharges via gravity to the Friday Harbor marina. The existing outfall extends approximately 1,775 feet into the bay with a diffuser at the end. The seaward 745 feet of pipe was installed in 1984 and is 16-inch diameter High Density Polyethylene pipe. Approximately 1,030 feet of 10-inch diameter cast iron pipe between shore and the new HDPE pipe was not replaced. The cast iron pipe is now badly corroded and needs to be replaced. It is highly recommended that the Town replace this corroded pipe with new, corrosion resistant materials and ensuring sufficient future capacity. The Town is currently in the design phase of upgrading the outfall line.

<u>Existing Staffing</u>

The WWTP is staffed from 7:30 AM to 3:30 PM five days a week with 3.5 full time employees and with 24-hour call-out. The plant is not staffed during the weekends. The lead operator is Group II, and two other operators are also Group II. The WWTP must have at least a Group II operator in reasonable charge of daily operation.

Design Criteria

Under WAC 173-220-150 (1)(g), influent flows and waste loadings must not exceed approved design criteria (Table 4-1).

Table 4-1: Existing Design Criteria for Friday Harbor Wastewater Treatment Plant

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	0.69 MGD
Biochemical Oxygen Demand (BOD_5) – Max. Month	1,600 lb/day
Total Suspended Solids (TSS) – Max. Month	1,110 lb/day

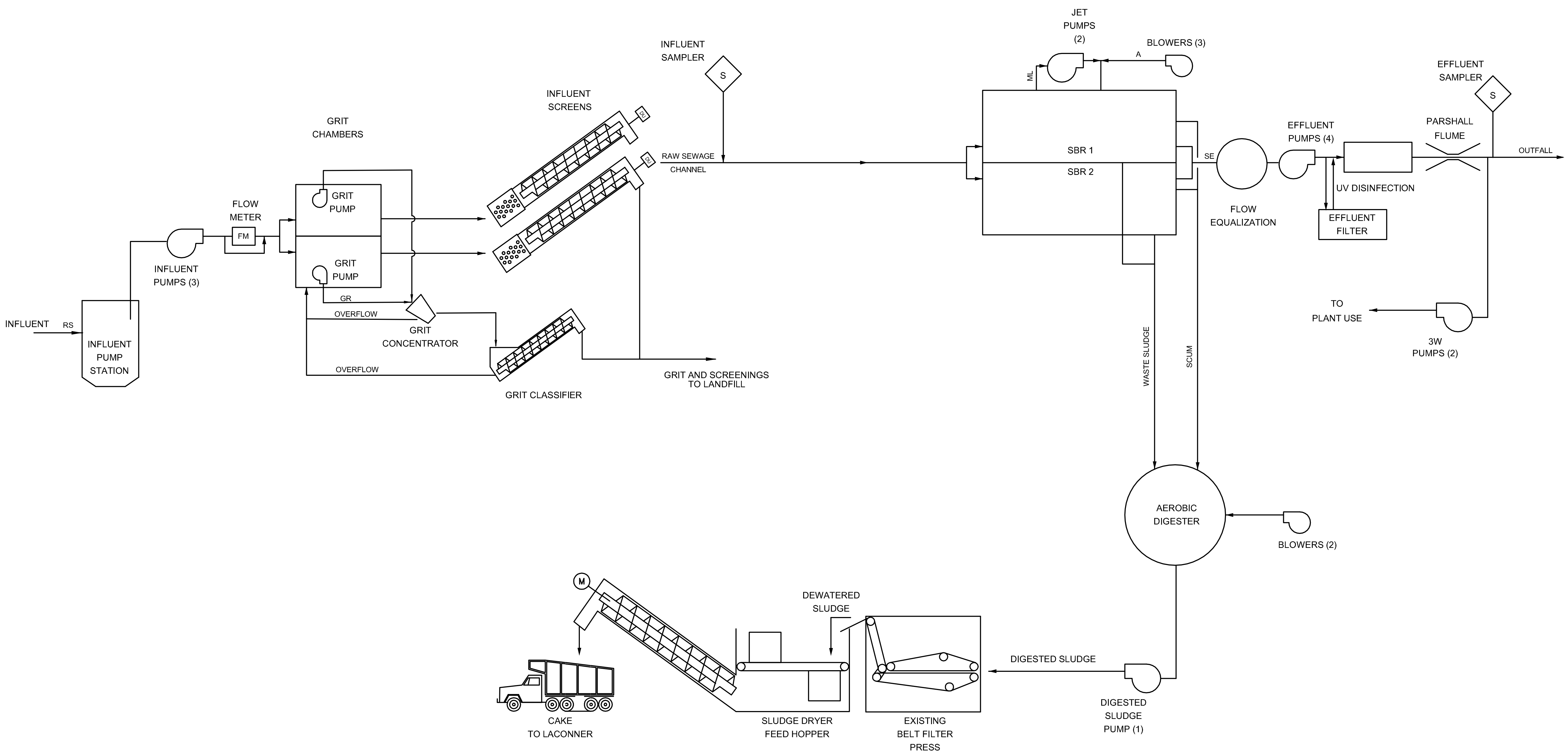
Current Wastewater flows to the treatment plant are approximately:

Average Annual Daily Flow: 0.29 MGD (0.36 MGD max value recorded)
Peak month: 0.46 MGD (0.58 MGD max value recorded)

Therefore, the treatment plant is currently operating below design capacity. However, based on the flows and loads projected in Chapter 3, the existing wastewater facilities will reach current design criteria limits (85% of Flow Limit) as soon as the year 2033.

Industrial Wastewater Producing Facilities

The Town of Friday Harbor does not receive wastewater from industrial sources.



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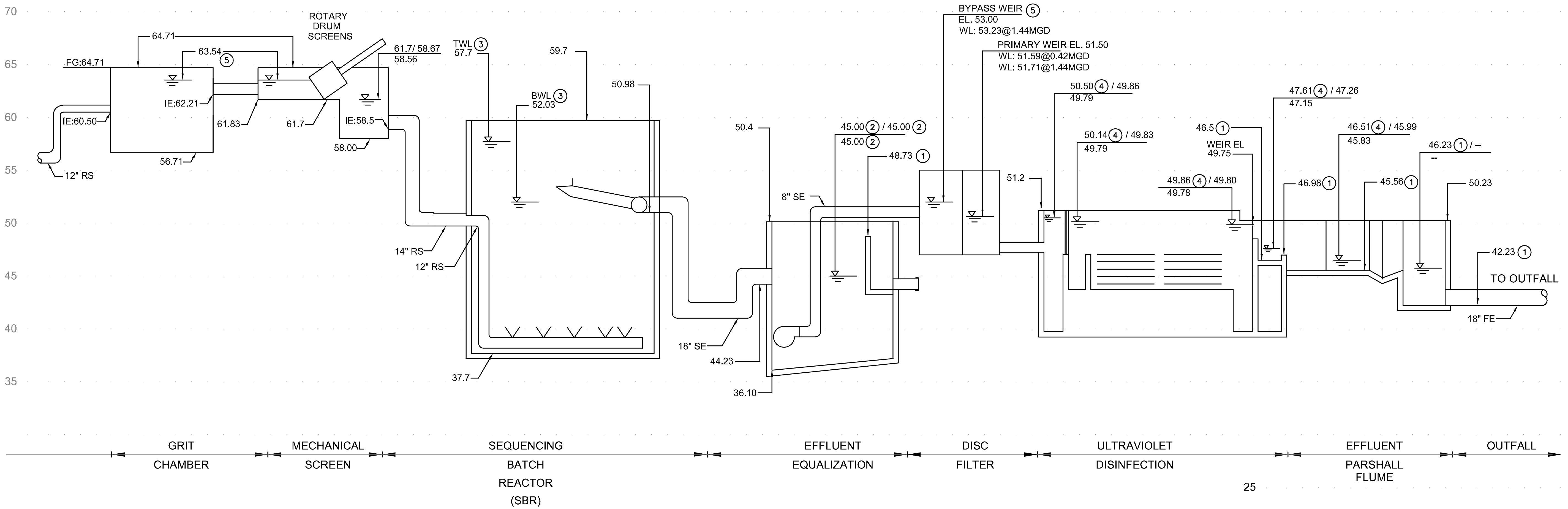
FRIDAY HARBOR
WASHINGTON

EXISTING PLANT FLOW SCHEMATIC

DATE SEP, 2019
SCALE AS SHOWN
JOB NUMBER 2018-107

SHEET FIG.
PAGE 4-1



KEY NOTES:

1. DESIGN FLOW ELEVATIONS PRESENTED IN THE LEGEND APPLY TO THE HEADWORKS IMPROVEMENTS PROJECT ONLY. SEE TOWN OF FRIDAY HARBOR, WASTEWATER TREATMENT PLANT IMPROVEMENTS, VOLUME 4 OF 4, PART C: DRAWINGS, MAY 2002, SUBMITTED BY BROWN & CALDWELL FOR ORIGINAL DESIGN CRITERIA. ELEVATION INFORMATION FROM PREVIOUS DRAWINGS. ACCURACY NOT VERIFIED.
2. LEVEL CONTROLLED BY PUMPING AND VARIES REGULARLY THROUGH FULL DEPTH OF BASIN. MAXIMUM LEVEL SHOWN.
3. BWL AND TWL (*BOTTOM AND TOP WATER LEVEL) CONTROLLED BY SEQUENCING BATCH REACTOR OPERATION; NOT DEPENDENT ON FLOW RATE. PROFILE UPSTREAM OF SBR BASED ON TWL IN SBR.
4. FLOW RATE DOWNSTREAM OF EFFLUENT EQUALIZATION ASSUMED TO BE 2.3 MGD DURING PWWF CONDITION.
5. MAXIMUM LEVEL UPSTREAM OF MECHANICAL SCREEN AND DISC FILTER CONTROLLED BY CLEANING CYCLE AND HYDRAULIC CAPACITY. HYDRAULIC CAPACITY OF PROPOSED MECHANICAL SCREEN = 2.88 MGD.

NOTE ON ELEVATIONS:

BASIS OF ELEVATIONS: ALL ELEVATION INFORMATION REPRESENTED ON THIS DRAWING IS BASED ON THE BROWN AND CALDWELL JUNE 30, 2004 RECORD DRAWING OF THE WWTP FACILITY. ELEVATIONS IN THAT DRAWING SET ARE PURPORTED TO BE RELATIVE TO THE NOAA/TIDAL (MLLW=0.00') DATUM, BASED ON THE FOLLOWING NOTE ON THE SITE CONTROL PLAN, DRAWING NUMBER 100-C-002:
"SURVEY CONTROL:
VERTICAL DATUM: BENCH MARK "C 237"
USC&GS ELEV. 96.157 ABOVE MLLW.
MLLW=0.00."
SURVEY WORK PURSUANT TO THE CURRENT EFFORT WAS BASED ON NAVD88 VALUES DERIVED BY HOLDING THE PUBLISHED VALUE OF WSDOT BENCHMARK C-237, SAID BENCHMARK ALSO BEING WSDOT BM NO.6891, BEING A BRASS DISC IN THE TOP OF THE CONCRETE WALL AT THE SOUTHEAST ENTRANCE OF THE SAN JUAN COUNTY COURTHOUSE, AND SUBSEQUENTLY CONVERTED TO THE PLANT DATUM. NAVD88 ELEVATION AT NO.6891=95.213. IN ORDER TO CONVERT ELEVATIONS SHOWN ON THIS PAGE TO THE NAVD88 DATUM, SUBTRACT 0.95 FT FROM THE DEPICTED ELEVATION VALUE. FOR EXAMPLE, AN OBJECT HAVING A DEPICTED ELEVATION OF 50.00' RELATIVE TO THE "BROWN AND CALDWELL" (PLANT) DATUM WOULD HAVE AN ELEVATION OF 49.05' RELATIVE TO THE NAVD88 DATUM. FOR EXAMPLE, THE BWL OF THE SBR WOULD BE 52.03-0.95 = 51.08 FT NAVD88.

LEGEND:

WS EL AT PWWF A,B / WS EL AT MAX MTH A,C
WS EL AT ADWF A,D

A WS EL INDICATES WATER SURFACE ELEVATIONS IN FEET ABOVE MLLW, WITH TIDE AT MHHW
B PWWF = 2.88 MGD
C MAXIMUM MONTH FLOW = 0.66 MGD
D ADWF = 0.42 MGD

HIGHEST OBSERVED TIDE 11.26
MHHW 7.72
MSL 4.73
MLLW 0.00

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FIG. 4-2

Facility Capacity

Table 4-2 shows the capacity of the major components of the existing WWTP. Based on these capacities and the projected peak flows, the table also shows the components which require capacity upgrades.

Table 4-2: Existing WWTP Component Hydraulic Capacity

Component (No.)	Existing Capacity	Status
Influent Pumps (3)	Duty: 2.62 MGD (1.31 MGD each) (Duty: Two Pumps)	Meets projected flows
Mechanical Screen (1)	2.88 MGD per Screen, 5.76 MGD total.	Exceeds projected flows.
Grit Basins	2.15 MGD each, 4.3 MGD total.	Exceeds projected flows
Bar Screen (1)	5+ MGD	Exceeds projected flows
Influent Flow Measurement (1)	NA	Meets projected flows
Influent piping 16” Headworks to SBR	3.0+ MGD	Exceeds projected flows
SBR (Sequencing Batch Reactor)	0.69 MGD (Max Month)	Exceeds projected flows, redundancy recommended.
	1.6 MGD (Peak Day)	Exceeds projected flows, redundancy recommended.
	2.6 MGD (Peak Hour)	Upgrade Needed, redundancy recommended.
Effluent Piping to Digester 18”	3.1 MGD	Exceeds projected flows
Effluent Flow Measurement (1)	Malfunctioning	Upgrade Recommended
Effluent Outfall Pipeline: 10-inch	0.7 MGD	Upgrade Recommended
Digester	370,000 Gallons	Meets projected flows, Upgrades Recommended
Belt Press	200+ gpm @ 0.5% Solids	Meets projected flows, Upgrade / Replacement Recommended
Sludge Dryer (Abandoned)	0.5 Wet Ton per Hour	Unit has been abandoned and decommissioned. Dewatered biosolids are transported off site to a composting facility. No Upgrade Recommended.
Post Equalization Basins	80,000 gallon total - 0.8 MGD max day flow	Upgrade N/A
Flow Equalization Overflow 12-inch	1.1 MGD x 2 = 2.2 MGD	Upgrade N/A
Flow Equalization Pumps (4)	532 gpm = 1.5 MGD per basin	Exceeds projected Flows
Tertiary Treatment Disc Filter	1.44 MGD	Does not meet projected flows or recommended redundancy. Not an essential long term solution. No Upgrade Recommended.
UV Disinfection	2.3 MGD	Upgrade Recommended

Headworks Evaluation

The headworks components are considered to be the 3 influent pumps, mechanical screens, manual bar screen, influent flow measurement, and grit removal.

General

The influent pump station is in good working order and satisfactory for the Town's needs throughout this planning period. The mechanical screens, manual bar screen, influent flow measurement, and grit removal basins were all installed and placed online in September 2019. These components all have full redundancy and meet or exceed future peak flows.

Influent Piping

The existing influent piping is more than adequate for current and future peak flows. It is recommended that these existing pipes be video inspected to determine their condition prior to construction of the proposed new facilities.

Existing Treatment System Evaluation

Treatment Plant Performance

In recent years, the Town has experienced considerable difficulty meeting permitted effluent limits. More specifically, the Total Suspended Solids limit of 30 mg/L has been exceeded on numerous occasions. These violations are the result of multiple factors in the design and performance of the existing SBR system. The primary factors effecting the high TSS are:

a) Solids passing through old headworks. This issue should be corrected with the new headworks being placed online September 2019.

b) As a result of item 1, solids were becoming lodged in the decanter solids exclusion valves. These valves were being lodged open with solids not caught in the headworks. This resulted in Mixed Liquor Suspended Solids (MLSS) being sent to UV disinfection that has not gone through all stages of the SBR process. In other words, MLSS is entering the decanter during the fill, react, and settle stages resulting in higher levels of TSS. This issue should be corrected with the new headworks being placed online September 2019.

c) Undersized SBR basins can't handle peak flows. As peak flows enter the SBR the cycle times adjust (shorten) to accommodate the higher flows. However, when peak flows reach approximately 0.5 MGD or higher the cycle times can not be shortened any further and a "filled decant" stage is allowed. During this time the SBR basin is decanting while also being filled with screened effluent. This allows for short circuiting of untreated wastewater during most peak flow events. In wastewater, peak flows typically occur during the winter months corresponding to rain events.

The existing treatment plant also lacks redundancy. If one SBR basin needs to be taken offline to perform maintenance on items such as the decanter solids exclusion valves, then the remaining SBR must be converted to a plug flow system with aeration only which is not successful at treating wastewater for more than 24 hours.

Plant Piping Capacity

Existing piping on site ranges from 4 inches to 16 inches in diameter and anywhere from 10 to 40 years old. The majority of the piping was installed during the 2004 upgrade, but some piping from the original plant is still in use. In most cases, the existing piping exceeds the projected peak flow of 2.88 MGD. For some pipes that may be repurposed, it is recommended that these pipes be inspected with video to verify condition.

Blowers

The plant has five existing blowers and one new blower. Three are dedicated to the SBR system for aeration, two are dedicated to the digester, and one is dedicated to the new aerated grit basins. The three SBR blowers were outfitted with VFDs in January 2017. The existing blowers have the capacity needed for existing and future aeration demand, however they are over 14 years old. It is recommended the existing blowers are replaced.

Receiving Waters

Description of the Receiving Waters:

The Friday Harbor WWTP discharges to Friday Harbor, an embayment connected to the San Juan Channel. The discharge waterbody quality designation is 'Extraordinary Marine Water'. There are no other significant point source outfalls nearby. Non-point sources of pollutants are generally limited to stormwater runoff from Friday Harbor and from activities at the Friday Harbor Marina. Ambient background data as summarized from the Fact Sheet:

Table 4-3: Ambient Background Data

Parameter	Value used
Temperature (highest annual 1-DADMax)	11.19 deg C
pH (average)	7.7 standard units (su)
Salinity	29.75 practical salinity units (psu)
Ammonia	0.715 mg/L-N
Dissolved Oxygen (10^{th} Percentile)*	5.0 mg/L

** Low dissolved oxygen value may be due to natural conditions based on similarly low values observed at other stations within the San Juan Islands that do not have direct anthropogenic influences.*

The Friday Harbor embayment of the San Juan Channel is listed on the Ecology 303(d) list as impaired for Dissolved Oxygen. The embayment is also listed as a "Category 2 – Waters of Concern" water body for fecal coliform bacteria.

Location of the Point of Discharge

The point of discharge in Friday Harbor is at coordinates Latitude: 48.541111, Longitude: -123.013333. The discharge point is approximately 1,750 LF east-northeast off the shore at the end of McDonald Street in Friday Harbor, and approximately 125 LF beyond the marina breakwater. The nearest shoreline is approximately 700 LF to the west-northwest. The outfall pipe terminates at a depth of -55 feet mean lower low water (MLLW) and is equipped with a 45-foot long diffuser section that consists of four (4) inch diameter ports spaced 15 feet apart. See

Figure 6 from Appendix F - Engineering Report (2 pages) for maps showing the location of the point of discharge.

Applicable Water Quality Standards

Applicable water quality standards are defined in water quality standards for surface waters of the state (WAC 173-201A), and more specifically for this site marine water quality standards (WAC 173-201A-210) for the Extraordinary category. The Friday Harbor facility must meet Tier 1 Antidegradation requirements (WAC 173-201A-210). Additional detailed applicable water quality standards and discussion are presented in the Fact Sheet.

How water quality standards will be met outside of any applicable dilution zone

Water quality standards will be met outside of any applicable dilution zone by maintaining facility discharges in compliance with the discharge permit. As described in the Fact Sheet, Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the facilities discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing (dilution) zone if permit limits are met.

Inflow / Infiltration Studies

Significant I&I has contributed to the Towns peak flows entering the wastewater treatment plant. The Town of Friday Harbor completed an I&I study in 1977 and in 2018/2019 as part of the General Sewer Plan update. The Town has ordinances in place prohibiting discharge of stormwater to the sanitary sewer collection system, however the Town lacks the resources and funding to enforce I&I policies. An I&I program is being developed by the Town to reduce impact on the sewer collection system and wastewater treatment facilities. An I&I Program and Corrective Measures Plan is included in the I&I Study portion of the 2019 General Sewer Plan.

A simple analysis of average daily wet weather flows vs dry weather flows shows that wet weather flows are on average 0.095 MGD higher than dry weather flows. This equates to approximately 34% of annual average flows.

Digester Evaluation

The SBR sludge is pumped into the digester, where it is stored and aerated by two dedicated blowers. The digester slowly fills during the week, and sludge is pumped when dewatering/drying activities are scheduled. The digester does not currently have a decant system or appropriate monitoring.

The digester has 370,000 gallons of storage capacity.

Current Digester Parameters:

Average wastage rate = 12,000 – 13,000 gallons per day
Average concentration = 4,000 – 5,000 mg/L
Average weekly volume added = 90,000 (3,400 lbs/week dry solids)
Total digester volume range = 92,500 gallons (min.) @ 5-ft SWD to 277,500 gallons (max) @ 15' SWD
Reserve Capacity range = 277,500 to 92,500 gallons (1-3 weeks)

A decanting system is recommended to allow the digester to store a thicker concentration with less volume. It is also recommended that the digester be outfitted with dissolved oxygen, pH, and level sensors for better operational control. These controls will allow the operators to effectively maximize denitrification while maintaining pH control.

Utility Water Systems Evaluation

The utility water system components are considered to be the 3W Effluent Water System, Automatic Sediment Filter Equipment, 60,000 gallon storage tank, and 2W Water System with Air Gap, Pumps, Hydropneumatic Bladder Tanks, and Controls.

<u>3W Effluent Water System</u>

The 3W water is currently pumped (using 5 HP Gorman Rupp Model U3 3"x3" self-priming non clog centrifugal pumps) from the effluent channel to the system, supplying water to the belt press spray wash, drum dryer condenser, and odor control units. It is estimated that the weekly 3W water demand varies between 90,000 gallon and 120,000 gallons. However, with the drum dryer offline the demand is currently 10,000 to 30,000 gallons per week. And with the proposed centrifuge upgrade the demand will be approximately 5,000 to 10,000 gallons per week.

<u>Sediment Filter Equipment</u>

An Amiad sediment filter was installed for 3W water needs. It has been problematic from the beginning, and has been taken off line. The Town tried 100 micron and 50 micron screens, but found that they are all problematic. The main problem is that the unit must backwash continuously to keep up with fouling issues.

A new filter is needed to protect the solenoid valves and prevent clogging issues at small nozzle locations. Recommendation is to install a compressible media filter system designed for 5+ micrometer particle removal and turbidity reduction, such as the Schrieber Fuzzy Filter system.

Existing 3W Storage Tank

The existing storage tank is a Mt Baker Silo concrete tank that is 26' diameter and has a 15' side water depth. The actual capacity is approximately 59,500 gallons. Since the 3W Gorman Rupp pumps may be disabled due to various reasons (low flow at the effluent channel, pump failure, and/or 3W filter system failure) it is recommended that the 3W storage tanks be sized for the 1 week demand.

2W Water System with Air Gap/Pump Units

A 2W water system serves the WWTP seal water, spray water, and hose service connections. The existing 2W water system was configured with an air gap, booster pumps, bladder tanks, and controls. However, the air gap system did not work and has been disconnected. 2W water currently flows through a Reduced Pressure Backflow Assembly (RPBA). Improvements are recommended to bring the system into compliance with WAC 246-290.

Solids Handling Facilities Evaluation

The solids handling components include the Roediger Belt Filter Press, Fenton Drum Dryer, Biofilter Odor Control Unit, and Solids Handling Buildings. The Fenton Drum Dryer has been taken offline during the summer of 2019.

The solids at the Friday Harbor WWTP are stored in a 370,000 gallon digester and processed on a weekly basis. The process includes a Roediger Belt Filter Press which dewaters and thickens the sludge from 4,000 mg/L (approx.) solids to 12% solids (approx.). The average sludge output is 13.5 wet tons per week (16 CY of cake at 12%). This equates to approximately 1.7 dry tons per week.

The digester is configured with a floating aerator which can be used on a daily cycle, as needed, to mix, aerate, and digest solids. The digester consistently has a solids concentration range between 3,000 and 5,000 mg/L. The digester is not configured for decanting, so the solids concentration remains relatively constant year round.

Friday Harbor currently pumps liquid from the digester to their gravity belt filter press to thicken and dewater sludge prior to hauling offsite. The belt filter press is only able yield cake with 11% to 13% solids. In addition, it is fairly old (installed in 1995) and ready for a major rebuild.

The dewatered cake is hauled to La Conner's composting facility at the City's WWTP. The hauling and tipping costs are significant, and the Town wants to streamline the process as much as possible. In addition, improvements will need to consider turning radius and sludge box access to minimize haul truck time and noise on site during the pick-up/drop-off periods (typically 5:00am).

Currently there is no demand for the dried biosolids in the Town of Friday Harbor or on San Juan Island.

Belt Filter Press

The existing belt filter press is a Roediger Tower Press model # TP 12.43 (with Roedos Model L-1 polymer system), installed in 1995. The belt filter press has a 1.2 meter belt and an input capacity of 200+ gpm at 0.5% solids. In addition, the spray water system (3W) requires roughly 10 - 30 gpm during operation.

In late 2006 the Roediger Corporation closed their belt press division. In early 2007 this technology was purchased by Charter Machine Company (CMC), and since then CMC is manufacturing belt press equipment using similar technology. The Town currently purchases spare parts from Tri-borough Services in Pennsylvania.

Digested sludge is pumped from the digester and fed to the belt filter press. As the sludge is pumped to the belt press a polymer solution is metered and injected into the sludge feed line, where it is mixed and aged prior to flowing on the belt of the gravity section of the belt press.

Once the sludge exits the high pressure zone of the belt press, the sludge is deposited into the sludge feed hopper. Hopper capacity = 8 CY.

Design information:

Input Parameters:

0.45%, 90,000 gallons per week (3,400 lbs/week dry solids)
Polymer: 10-20 lbs/ton
Make Down Water: As Needed.

Output:

14% solids, 2,900 gallons per week or 14.4 CY of cake (3,400 lbs/week dry solids)
Mother Filtrate: Approximately 87,000 gallons per week
Wash Filtrate: Approximately 10,000 – 30,000 gallons per week.
Solids Capture = 90% to 95%

The unit produces a dewatered product somewhere between 11% and 13% solids. The belt filter press unit is aging significantly, requiring constant maintenance and nearing its end of life. In addition, since the Town is now sending cake to the Town of La Conner, the preferred solids concentration is 16% or more. It is recommended that the filter press is replaced with newer technology such as a centrifuge that would last 20 years or more and provide high solids % product, demand less wash water, and fit inside a smaller footprint.

<u>Fenton Drum Dryer (offline)</u>

The Fenton Drum Dryer was taken offline in the summer of 2019. The information below is included in the event the dryer is used in the future.

The propane powered Fenton Drum Dryer is a model RK-36 with a design processing capacity of ½ wet ton per hour. Condenser water requirement = 60 gpm at 45 psi (40,000 - 70,000 gallons per week). This unit was installed in 2004.

The drum dryer has been problematic, and difficult to maintain. In addition, the manufacturer (Fenton) is no longer in business. Based on research, it appears that RDP Technologies, Inc. has purchased Fenton’s technology. However, the drying industry is moving away from drum dryers and towards belt dryers for municipal sludge applications. If the Town plans to continue producing Class A Biosolids it is recommended the Town replace their existing drum dryer with a new belt dryer, however given the newly adopted plan to send cake to the Town of La Conner a new dryer is not necessary.

Biofilter Odor Control

The Town installed a biofilter odor control unit for foul air from the solids area. Unit appears to be working as intended. One maintenance item to note is that piping joints should be checked periodically for leakage to ensure air transfer is working at the desired efficiency.

Tertiary Treatment and Disinfection Evaluation

The ultraviolet disinfection system components are the Wedeco UV Modules, Effluent Channel, and Flow measurement equipment. The tertiary treatment system component is the Veolia Hydrotech discfilter.

UV Equipment

The existing Wedeco UV equipment currently meets the Towns influent flows and loadings. However, it is projected that the UV system will need to be expanded in 5-10 years when the peak hour flow is projected to exceed 2.3 MGD. The current system consists of 1 channel with 2 banks. Each bank contains 2 modules with 6 lamps each. Each bank, as well as the channel width, has the capacity to add a third module. This expansion will be necessary if peak flows were to reach 1.96 MGD, which would be 85% of the design flow rate.

In addition, a shelter over the UV disinfection area is recommended to protect equipment, prevent algae growth, and provide a more comfortable working area.

Disc Filter

A new disc filter was installed and placed online during the spring of 2018. The discfilter is a Veolia Hydrotech Discfilter model HSF2208-1C. The filter was installed after the effluent equalization basins so that it receives a relatively steady flow rate. The filter has a design capacity of 0.66 MGD and a future total capacity of 1.44 MGD. The filter contains 8 filter discs with a diameter of 2.2m and a pore size of 10µm. After exiting the filter effluent flows by gravity to the UV disinfection channel. A high flow bypass also exists on the filter in the event flows exceed 1.44 MGD.

The disc filter was sized to handle future max day flows (1.44MGD, 2040) but not future peak hour flows and does not have full redundancy. The disc filter was installed in response to high effluent TSS and will likely not be critical to the treatment process after the headworks upgrades completed September 2019 and plant upgrades scheduled for 2023. However, the Town plans to keep disc filter in place permanently as extra security to achieve quality effluent.

Miscellaneous Items - Evaluation

Other items include the flat roofs on existing buildings, outfall improvements needed, and other considerations.

Flat Roof buildings

The following buildings have flat roofs which are slowly becoming maintenance concerns due to drainage issues:

- Operations Annex Building
- Water Utilities Building
- Blower Building
- Operations Building

New sloped metal roofs could be provided for these buildings. Metal roof design could include standing seam configuration, 4:12 to 6:12 slopes, and prefabricated trusses.

Outfall Upgrade

Effluent normally discharges via gravity to the Friday Harbor marina. The existing outfall extends approximately 1,775 feet into the bay with a diffuser at the end. The seaward 745 feet of pipe was installed in 1984 and is 16-inch diameter High Density Polyethylene pipe. Approximately 1,030 feet of 10-inch diameter cast iron pipe between shore and the new HDPE pipe was not replaced. The cast iron pipe is now badly corroded and needs to be replaced. This 10-inch portion of the existing outfall is undersized and will need to be replaced soon since peak flows are restricted. It is highly recommended that the Town replaces this corroded pipe with new, corrosion resistant materials and ensuring sufficient future capacity. The Town is currently in the design phase of the outfall line upgrade project.

For additional information, see Appendix F - Wilson Engineering Proposed Sewer Outfall Replacement engineering report completed in June 2016.

5.0 - WASTEWATER TREATMENT ALTERNATIVES

The purpose of this section is to identify and describe the improvement alternatives to the existing facilities. The goal of this evaluation is to select an alternative that is cost effective, reliable and low maintenance, fits within site constraints, and has effective treatment and capacity for current and future flows and loadings.

Facility Loadings

The performance of the existing WWTP is a primary reason improvements are needed. As described in Chapter 4.0, the current plant is not effectively treating wastewater for a variety of reasons. To correct the treatment problems and add redundancy to the treatment system, a significant upgrade to the wastewater treatment plant is needed.

Table 5-1: Current Permitted Influent Flow / Loading Limits

Current Permitted Facility Load Limits	
Maximum Month Design Flow (MMDF)	0.69 MGD
BOD_5 Influent Loading for Maximum Month	1,600 lb/day
TSS Influent Loading for Maximum Month	1,110 lb/day

Table 5-2: Existing Influent Flows and Loadings

	Flow	BOD		TSS		Ammonia		Alkalinity		TKN	
	(MGD)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)
ADF	0.28	524	224	409	175	70	30	539	231	117	50
MMWWF	0.44	762	208	582	159	99	27	763	208	165	45
Max Day	0.96	762	95	582	73	99	12	763	95	165	21
PHF	2.2	762	42	582	32	99	5	763	42	165	9
PIDF	2.7										

Table 5-3: Future (2040) Influent Design Flows and Loadings

	Flow	BOD		TSS		Ammonia		Alkalinity		TKN	
	(MGD)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)
ADF	0.42	785	224	613	175	105	30	809	231	175	50
MMWWF	0.66	1141	207	872	158	149	27	1144	208	279	45
Max Day	1.44	1141	95	872	73	149	12	1144	95	279	23
PHF	2.88	1141	48	872	36	149	6	1144	48	279	12
PIDF	2.7										

Max Day flow was calculated by multiplying Average Daily Flow by 3.4, which is the observed peaking factor of existing influent flows.

Peak Hourly Flow was calculated by multiplying Max Day Flow by 2.0. The actual observed peaking factor is closer to 2.29, however with planned I & I reduction a peaking factor of 2.0 is very conservative. This equates to an Hourly to Average Daily Flow peaking factor of 6.86.

Peak Instantaneous Design Flow (PIDF) is 2.7 MGD which is the high flow rate of the Influent Pump Station.

Table 5-4: Additional Effluent Design Criteria

Parameter	Limit	Condition	Notes
pH range	6-9	Min-Max (Std. Units)	
Fecal Coliform	28/100 mL	Monthly Geometric Mean	
Fecal Coliform	400/100 mL	Weekly Geometric Mean	
BOD	30 mg/L	Ave Monthly (85% Removal)	
	40 mg/L	Ave Weekly	
TSS	30 mg/L	Ave Monthly (85% Removal)	
	20 mg/L	Ave Weekly	
Design Population	3372		

Treatment Alternatives

Three treatment alternatives have been evaluated in this facilities plan based on Cost Effectiveness (Construction and Operations), Treatment Effectiveness, Operations and Maintenance Demands, and Site Layout.

The three treatment alternatives evaluated are:

1. Sequencing Batch Reactor Expansion
2. Conventional Extended Aeration
3. MBR Treatment

Alternative treatment facility locations were not considered due to high anticipated costs of relocating, existing collection system configuration, and lack of appropriate land.

All treatment alternatives will have similar effectiveness at biologically treating dilute influent flow during wet weather events, however, the longer residence time of the extended aeration process will provide more effective treatment as compared to the other alternatives.

All treatment alternatives would be sized to hydraulically handle future peak instantaneous flows. The MBR option is the most sensitive to peak flows and would require an equalization basin to regulate those peaks.

Plant Classification

Sequencing Batch Reactor Expansion = Classification III

Conventional Extended Aeration = Classification II

MBR Treatment = Classificaiton III

Since tertiary treatment exists in the form of a disc filter the extended aeration alternative would also be classified as Class III, however, given the very simple operation of the disk filter, a Classification of II would be most appropriate for that alternative.

Alternative 1 - Sequencing Batch Reactor Expansion

SBR Process Description

A Sequencing Batch Reactor or SBR is a type of activated sludge process in which the entire process occurs in a single reactor basin. The treatment process occurs over a series of stages, Fill, React, Settle, Decant, and Idle. The SBR process is the process of the existing wastewater treatment plant at the Town of Friday Harbor.

During the Fill stage, screened influent enters the basin and is added to the existing biomass remaining from the previous cycle. This stage may be mixed or aerated depending on treatment needs. In the existing SBR system the Fill stage includes static fill, mixed fill, and aerated fill.

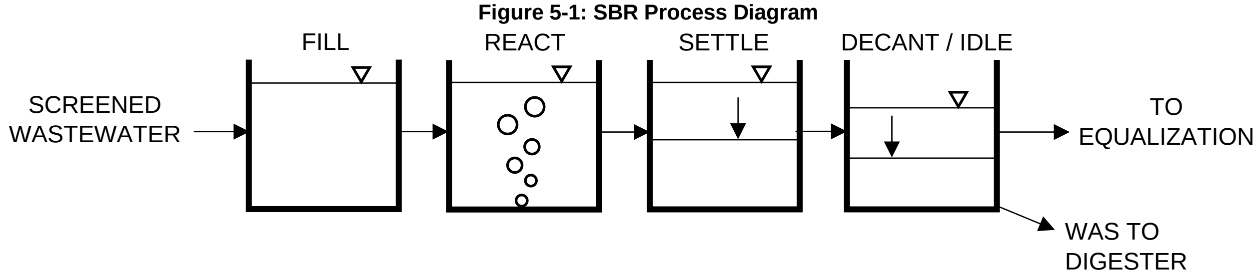
In the React stage, no additional wastewater enters the basin and the wastewater is aerated for a period of time required depending on the desired effluent quality. Most of the BOD is removed during this stage. Mixing and Aeration can be turned on or off in the Fill and React stages depending on Nitrification, Denitrification, or Phosphorus removal requirements.

In the Settle stage, activated sludge settles from the treated effluent without inflow or outflow. No mixing or aeration occurs during this stage. This stage is followed by the Decant stage where clear supernatant is removed for disinfection.

The final stage is the Idle stage. This stage is used depending on the system objectives. An idle stage is not necessary, but may be used for sludge wasting.

The proposed SBR process would include expansion of the existing plant with the addition of a third SBR basin. The three basin design would allow for more flexibility and control of the process and the ability to handle high flows. Three basins would also allow redundancy in the treatment process by allowing one basin to be taken offline during normal flows. With three basins, each basin would potentially be at a different stage of the SBR process. The new third basin would be 75-ft x 24-ft, and 20-ft side water depth and have a volume of approximately 0.81 million gallons.

Figure 5-1: SBR Process Diagram



SBR Cost Effectiveness (Construction / Operations & Maintenance)

The SBR system can be installed adjacent to the two existing SBR basins in space previously allocated for expansion. The third basin would be the same size and configuration as the previous two existing basins. The primary additional components would be concrete walls & slab, process piping, and internal SBR equipment. The SBR system does not require a clarifier for solids separation which would eliminate additional concrete costs. These features keep the overall capital costs for an SBR system relatively low compared to the MBR option, but significantly higher than the Extended Aeration option. Also, the sophistication of an SBR system has proven to require extra costs for pumping, control valves, monitoring systems, and SCADA features. Earthwork costs would be similar to the conventional extended aeration plant due to excavation and backfill required.

The estimated capital costs for an SBR system, including contingency, sales tax, and engineering, were determined to be approximately $4.7 Million. This construction cost is low relative to the other alternatives. However, the SBR would have higher operations and maintenance costs due to the complexity of an SBR plant and higher aeration requirements. SBR plants require more operator attention to manage the stages of each basin and adapt to changing flows, as a result operations labor hours per week are increased. Additionally, the SBR alternative would require the addition of one 20 HP blower for the third basin.

<u>SBR Treatment Effectiveness</u>

The performance of the SBR system has proven to be unreliable over the years since the existing SBR plant was first constructed. The variable flows and loadings have not been easy to manage and have resulted in numerous violations, mostly with effluent Total Suspended Solids. The SBR system is susceptible to disruption by peak flows which the Town sees routinely. Given the history of the existing SBR system and its challenges with meeting existing effluent requirements in the past, the SBR alternative would not be the recommended solution for Friday Harbor.

<u>SBR Operations & Maintenance</u>

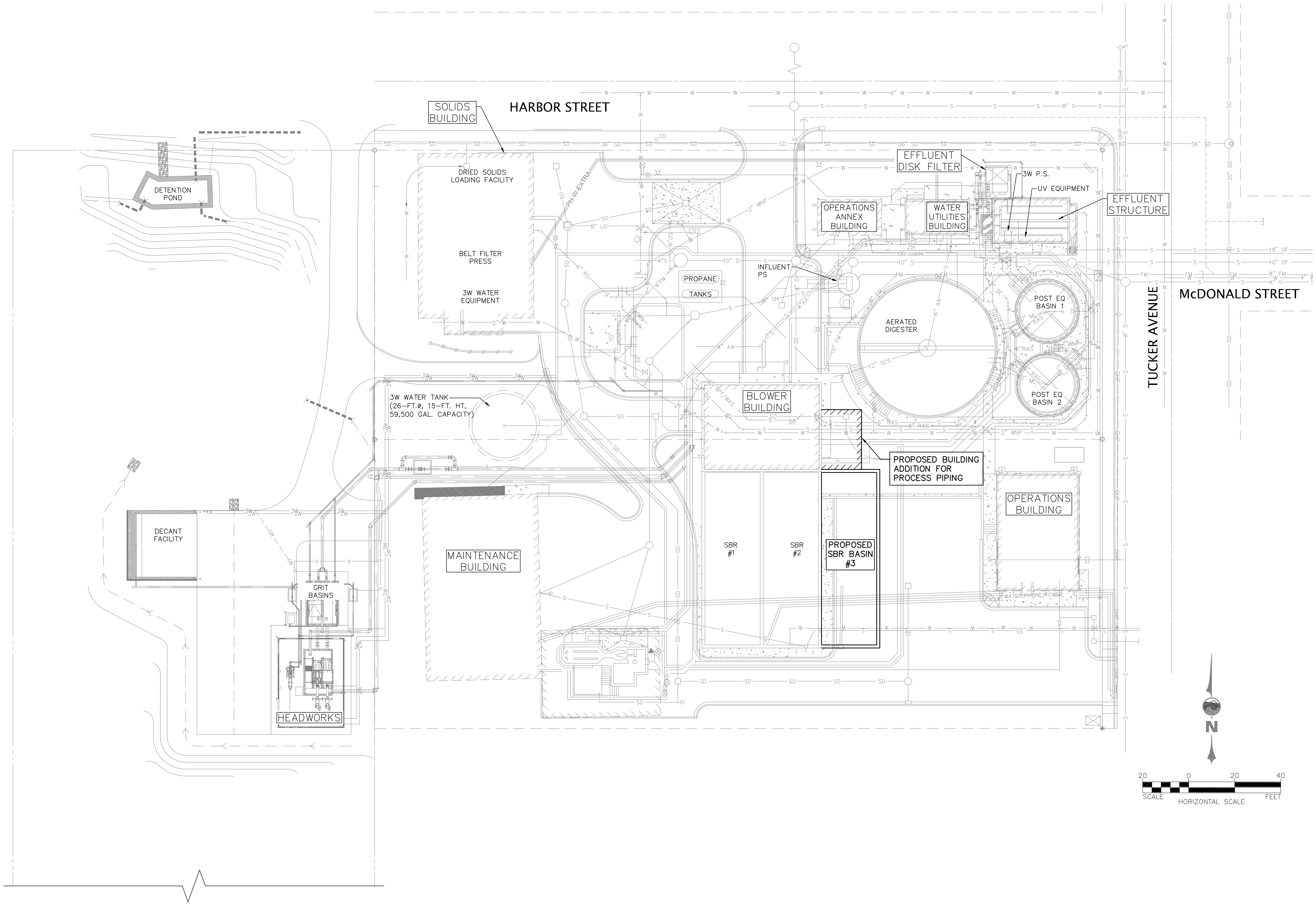
With a typical SBR, equipment such as clarifiers, anoxic basins mixers, recirculation pumps, and RAS pumps are not necessary as the treatment occurs in a single reactor basin minimizing operation and maintenance requirements. However, the Town of Friday Harbor has had many challenges with the existing SBR and the required attention necessary to maintain each basins equipment. The decanter exclusion valve equipment specifically has disrupted the treatment process on numerous occasions requiring tanks to be drained completely for repairs.

The brains of an SBR are in the automatic controls, valves, and switches which require more attention and higher maintenance skills than other processes. The sophisticated nature of a three basin SBR results in significant operator attention and required maintenance.

<u>SBR Site Layout</u>

Figure 5-2 below shows the proposed layout of an SBR system on the existing site. The proposed layout would utilize previously allocated space to the east of the two existing SBR basins for a third basin of equal size. The proposed third basin would be 75-ft long x 24-ft wide with a side water depth of 20-ft. This basin would also be a concrete basin matching basins 1 and 2, however the internal equipment for all three basins would be upgraded with the latest SBR equipment. The primary reason to upgrade the SBR equipment for the two existing basins would be to address the ongoing trouble the plant has with the solids exclusion valves. The existing concrete post equalization basins would remain.

The site layout for the SBR option fits well on the existing site since space was previously allocated for a third basin, however significant piping, pumping, and the addition of a building would be needed to accommodate a third basin.



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WWTP FACILITIES PLAN

PROPOSED SBR ALTERNATIVE SITE PLAN

DATE MARCH 2017

SCALE AS SHOWN

JOB NUMBER 2016-102

SHEET

FIG. 5-2

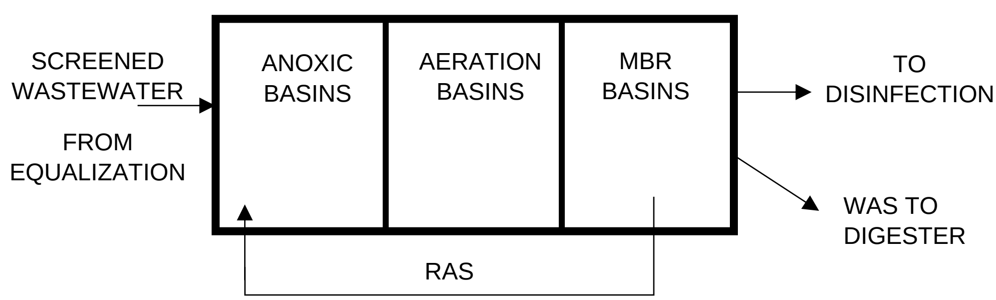
PLOT SETTINGS: Bluebeam PDF, Tabloid, Landscape, 1:2, WE APWA_SCREENED.ctb
W:\2016\2016-102 FRIDAY HARBOR WWTP FACILITY PLAN\DWG\EXHIBITS\WWTP FACILITIES EXHIBITS 2.DWG -- 11/12/2019 11:27 AM -- Scott Wilson

Alternative 2 – Membrane Bioreactor (MBR)

MBR Process Description

The MBR system is a type of activated sludge biological treatment process that uses a membrane for filtration along with a suspended growth bioreactor. After grit removal and screening, wastewater enters the equalization basin to prevent surges through the MBR. After equalization wastewater enter the anoxic zone at the front end of the plant. In the anoxic zone, wastewater is mixed with Return Activated Sludge (RAS) from the MBR basin as well as mixed liquor from the aeration zone. This process is known as the Modified Ludzack-Ettinger (MLE) process which achieves higher levels of denitrification. After the anoxic zone, wastewater flows to the aeration zone for biodegradation and continued mixing of the activated sludge. Aeration and Mixing is performed by diffusers mounted to the basin floor. After aeration, wastewater is sent to the MBR basin for filtration. In the MBR basin, clean water is pulled through the membrane and sent to disinfection. Waste Activated Sludge is sent from the MBR basin to the digester and Return Activated Sludge is recycled to the front end anoxic basin. For the proposed alternative, two identical MBR systems would be installed for redundancy and flexibility.

Figure 5-3: MBR Process Diagram



MBR Cost Effectiveness (Construction / Operations & Maintenance)

The estimated capital costs for construction of this alternative, including contingency, sales tax, and engineering, are estimated to be $8.4 million. The MBR alternative has the highest equipment costs and overall construction costs as a result. The equipment costs alone are $2.15 million. This includes aeration equipment, mixers, blowers, pumps, and the membrane units.

The operations and maintenance costs are higher than our recommended alternative (Alternative 3 – Extended Aeration), due primarily to the additional operator attention required and electrical costs to control the process. The wasting process will be improved however due to an increased mixed liquor concentration from the MBR. This will result in more digester capacity and more efficient sludge drying which will save operator time and energy.

MBR Treatment Effectiveness

MBR systems are incredibly successful at producing high quality effluent. The MBR process will easily achieve BOD less than 10, TSS less than 1, and Total Nitrogen less than10. During normal flows the MBR process produces high quality effluent, however shock loads can disrupt the membranes. To address this, we have included an equalization basin to control the flow into the MBR plant. Overall the MBR system is the best option for treatment effectiveness and would meet any anticipated effluent limits now and well into the future.

<u>MBR Operations & Maintenance</u>

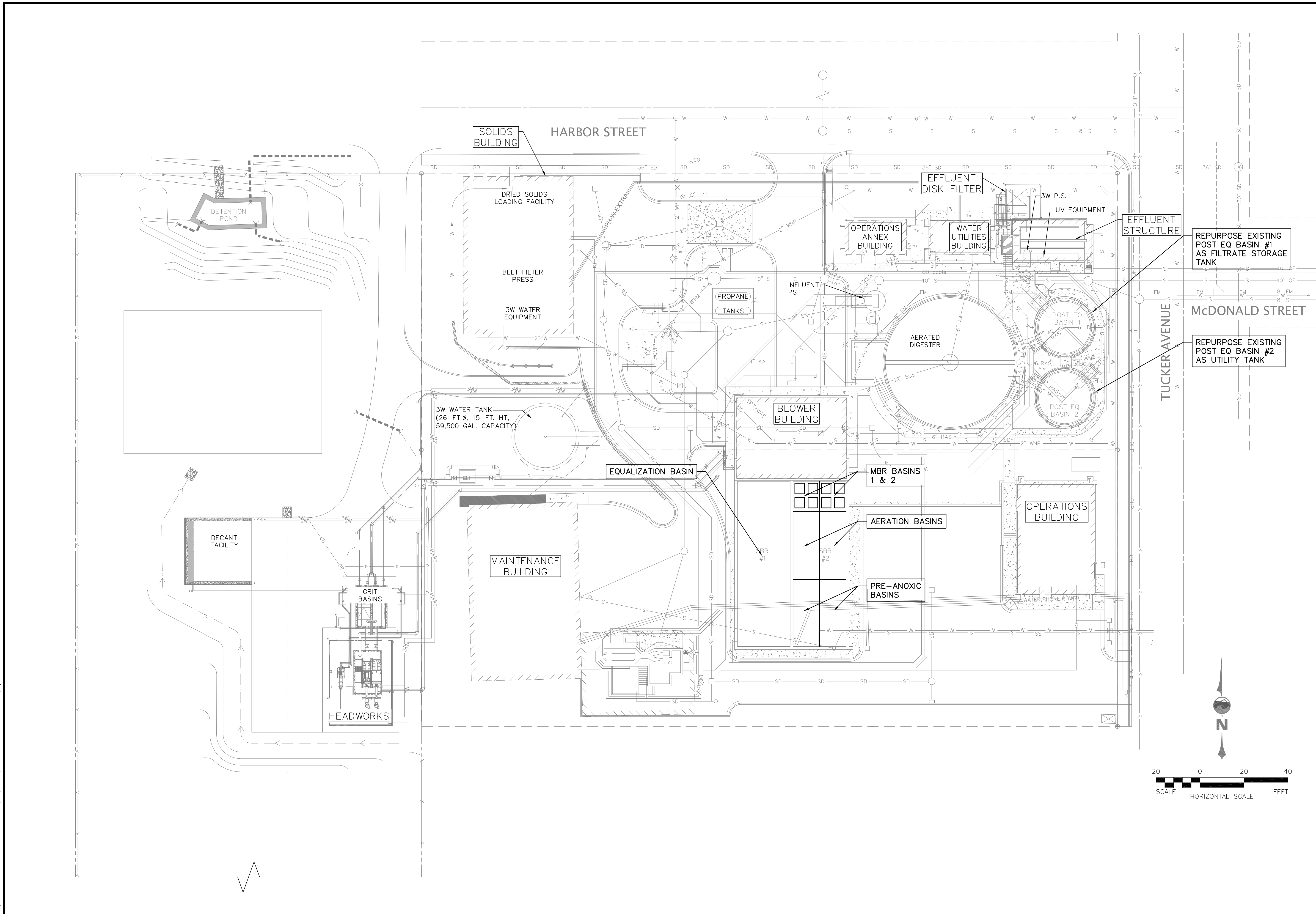
The operations and maintenance of an MBR system has significant complexity. The operators must closely monitor each basin, control flow between basins, and monitor recycle rates in order to achieve proper treatment. While this alternative produces very high quality effluent, it is significantly more complex and less forgiving then the extended aeration process.

For maintenance, the MBR system would require routine checks on pumps, valves, mixers, aeration equipment, and additional process equipment. These duties would increase work load and demand significantly higher operator hours.

<u>MBR Site Layout</u>

Figure 5-4 below shows the proposed layout of an MBR system on the existing site. The proposed layout would utilize the existing SBR basins. The West Basin would be converted to an equalization basin. The west basin is 256,000 gallons which would provide 27% of current peak day, 18% of future peak day, and 61% of future average day flows. All internal piping would be removed and pumps and mixers would be installed. The East Basin would be divided in half with a concrete wall creating two independent flow paths. For each flow path three basins would be divided by concrete walls: an anoxic basin, aeration basin, and MBR basin. The anoxic basin would include mixers and feed forward pumps. The aeration basin would include fine bubble diffusers mounted to the floor. The MBR basin would include the MBR cassettes.

The site layout of the MBR system is a significant advantage over the Extended Aeration and SBR alternatives. This option would utilize only existing basins and not require additional basins. This would allow the site configuration to stay the same, keeping the existing parking lot to the east. This option would also free up the two post-equalization basins.



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WWTP FACILITIES PLAN
MBR ALTERNATIVE SITE PLAN

DATE: MARCH 2017
SCALE: AS SHOWN
JOB NUMBER: 2016-102

SHEET
FIG. 5-4

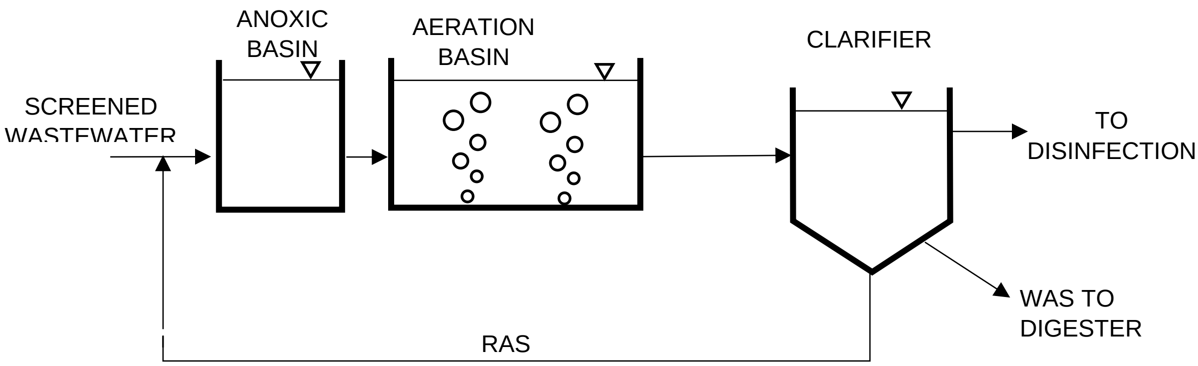
Alternative 3 – Conventional Extended Aeration Process

Conventional Extended Aeration Process Description

The Extended Aeration process consists of activated sludge biological treatment and clarification system configured in an anoxic basin followed by aerated rectangular basin followed by two circular clarifiers. The process uses a long sludge age, activated sludge process to create a very cost effective treatment solution. After grit removal and screening, wastewater enters the anoxic basins where it is mixed with the mixed liquor from the aeration basin for denitrification. Wastewater then flows to the aeration basin for biodegradation and mixing of the activated sludge. Aeration is performed by bubble diffusers on the basin floor.

After aeration, suspended solids are separated from effluent in the clarifier. Clear effluent flows from the surface of the clarifier over weirs to disinfection. Sludge is drained from the bottom of the clarifier as Waste Activated Sludge (WAS) to the digester. Return Activated Sludge is recycled to the front end of the anoxic basin. For the proposed alternative two identical trains would be installed to achieve greater redundancy and flexibility.

Figure 5-5: Conventional Extended Aeration Process Diagram



Conventional Extended Aeration Costs (Construction / Operations & Maintenance)

The estimated construction costs for this option, including contingency, sales tax, and engineering, were determined to be approximately $4.7 million. This alternative is very cost effective relative to the MBR system and comparable to the SBR expansion. The most significant costs for this process would be the addition of two concrete clarifiers, which are estimated to cost $495,000. However, this alternative would utilize the two existing SBR basins and a majority of the existing piping and aeration system.

For the operations and maintenance costs the extended aeration option has a very low yearly cost of operating. The most significant operation cost is the power required to run the blowers for aeration. The existing three 20 HP blowers used for the SBR system would provide sufficient aeration, however these blowers should be replaced and would be running constantly rather than intermittently which would increase the electrical costs.

Both construction and operations costs make the extended aeration option preferred when compared with the other alternatives presented.

Conventional Extended Aeration Effectiveness

The effluent from a conventional Extended Aeration system is estimated to be less than 20 mg/L BOD, and 30 mg/L TSS. The process has a long Hydraulic Retention Time and Solids Retention Time (HRT/SRT) which allows the system to be more forgiving to shock loads or hydraulic surges. Given the variable flows typical in Friday Harbor this design would help maintain quality effluent through the entire year. Adjustment of feed forward pumps, RAS rate, WAS rate, and aeration will be the critical controls to producing quality effluent.

With the addition of anoxic basins prior to aeration the plant will have effective denitrification to meet potential future regulations.

This option would result in greater TSS reduction to meet effluent limits and avoid violations.

Conventional Extended Aeration Operations & Maintenance

The Extended Aeration system will require routine maintenance, inspection, and cleaning of its major components. The clarifiers will require cleaning of the clarifier basin, weirs and launders and require inspection and maintenance of the clarifier drive motor. In addition, the aeration system will require occasional cleaning of diffusers in the aeration basin. The system will also include feed forward pumps between basins, RAS pumps, WAS pumps, flow meters, electronic WAS valves, and blowers all requiring routine servicing.

Because the Extended Aeration option is more forgiving to shock loads or hydraulic surges, the operator attention necessary would be significantly less than the other alternatives evaluated. This plant would not require constant attention and adjustment to peak loads or flows.

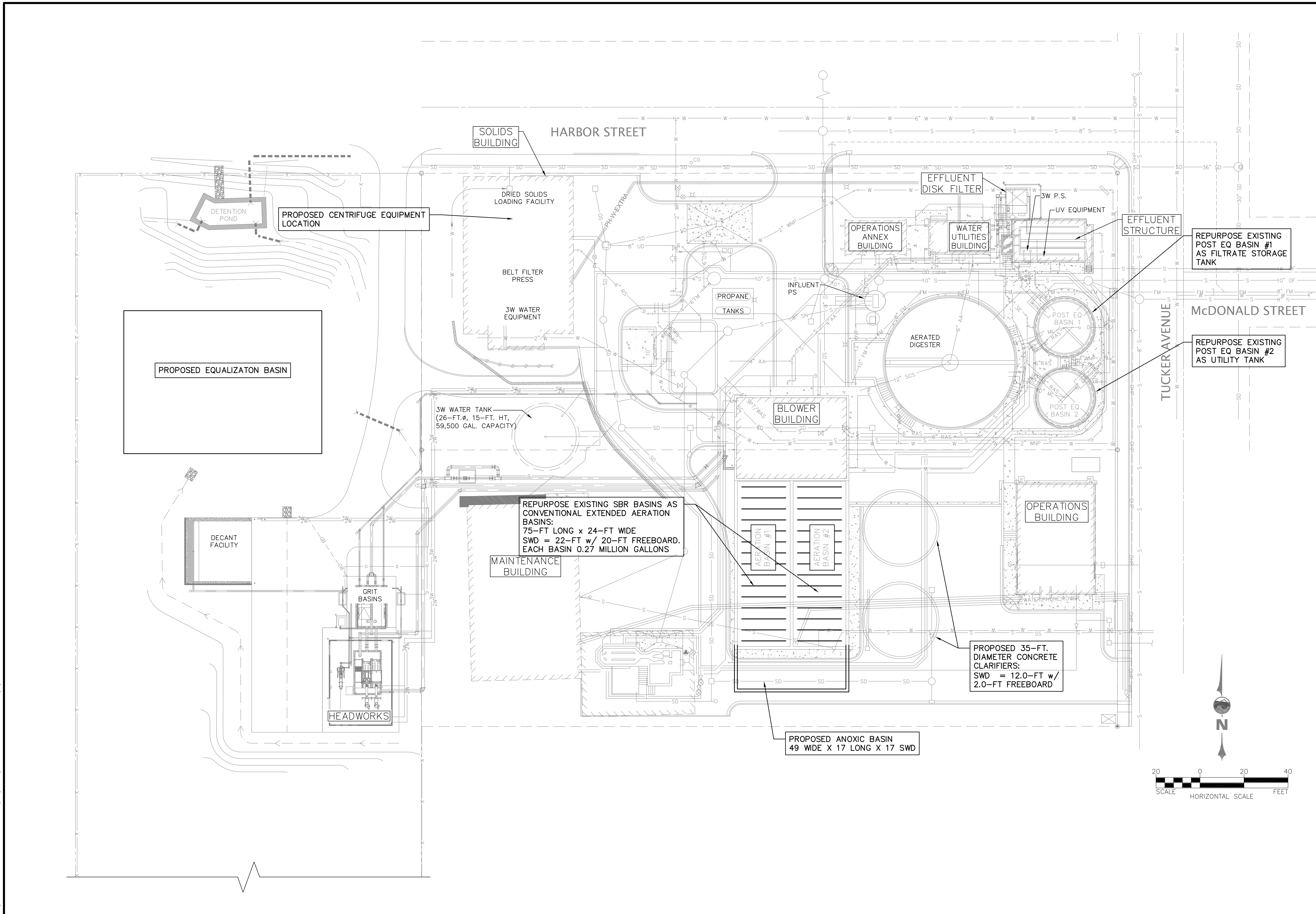
Conventional Extended Aeration Site Layout

The figure below shows the proposed layout of the Extended Aeration system on the existing site. The proposed layout would utilize the existing SBR basins and convert them to aeration basins. The majority of the existing SBR equipment in the basins will be removed and replaced with diffusers along the bottom of each basin. New air headers will be installed along the top of the wall of each basin but will take advantage of existing air piping coming from the blower pump room.

New anoxic basins will be placed near the aerations basins on the south side of the plant. These basins will either share a common wall with the aeration basins or be hydraulically connected via gravity piping.

The two proposed clarifiers will be constructed just east of the existing SBR basins in space allocated for a third SBR. This space is currently being used for parking. The clarifiers will be circular concrete clarifiers 35-ft in diameter. The top of wall elevation for these clarifiers will be similar to the existing SBR basins.

The advantage of the extended aeration system layout is the ability to utilize the existing SBR basins and the existing blower/pump room as they are currently configured. It would also allow the two post-equalization basins to be taken offline and repurposed. The disadvantage is the parking space that will be used for the addition of the two proposed clarifiers. This alternative would have a preferred layout over the SBR system since it would not need the addition of major piping or buildings, but would take up more space compared to the proposed MBR system which would not need the addition of any additional basins or buildings.



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WWTP FACILITIES PLAN

PROPOSED EXT. AIR SITE PLAN

SHEET FIG. 5-6

DATE MARCH 2017

SCALE AS SHOWN

JOB NUMBER 2016-102

6.0 - RECOMMENDED IMPROVEMENTS

The purpose of this section is to identify and describe the recommended improvements to the existing wastewater treatment facilities. Improvements of this section will consist of site improvements and selection of the recommended treatment alternative. The goal of treatment alternative evaluation is to select an alternative that is cost effective, reliable, low maintenance, fits within site constraints, and has effective treatment and capacity for current and future flows and loadings.

Recommended Treatment Alternative

Description of System

Based on the evaluation of each treatment process alternatives, the Conventional Extended Aeration process is recommended as the best option for the Town of Friday Harbor. The process is fundamentally an extended-aeration activated sludge process and thus is effective at treating variable flow and waste loads. The process contains typical characteristics of extended-aeration systems, including long hydraulic and solids retention times, high microorganism concentration, and low food:microorganism ratio (F/M). Primary clarification is unnecessary and would not be utilized. The system which is proposed for Friday Harbor can achieve denitrification by biological means if necessary for effluent limits in the future; the treatment scheme is similar to the Modified Ludzack-Ettinger (MLE) activated sludge process and can incorporate an anaerobic zone prior to the aeration basins.

The process will install two new anoxic basins, utilize the existing SBR basins, and have two external clarifiers for secondary clarification. Figure 6-1 shows a flow diagram of the proposed treatment process.

After screening and grit removal, influent flow will be routed to the anoxic basins for mixing with the mixed liquor and denitrification. Flow will then move to the extended aeration basins where fine bubble diffuser assemblies are supported near the basin floor. Air delivery will be controlled by PLC programming and flow-paced with blowers powered by variable-frequency drives. Mixed-liquor dissolved oxygen concentration (DO) will be monitored and compared to a set point value.

Solids in effluent from the extended aeration basin are settled in one of two external clarifiers. Biomass is separated from the mixed liquor in the clarifier. A floating flocculating rake mechanism travels around the length of the clarifier to aid in solids settling and distribution. Settled sludge is collected in the bottom of the clarifier by a stationary suction pipe and pumped by Return Activated Sludge (RAS) pumps which discharge to the extended aeration basins. Biomass wasting is controlled by an automated valve which will send Waste Activated Sludge (WAS) from the bottom of the clarifier to the aerobic digester. The clarifiers will be constructed of concrete. Effluent will flow over a fixed overflow weir and will flow by gravity to disinfection. Floating materials and debris are removed using a rotating scum removal system.

Future Expansion

The extended aeration treatment system has been sized and will be designed to easily handle the projected flows and loadings presented in Chapter 5. This includes peak hourly flows of 2.88 MGD. However, if future expansion becomes necessary, the treatment plant could expand into property to the west of the existing lot. This space would allow for additional aeration basins and clarifiers as needed.

Future Nutrient Effluent Limits

The Town is aware that the Department of Ecology is taking steps to limit the growth of nutrient discharges to the Puget Sound through the Puget Sound Nutrient Source Reduction Project and that the following provisions are anticipated when permits are re-issued.

- Prevent the increase of nutrient loading from existing municipal treatment plants by capping nutrient loading at current levels.
- Set achievable effluent limits for municipal treatment plants that already have nutrient removal technologies installed.
- Require municipalities to begin the planning process that will lead to implementation of nutrient removal technologies.

At this time, the Department of Ecology has not provided a future effluent limit for either Total Nitrogen or Phosphorus. However, the treatment alternative recommended with added anoxic basins will improve denitrification from current effluent levels. Phosphorus reduction will be minor with the conventional extended aeration process, but chemical addition or enhanced biological phosphorus removal could be added in the future if needed.

With the recommended treatment process a Total Nitrogen effluent level below 15 mg/L and Phosphorus effluent level below 5 mg/L are anticipated.

Design Calculations

The following calculations were used to determine the sizing of two extended aeration basins. The calculations below are based on Future Max. Month flows and loadings. The calculations below show that the existing basins are adequate for treatment of existing and future flows and loadings.

Variables and known values,

$$Q = Future\ Peak\ Day, 1.44\ MGD$$
$$Basin\ Volume = 34{,}200\ ft^3$$
$$BOD_{in} = 95\frac{mg}{L}, \text{Max. Month}$$
$$TKN_{in} = 45\ \frac{\text{mg}}{L}, \text{Max. Month}$$

Hydraulic Residence Time, HRT

$$HRT = \frac{V}{Q}$$

$$HRT = \frac{2 * 34{,}200\ ft^3}{1.44\ MGD * 10^6 * 0.13368\frac{gal}{ft^3}}$$

$$HRT = 0.36\ days$$

$$\begin{aligned}&Where,\\&V = Total\ Volume, ft^3\\&Q = Flow\ Rate, ft^3/day\end{aligned}$$

BOD Loading Rate (per Basin), BOD_{Load}

$$BOD_{Load} = BOD_{in} * \%Removal * Q$$

$$\begin{aligned}&Where,\\&BOD_{in} = 95\ \frac{mg}{L}\\&\%Removal = 100\%\\&Q = Flow\ Rate, MGD\end{aligned}$$

$$BOD_{Load} = 95\frac{mg}{L} * 1.0 * \frac{1.44\ MGD}{2} * 8.34\frac{lbs}{gal}$$

$$BOD_{Load} = 570.46\frac{lbs}{day}$$

BOD Volumetric Loading Rate (per Basin), $BOD_{Vol\ Load}$

$$BOD_{Vol\ Load} = \frac{BOD_{Load}}{V}$$

$$\begin{aligned}&Where,\\&V = Basin\ Volume, ft^3\\&BOD_{Load} = 570.46\frac{lbs}{day}\end{aligned}$$

$$BOD_{Vol\ Load} = \frac{570.46\frac{lbs}{day}}{34{,}200\ ft^3} * 1000$$

$$BOD_{Vol\ Load} = 16.68\frac{lb}{1000ft^3}$$

TKN Loading Rate (per Basin), TKN_{Load}

$$TKN_{Load} = TKN_{in} * \%Removal * Q$$

$$Where,$$

$$TKN_{in} = 45 \ \frac{mg}{L}$$
$$\%Removal = 100\%$$
$$Q = Flow\ Rate, MGD$$

$$TKN_{Load} = 45\frac{mg}{L} * 1.0 * \frac{1.44\ MGD}{2} * 8.34\frac{lbs}{gal}$$

$$TKN_{Load} = 270.22\frac{lb}{day}$$

Calculations for additional flows and loadings and are presented in table 6-1.

WWTP Sizing and Layout

Aeration basin sizing is shown in the calculations above. Sizing the extended aeration basins is based on the BOD Volumetric Loading Rate. The target BOD Volumetric Loading rate is around 10 lb/1000ft^3. In addition, minimum $BOD_{VolLoad}$ should be no less than 4 lb/1000ft^3 and maximum $BOD_{VolLoad}$ should be no more than 18 lb/1000ft^3. Table 6-1 below shows the $BOD_{VolLoad}$ for various design flow rates.

Table 6-1: $BOD_{VolLoad}$ for two basins:

	Flow (MGD)	**BOD Loading** (mg/L)	**$BOD_{Volload}$** (lbs/1000ft^3)
Existing Ave Day	0.28	224	7.65
Existing Max Month	0.44	208	11.16
Projected Ave. Day	0.42	224	11.47
Projected Max Month	0.66	207	16.66
Existing Ave Week	0.62	297	
Projected Ave. Week	0.90	445	

The existing SBR basins will be utilized for the extended aeration basins. These basins will remain as 24-ft x 75-ft vertical walled concrete basins. The basins will have 2-ft of freeboard to comply with DOE regulations, therefore the side water depth will be 19-ft. Total volume of each basin will be approximately 255,833.78 gallons which is adequate for existing and future flows and loadings.

Secondary Clarification

Two 35-ft secondary clarifiers will be installed after the extended aeration basins. The clarifiers will have complete redundancy at Projected Peak Day flows. Biomass is separated from the mixed liquor in the clarifier. A floating flocculating rake mechanism travels around the length of the clarifier to aid in solids settling and distribution. Settled sludge is collected in the bottom of the clarifier by a stationary suction pipe and pumped by RAS pumps which discharge to the extended aeration basin. Biomass wasting is controlled by an automated valve and sent to the aerobic digester. The clarifiers will be constructed of concrete, have a top elevation of 59.7, and a side water depth of 12.0-14.0-ft.

Per the Department of Ecology guidelines, settling tanks shall be sized mainly on the basis of surface overflow rate. Surface overflow rates shall be between 400-600 (gpd/sf) under Average Design Flow and 1,200-1,500 (gpd/sf) under Peak Design Flow.

Clarifier Sizing Calculations

The following calculations were used to determine the size of the proposed clarifiers.

Surface Overflow Rate (per Clarifier, projected Avg. Day Flow to Single Clarifier), SOR

$$SOR_{Ave\ Day} = \frac{Q}{\frac{\pi}{4} * D^2}$$

$$Where,$$

$$Q = Future\ Ave.Day\ Flow\ \text{Rate}, \frac{gal}{day}$$

$$\text{D} = Clarifier\ Diamater, ft$$

$$SOR = \frac{0.42\ MGD * \ 10^6}{\frac{\pi}{4} * 35\ ft^2}$$

$$\boldsymbol{SOR = 436.54\ gpd/sf}$$

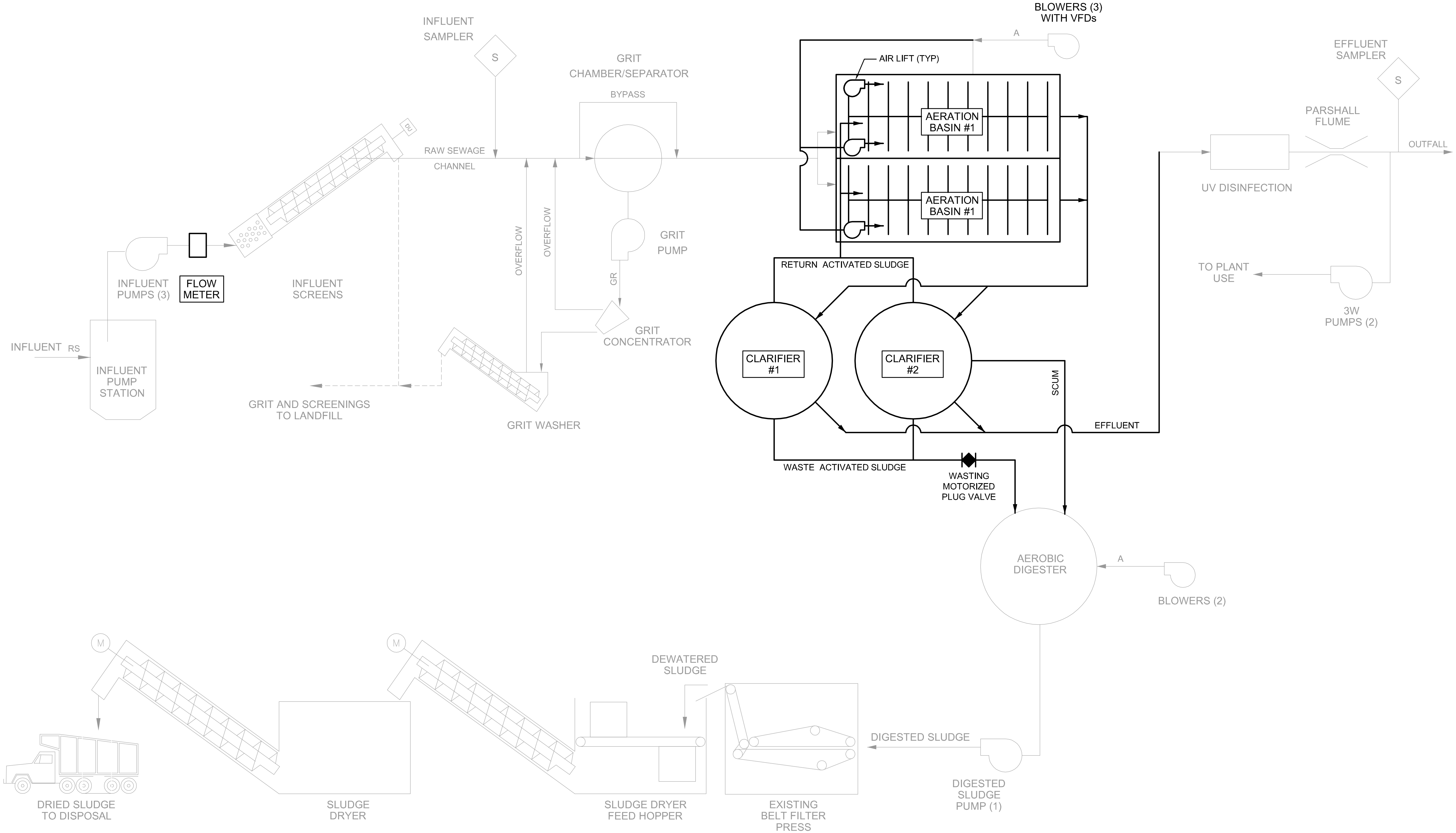
$$SOR_{Peak\ Day} = \frac{Q}{\frac{\pi}{4} * D^2}$$

$$SOR = \frac{1.44\ MGD * \ 10^6}{\frac{\pi}{4} * 35\ ft^2}$$

$$\boldsymbol{SOR = 1496.71\ gpd/sf}$$

Redundancy

The recommended treatment plant improvements will meet all reliability and redundancy requirements for a Class II WWTP as defined by Ecology. The proposed treatment system will provide two parallel trains of unit processes, as required by Ecology for systems with a peak hourly flowrate three times the average annual flowrate.



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Wilson
SURVEY/ENGINEERING

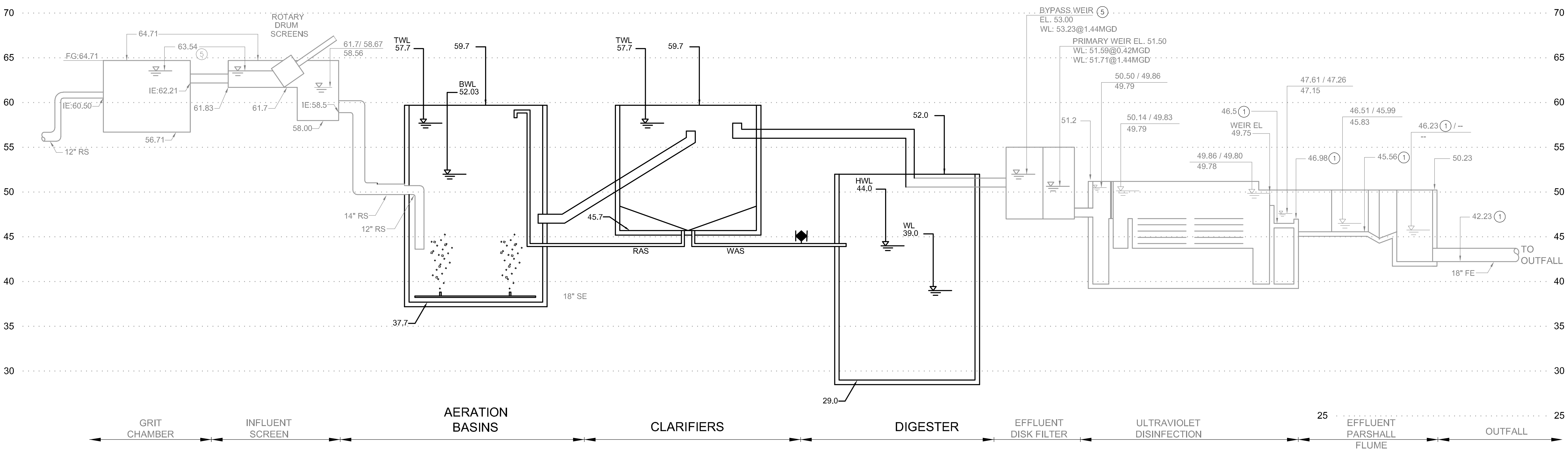
DESIGNED BY
DRAWN BY
CHECKED BY

TOWN OF FRIDAY HARBOR
FRIDAY HARBOR WASHINGTON

WWTP FACILITIES PLAN
PROPOSED FLOW SCHEMATIC

DATE
MARCH 2017
SCALE
AS SHOWN
JOB NUMBER
2016-102

SHEET
FIG. 6-1



KEY NOTES:

1. DESIGN FLOW ELEVATIONS PRESENTED IN THE LEGEND APPLY TO THE HEADWORKS IMPROVEMENTS PROJECT ONLY. SEE TOWN OF FRIDAY HARBOR, WASTEWATER TREATMENT PLANT IMPROVEMENTS, VOLUME 4 OF 4, PART C: DRAWINGS, MAY 2002, SUBMITTED BY BROWN & CALDWELL FOR ORIGINAL DESIGN CRITERIA. ELEVATION INFORMATION FROM PREVIOUS DRAWINGS. ACCURACY NOT VERIFIED.
2. LEVEL CONTROLLED BY PUMPING AND VARIES REGULARLY THROUGH FULL DEPTH OF BASIN. MAXIMUM LEVEL SHOWN.
3. BWL AND TWL ("BOTTOM AND TOP WATER LEVEL) CONTROLLED BY SEQUENCING BATCH REACTOR OPERATION; NOT DEPENDENT ON FLOW RATE. PROFILE UPSTREAM OF SBR BASED ON TWL IN SBR.
4. FLOW RATE DOWNSTREAM OF EFFLUENT EQUALIZATION ASSUMED TO BE 2.3 MGD DURING PWWF CONDITION.
5. MAXIMUM LEVEL UPSTREAM OF MECHANICAL SCREEN AND DISC FILTER CONTROLLED BY CLEANING CYCLE AND HYDRAULIC CAPACITY. HYDRAULIC CAPACITY OF PROPOSED MECHANICAL SCREEN = 2.88 MGD.

NOTE ON ELEVATIONS:

BASIS OF ELEVATIONS: ALL ELEVATION INFORMATION REPRESENTED ON THIS DRAWING IS BASED ON THE BROWN AND CALDWELL JUNE 30, 2004 RECORD DRAWING OF THE WWTP FACILITY. ELEVATIONS IN THAT DRAWING SET ARE PURPORTED TO BE RELATIVE TO THE NOAA/TIDAL (MLLW=0.00') DATUM, BASED ON THE FOLLOWING NOTE ON THE SITE CONTROL PLAN, DRAWING NUMBER 100-C-002:
"SURVEY CONTROL:
VERTICAL DATUM: BENCH MARK "C 237"
USC&GS ELEV. 96.157 ABOVE MLLW.
MLLW=0.00."
SURVEY WORK PURSUANT TO THE CURRENT EFFORT WAS BASED ON NAVD88 VALUES DERIVED BY HOLDING THE PUBLISHED VALUE OF WSDOT BENCHMARK C-237, SAID BENCHMARK ALSO BEING WSDOT BM NO.6891, BEING A BRASS DISC IN THE TOP OF THE CONCRETE WALL AT THE SOUTHEAST ENTRANCE OF THE SAN JUAN COUNTY COURTHOUSE, AND SUBSEQUENTLY CONVERTED TO THE PLANT DATUM. NAVD88 ELEVATION AT NO.6891=95.213. IN ORDER TO CONVERT ELEVATIONS SHOWN ON THIS PAGE TO THE NAVD88 DATUM, SUBTRACT 0.95 FT FROM THE DEPICTED ELEVATION VALUE. FOR EXAMPLE, AN OBJECT HAVING A DEPICTED ELEVATION OF 50.00' RELATIVE TO THE "BROWN AND CALDWELL" (PLANT) DATUM WOULD HAVE AN ELEVATION OF 49.05' RELATIVE TO THE NAVD88 DATUM. FOR EXAMPLE, THE BWL OF THE SBR WOULD BE 52.03-0.95 = 51.08 FT NAVD88.

LEGEND:

WS EL AT PWWF A,B / WS EL AT MAX MTH A,C
WS EL AT ADWF A,D

A — WS EL INDICATES WATER SURFACE ELEVATIONS IN FEET ABOVE MLLW, WITH TIDE AT MHHW
B — PWWF = 2.88 MGD
C — MAXIMUM MONTH FLOW = 0.66 MGD
D — ADWF = 0.42 MGD

HIGHEST OBSERVED TIDE 11.26
MHHW 7.72
MSL 4.73
MLLW 0.00

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Wilson SURVEY/ENGINEERING

DESIGNED BY | DRAWN BY | CHECKED BY

TOWN OF FRIDAY HARBOR
FRIDAY HARBOR WASHINGTON

WWTP FACILITIES PLAN
PROPOSED HYDRAULIC PROFILE

DATE MARCH 2017
SCALE AS SHOWN
JOB NUMBER 2016-102

SHEET FIG. 6-2

PLOT SETTINGS: Bluebeam PDF, Tabloid, Landscape, 1:2, WE_APWA_SCREENED.ctb
W:\2016\2016-102 FRIDAY HARBOR WWTP FACILITY PLAN\DWG\PROPOSED HYDRAULIC PROFILE.DWG -- 11/12/2019 12:04 PM -- Scott Wilson

Recommended Site Improvements

Based on flow and load capacities, future effluent limits, and operation and maintenance needs, the following improvements are being recommended for the Town of Friday Harbor WWTP.

Utility Water Systems Improvements

Fuzzy Filter System

As described in Chapter 4, the existing Amiad sediment filter system has been problematic from the beginning and is not currently being used. A new filter system is recommended to protect the solenoid valves and prevent clogging issues at small nozzle locations. A Fuzzy Filter System is recommended to replace the existing Amiad filter. The proposed 3' x 3' filter unit would be installed on top of the new proposed storage tank. This filter unit has a 360 gpm capacity which slightly exceeds the existing utility water pump capacity (100 gpm to 300 gpm +/-).

See Appendix E – Exhibit 1. Cost estimate presented in Chapter 7.0.

2W Water System with Air Gap/Pump Units

Per WAC 246-290-490 all WWTPs are considered to be a high hazard area, and are required to have an air gap for all utility water connections. Since the existing air gap system is not in service, It is recommended that an air gap is be placed in service. It is anticipated that the two booster pumps will need VFDs. In addition, it is anticipated that this work will include a new pressure transducer, PLC panel, and controls.

See Appendix E – Exhibit 2A. Cost estimate presented in Chapter 7.0.

Solids Handling Improvements

Dryer Equipment

The existing Fenton Drum Dryer has been decommissioned and abandoned. Beginning early fall 2019 the Town negotiated a contract to transport dewatered biosolids to La Conner's composting facility. The cost to replace the Fenton Drum Dryer is not considered to be worthwhile in light of the composting option made available from the Town of La Conner.

Dewatering Improvements

The Town's Roediger Belt Filter Press was installed in 1995, and has been heavily used over the years. The unit is fast approaching the end of its useful life, and will need major rebuilding work if a decision is made to keep it. Work will need to include new belt, new rollers, and mechanical improvements. However, newer centrifuge technology has been widely proven to outperform belt press technology by 4 to 6 points in similar situations. We would anticipate the centrifuge product to be 16% total solids (minimum) compared to the 12% typically produced with the Town's belt filter press. In addition, the centrifuge offers other advantages, such as substantially less wash water demand, smaller footprint, and ease of maintenance.

It is recommended that the Town move forward with dewatering equipment improvements.

See Appendix E – Exhibits 3/4. Cost estimate presented in Chapter 7.0.

Hauling Comparison

For this comparison we are using the following % solids yield for the each technology:

- Belt Filter Press: 12% solids
- Centrifuge: 17% solids
- Dryer: 90% solids

Since the Town has already negotiated a contract with LaConner's composting facility for dewatered solids and Lautenbach for hauling a 30 CY storage box, we will use actual Yr-2019 unit costs for this analysis. The current tipping fee at LaConner is $58/ton. In addition, Lautenbach's transport cost for one 30CY box is approximately $1,300/trip.

For this analysis we will assume 1 box hauled per week for the centrifuge and belt filter press options. In addition, we will assume 1 box hauled per month for the dried solids (90% solids) option.

Cost calculations are provided in Appendix B – Solids Hauling Cost Evaluation. The year 2020 to year 2040 hauling cost totals are:

- Belt Filter Press: $2.49M
- Centrifuge: $2.18M
- Dryer: $0.47M

Centrifuge Dewatering Equipment Comparison

The top three centrifuge manufacturers evaluated are Andritz, Alfa Laval, and GEA Westfalia.

All manufacturers sized equipment for the following:

- Hydraulic capacity = 150 gpm
- % Solids Anticipated = 16% to 18%
- Percent capture is assumed to average 95%. Therefore we will account for a 5% return of solids through filtrate.

- Polymer system is anticipated to be an emulsion system.
- Sludge will be entirely waste activated, and unit is to handle the 4,000 mg/L concentration as currently reported, but also anticipate that concentration will increase to 6,000 or 8,000 mg/L in the future when new decanting system is online. Potential increase also when WWTP process is adjusted from SBRs to Extended Aeration.
- Main drive size = 50 HP.
- Control Panel with Allen Bradley PLC components.
- Proposals for equipment included in Appendix D.

ANDRITZ

Andritz proposed the D4LL model for this facility. The equipment quote from Andritz is $260,000 for this option. The equipment sales representative is Joe Buckman at APSCO.

GEA WESTFALIA

GEA proposed the CF 466 model for this facility. The equipment quote from GEA is $265,000 for this option. The equipment sales representative is Bret Kreier at JBI Water & Wastewater.

ALFA LAVAL

Alfa Laval proposed the Aldec 75 model for this facility. The equipment quote from Alfa Laval is $270,000 for this option. The equipment sales rep. is Mike Reilly at Wm. H. Reilly & Co.

Alternative #1 – Continue Dewatering with existing Belt Filter Press Equipment

The existing Roediger Belt Filter Press Unit is 24 years old and has reached a stage where it will need a major overhaul/rebuild, if the Town chooses to continue using it. The work will need to include new belts, new rollers, new drives, and a new sludge conveyor system to a new storage box.

The rough order of magnitude cost to overhaul/rebuild the existing belt filter press equipment is estimated at $400,000 (approx.).

In addition, if the existing belt press equipment is offline for a significant time period, the Town will need to use an alternative method for handling liquid sludge. The digester currently has capacity for 3-4 average weeks of storage, however, operation staff prefers to keep the digester half full (or lower) so they have extra storage available for emergency events.

Rough order of magnitude cost to transport liquid sludge (in 5,000 gallon vactor trucks) during the belt filter press overhaul/rebuild period (assume 10 weeks during summer construction period):

Hauling Cost: $2,000 x 20 trips/week x 10 weeks = $400,000

Tipping fee = $0.10/gallon x 100,000 gal/week x 10 weeks = $100,000

The total cost for all work items planned under Alternative #1:

Construction Contractor Work ($969,000):

- Overhaul/Rebuild Belt Filter Press: $400,000
- Painting: $15,000
- Remove Drum Dryer Equipment: $36,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Direct Contract Work ($500,000):

- Haul and Dispose of Liquid Sludge: $500,000

See Appendix C – Construction and Engineering Cost Estimates – Alternate #1

Alternative #2 – Replace Belt Filter Press Equipment with Centrifuge

The existing solids building is a wood frame structure with metal roof.

Since the building is configured with belt filter press equipment, drum dryer equipment, and plant water (3W) pumps/piping, major modifications will be needed if new dewatering equipment is to be installed. The most feasible concept would be to demo the existing dryer and construct the centrifuge facilities in the area currently occupied by the dryer and dried solids storage areas.

Haul truck access will need to be closely evaluated because the Town desires two sludge storage boxes (30 CY each), and large truck access is somewhat limited to the southern bays inside the existing building.

Rough order of magnitude cost to retrofit/refurbish the existing building for a new centrifuge unit with power, controls, instrumentation, mechanical, conveyance, storage, site work, and digester improvements is $1,560,000.

See Appendix C – Construction and Engineering Cost Estimates – Alternate #2

Alternative #3 – Construct New Dewatering Facility with Centrifuge Adjacent to Digester

Two locations have been selected for the new dewatering building location. Both options are anticipated to have similar costs. Option 1 is located between the digester and the existing solids building just north of the blower building.

Option #1 Pros:

- Ideal access location for haul truck.
- Short distance from digester, odor control unit, and minimal yard piping needed.

Option #1 Cons:

- Geotechnical investigation found soft soils extending 5 to 10 deep in this vicinity, so additional structural fill anticipated.

Option 2 is located on west side of site, between the stormwater detention pond and the new headworks facilities.

Option #2 Pros:

- Existing soils appear to be suitable for proposed loads and building foundations.
- Greenfield construction reduces costs and demolition required.

Option #2 Cons:

- More distance to yard piping connections.
- Additional maneuvering needed for sludge haul truck access, so additional pavement/earthwork required.

The rough order of magnitude cost to construct a new dewatering facility adjacent to the digester (See Appendix C - Construction and Engineering Cost Estimates – Alternate #3) is estimated at $2,325,000.

Alternative #4 – Construct New Dewatering Facility with Centrifuge Adjacent to Headworks

See discussion for Alternative 3, Option 2 above.

The rough order of magnitude cost to construct a new building adjacent to the headworks (See Appendix C - Construction and Engineering Cost Estimates – Alternate #4) specifically for the proposed centrifuge equipment is also estimated at $2,325,000.

Digester Improvements

It is recommended that a decant system is installed. This would allow the existing digester to store a higher solids concentration, which would allow for longer retention time and additional solids digestion.

Also, it is noted that the proposed decant system would be easier to operate with permanent level sensing equipment, permanent pH sensing equipment, and a permanent dissolved oxygen sensor.

Other digester work items include construction of a standard concrete slab above the sludge pump vault (instead of existing metal roof structure) and replacement of the existing sludge transfer pump with new pump downsized slightly for centrifuge capacity and configured for a solids concentration range of 0.4% to 2.0% total solids.

Adjustable Decant Pipe and Valving

As described in Chapter 4, the existing digester does not currently have a decant system in place.

The solids could be settled and clear liquid could be removed from the digester. Our recommended improvements would add two telescoping valves to the digester, and route T-Valve piping to the influent pump station. This would allow the digester to store a thicker concentration with less digester volume.

Sensors

In addition, it is recommended that a dissolved oxygen sensor, pH sensor, and water level sensor be added to the digester for monitoring purposes. Sensors could be mounted from the wall and located at the Operator's preferred location.

See Appendix E – Exhibits 5A-C. Cost estimate presented in Chapter 7.0.

Conveyance System Improvements

It is recommended that a conveyor is installed to transfer dewatered sludge to a sludge storage box for hauling, when needed. Five screw conveyor manufacturers were evaluated: Custom Conveyor Corporation, Spirac, KWS Environmental, MLM Conveying Systems, and Austin Mac, Inc.

All manufacturers sized equipment for the following:

- Capacity = 120 ft^3/hr
- % Solids = 18% to 20%
- Minimum Conveyor Length = 20 ft
- Reversible Operation.
- Control Panel not included.
- Proposals for equipment included in Appendix E.

CUSTOM CONVEYOR CORPORATION

Custom Conveyor Corporation proposed their Inclined Shaftless Screw Conveyor for this facility. The proposed conveyor has a 10-inch diameter spiral, and is 25 feet long. The equipment quote from Custom Conveyor Corporation is $42,000 for this option. The equipment sales representative is Joe Buckman at APSCO.

SPIRAC

Spirac proposed the U320-SPX/SS model for this facility. The proposed conveyor has an 11.4-inch diameter spiral, and is 22 feet long. The equipment quote from Spirac is $41,000 for this option. The local equipment sales representative is Mike McKamey at Beaver Equipment.

KWS ENVIRONMENTAL

KWS Environmental proposed their Shaftless Screw Conveyor for this facility. The proposed conveyor has a 12-inch diameter spiral, and is 20 feet long. The equipment quote from KWS Environmental is $60,700 for this option. The local equipment sales representative is Bret Kreier at JBI Water & Wastewater.

MLM CONVEYING SYSTEMS

MLM Conveying Systems proposed their Shaftless Conveyor for this facility. The proposed conveyor has a 11.22-inch diameter spiral, and is 20 feet long. The equipment quote from MLM Conveying Systems is $42,250 for this option. The local equipment sales representative is John Simon at Goble Sampson.

AUSTIN MAC, INC.

Austin Mac, Inc., proposed their Shaftless Screw Conveyor for this facility. The proposed conveyor has a 12-inch diameter spiral, and is 24 feet long. The equipment quote from Austin Mac is $29,800 for this option. Austin Mac does not have a local equipment sales representative, and they are located in Seattle, WA.

Conveyor Recommendations

It was determined that a shaftless screw conveyor would be the best option compared to shafted screw and belt conveyors for this application. Shaftless and shafted screw conveyors are generally better suited for dewatered sludge than belt conveyors due to their fully-enclosed design. Shafted conveyors typically have a higher capital cost than shaftless, and they feature bearings which require lubrication. Shaftless conveyors provide more efficient conveyance than shafted, and use a replaceable wear liner to protect the trough from being eroded by any grit in the sludge. It is anticipated that the wear liner on the shaftless conveyor would only require replacement every few years.

All five evaluated screw conveyor manufacturers have extensive experience manufacturing shaftless screw conveyors. Depending on the facility's experience with their existing Interquip belt conveyor, we would recommend bidding these units against each other to obtain the most competitive pricing.

Summary of Dewatering Equipment Evaluation

The proposed digester improvements will be beneficial no matter what dewatering technology is selected. The advantages include increased retention time, increased digestion, and improved process control.

Dewatering equipment options have several trade-offs. The new technology options with centrifuge equipment is very favorable since it will produce a higher solids concentration, will require substantially less wash water (2500 gallons per run cycle, approx. 25% of the BFP wash water demand), and will be more effective at containing and mitigating odors. In addition, labor required to clean the centrifuge is minimal, since the wash water cycle is a fully automated process. However, the centrifuge equipment is a substantial investment.

The top three centrifuge units (Andritz, Alfa Laval, and GEA Westfalia) are considered industry leaders, and we would recommend bidding these three units against each other to obtain the most competitive pricing.

Based on our evaluation, Biosolids Alternative #2 would be the most cost effective option and our initial recommendation. This option would utilize the existing biosolids building saving considerable design and construction costs. In this alternative the existing belt press would remain operational while new equipment is installed in the location of the existing drum dryer and biosolids storage area. The new equipment would consist of a centrifuge and conveyance system, along with the necessary mechanical piping and electrical equipment. This option would also allow for future biosolids expansion in the location of the existing belt filter press.

Headworks Improvements

The headworks components are considered to be the 3 influent pumps, mechanical screen, manual bar screen, and influent flow measurement.

<u>General</u>

A new headworks including flow metering, mechanical screens, grit removal, classifier, and building were installed and placed online in September 2019. At this time no improvements are recommended for the headworks system.

Miscellaneous Improvements

Flow Equalization Basin

It is recommended that the Town construct a flow equalization basin to handle peak flows and prevent disruption to the treatment process. An equalization basin could also be used for future plant maintenance as a utility basin to hold wastewater temporarily. The recommended equalization basin would be located on the west side of the plant property near the newly constructed headworks. The basin would be sized to handle 50% of future max month flows. This would result in a concrete basin that is approximately 60-ft long, 50-ft wide, and 15-ft SWD. The exact size would be determined during the design phase when site constraints can be evaluated in more detail. Based on the recommended dimensions the storage volume would be 788,192 gallons and would store 82% of current peak day flows, 55% of future peak day flows, and 188% of future average day flows. The equalization basin would be placed after the new headworks but before the SBR or future process. Screened wastewater would flow from the new headworks to the equalization basin and then be pumped to the SBR or future process.

Effluent Parshall Flume Improvements

The existing effluent Parshall Flume has been problematic due to a bow in the floor and should to be replaced with a new Parshall flume rated for the future Yr-2040 peak hour demand (2,000 gpm). It is recommended that the existing flume be removed and a new Parshall Flume is installed in the same location.

See Appendix E – Exhibits 2B. Cost estimate presented in Chapter 7.0.

UV Disinfection Area Shelter

A shelter is recommended to cover the UV disinfection area for protection and prevention of algae growth. The recommended shelter would protect equipment from sun exposure and harsh weather, plus allow operators a more comfortable working area. The proposed shelter would be a metal framed structure approximately 38-ft long and 22-ft wide, and include two side walls for wind protection.

See Appendix E – Exhibit 2A. Cost estimate presented in Chapter 7.0.

PLC Control and SCADA System

The existing WWTP PLC control and SCADA system should be expanded and upgraded to include all the proposed WWTP improvements and the latest technologies. This includes alarms, monitoring information, and supervisory control of all automatic valves, gates, pumps, blowers, clarifier motors, etc. The system will allow control and monitoring of the treatment process including the RAS system and WAS wasting system. The SCADA system will receive process signals from control panels throughout the plant and display this information at the SCADA computer in the Operations Building. Alarms from the new systems will be added to the existing SCADA system dial-out system for notification of alarms and failures.

Site Piping Improvements

Existing piping should be reconfigured for the UV disinfection and chlorine contact basin drain line. This line currently drains to the influent pump station. The ability to drain to the digester should be installed to give the operators more options for handling any solids which accumulate in these basins.

Outfall Upgrade

As discussed in Chapter 4, a major section of the existing outfall is damaged, severely undersized, and has required several leak repairs. It is highly recommended that the Town replaces this corroded pipe with new, corrosion resistant materials and ensuring sufficient future capacity. The Wilson Engineering Outfall Replacement report (Appendix F) outlines the recommended improvements and estimated costs. The replacement of this outfall is an essential piece to the treatment process to prevent backup and discharge of untreated wastewater to the Friday Harbor Marina.

Staffing and Testing Requirements

The WWTP is staffed from 7:00 AM to 3:30 PM five days a week with 3.5 full time employees and with 24-hour call-out. The plant is not staffed during the weekends. The lead operator is Group II, and two other operators are also Group II. The WWTP must have at least a Group II operator in reasonable charge of daily operation.

After improvements have been made, the WWTP will require similar operations staff for process control, maintenance, lab operations, biosolids handling, and general site work. Annual hours and projected staffing requirements are presented in Table 6-2 for the proposed improvements. These projected hours assume one staff is working a 5-day work week, with 29 holidays, vacation, and sick days, and 6.5 hours per day of productive work.

Table 6-2: Projected Staffing Requirements for Projected Improvements

Component		#	Annual Hours	Total Annual Hours
Process Operations				
	Extended Air System		1900	1900
Maintenance		Quantity	Hours	Total
	Screens	2	65	130
	Aeration Basins	2	65	130
	Clarifiers	2	130	260
	Pumps		250	250
	Blowers	5	52	260
	UV Disinfection	4	26	104
Laboratory		Tests per Week	Hours	Total
	BOD	4	2.5	520
	TSS	4	3	624
	Fecal	2	1	104
	Ph	7	0.25	91
	Ammonia	2	2	208
General Site Work			Hours	Total
	Custodial		200	200
	Mowing		120	120
	Painting		80	80
	Rust Removal		80	80
Biosolids Handling			Hours	
	Biosolids Handling		370	370
			TOTAL HOURS	5439
Estimated Hours per Year per Staff			1500	
			TOTAL STAFFING ESTIMATE (Total Hours/1500)	**3.6**

Construction Phasing

Phasing of construction will be necessary to ensure proper treatment through the existing plant during construction. A proposed phasing schedule is outlined below.

1. Construct clarifiers east of existing SBR. Continue SBR operation during clarifier construction.
    a. The majority of process piping can be installed during this time. This includes WAS piping, RAS piping, effluent and scum piping. Final connections with anoxic and aeration basins (existing SBR basins) and UV disinfection channels will need to be coordinated.
    b. Also during this time SCADA programming, and installation of D.O. monitoring in the aerations basins should be completed.
2. After clarifiers are complete and have been tested, convert existing SBR basins to full time aeration basins. During this time basin #1 will be aerated using the existing SBR aeration piping. Basin #2 will be drained, existing equipment removed, and new diffusers and air piping installed. Step 2 should happen during a time of the year when low flows are anticipated.
3. After Basin #2 is completed and tested it can start operating with the newly installed aeration equipment while basin #1 is retrofitted with the new equipment. Step 3 should also happen during a time of the year when low flows are anticipated.

Remaining improvements are not process sensitive and can happen on a typical construction schedule.

7.0 - FINANCIAL INFORMATION

The purpose of this section is to identify and describe the capital costs for the recommended treatment options proposed as facility improvements to the Friday Harbor WWTP, including the projected operation and maintenance costs associated with each option. Biosolids handling costs are discussed briefly with additional information in *Section 6.0 - Recommended Improvements*.

A summary of wastewater grant and loan programs is attached in Appendix C.

Construction Costs of Improvements

<u>Treatment Alternative Estimates</u>

The treatment alternatives discussed in Chapter 5 have been evaluated and a cost estimate has been established for each, presented below in Table 7-1. The initial estimated construction costs suggest that the MBR process may be prohibitively expensive; the construction cost of the MBR treatment alternative would be roughly $7 Million more than the other alternatives evaluated and its associated 20-Year Life Cycle Cost Estimate, shown below in Table 7-2, confirms that the MBR treatment alternative maintains a significantly higher cost over time. The high cost of the MBR alternative is in part due to the high equipment costs. Further, more detailed construction costs of all the treatment alternatives are presented in the following section.

Table 7-1: Construction Estimates for Alternatives

Process Alternatives	Construction Cost	Engineering, Contingency & Sales Tax	TOTAL
SBR Expansion	$2,701,000	$1,984,350	$4,690,000
MBR	$5,036,000	$3,396,000	$8,430,000
Extended Aeration	$2,950,000	$1,777,000	$4,727,000

Table 7-2: Overall 20-Year Life Cycle Cost Estimates for Alternatives

Process Alternatives	Total Cost	Annual O&M Cost	20 Year Life Cycle Cost
SBR Expansion	$4,690,000	$265,700	$11,850,000
MBR	$8,430,000	$323,700	$17,130,000
Extended Aeration	$4,727,000	$187,800	$9,770,000

<u>Detailed Construction Cost Estimates</u>

After initial evaluation of the treatment technologies, the Extended Aeration Process and Sequencing Batch Reactor Process (SBR) were selected as favorable alternatives. Detailed construction cost estimates for all treatment alternatives are presented below in Tables 7-3, 7-4, and 7-5. These estimates include an estimate of engineering services, a 30% contingency and contractor profit, and sales tax at 8.3%. The total estimate construction cost for each option is shown below.

1. Sequencing Batch Reactor Process….$4,690,000
2. Membrane Bio-Reactor…………………$8,430,000
3. Extended Aeration Process…………....$4,727,000

The Extended Aeration and SBR alternatives have similar construction costs; the 20-year life cycle assessment was used to determine which is the more financially feasible option. The Extended Aeration treatment alternative yields a lower cumulative cost over time due to the lower annual operation and maintenance cost, discussed below.

Table 7-3: Extended Aeration Construction Cost Estimate

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / De-Mob	Assume 10% of Total	1	LS	$ 268,400	$268,000
2	Demolition	Removal of Existing Yard Piping	1	LS	$ 50,000	$50,000
3	Excavation/Backfill	Excavation & Haul - Soils	2,000	CY	$ 90	$180,000
4		Overexcavation (10% of Excavation)	200	CY	$ 100	$20,000
5		Backfill & Compaction (Imported Fill Material)	700	CY	$ 80	$56,000
6		Remove & Haul Existing Biosolids - Basin 1	1	LS	$ 10,000	$10,000
7		Remove & Haul Existing Biosolids - Basin 2	1	LS	$ 10,000	$10,000
8		Anoxic Excavation & Backfill	1	LS	$ 142,000	$142,000
9	Equipment	VFD's for Blowers	5	EA	$ 5,000	$25,000
10		VFD Installation Cost	1	LS	$ 10,000	$10,000
11		Diffusers	1	LS	$ 200,000	$200,000
12		Diffuser Installation Cost	1	LS	$ 40,000	$40,000
13		Clarifier Equipment	1	LS	$ 250,000	$250,000
14		Clarifier Equipment Installation Cost	1	LS	$ 100,000	$100,000
15		DO & pH Sensors	1	EA	$ 15,000	$15,000
19		RAS Air Lift	2	EA	$ 10,000	$20,000
20		Anoxic Mixers	2	EA	$ 20,000	$40,000
21	Concrete	Clarifiers	358	CY	$ 1,100	$394,000
22		Clarifier Slope Fill	139	CY	$ 1,000	$139,000
23		Anoxic Basins	116	CY	$ 1,100	$128,000
24		Anoxic Basins Coating	1	LS	$ 50,000	$50,000
25	Yard Piping	RAS Piping	120	LF	$ 160	$19,000
26		Basin & Clarifier Drain Line / WAS Piping	360	LF	$ 160	$58,000
27		Diffuser Piping (2in 316 Stainless)	670	LF	$ 120	$80,000
28		Diffuser Pipe Fittings (2in 316 Stainless)	60	EA	$ 50	$3,000
29		Gate Valve (8in)	4	EA	$ 1,600	$6,000
30		Check Valve (8in)	4	EA	$ 800	$3,000
31		Gate Valve (12in)	8	EA	$ 2,400	$19,000
32		Check Valve (12in)	8	EA	$ 1,200	$10,000
33		Automated Valves	3	EA	$ 15,000	$45,000
34	Site Work	General Site Work and Restoration	1	LS	$ 122,000	$122,000
35		Asphalt Surfacing	1	LS	$ 30,000	$30,000
36		Painting	1	LS	$ 50,000	$50,000
39		Misc TESC Items	1	LS	$ 10,000	$10,000
40		Relocate Existing Piping	1	LS	$ 50,000	$50,000
41	Electrical	Controls, Wiring, Lighting, Service Equip, Feeders, Devices, Etc.	1	LS	$ 300,000	$300,000
	Subtotal					$2,950,000
	Contractor Profit (15%)					$440,000
	Contingency (15%)					$440,000
	Sales Tax (8.3%)					$280,000
	Total Construction Cost					$4,110,000
	Engineering Services Design & Constructon (15%)					$617,000
	Grand Total					**$ 4,727,000**

Table 7-4: Sequencing Batch Reactor Expansion Construction Cost Estimate

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 10% of Total	1	LS	$ 245,500	$246,000
2	Excavation/Backfill	Excavation & Haul	2,571	CY	$ 90	$231,000
		Backfill & Compaction (Imported Fill Material)	195	CY	$ 80	$16,000
		Overexcavation (10% of Excavation)	257	CY	$ 100	$26,000
3	Equipment	EVOQUA SBR Tank & Eqiupment	1	LS	$ 420,000	$420,000
		SBR Equipment Installation	1	LS	$ 168,000	$168,000
		Walkway, Grating & Handrails	1	LS	$ 100,000	$100,000
4	Concrete	Basin No.3	267	CY	$ 1,100	$294,000
		Control Bldg Foundation	39	CY	$ 1,100	$43,000
5	CMU Buildings	Control Bldg Extension	400	SF	$ 350	$140,000
6	Yard Piping	Site Piping and Valving	1	LS	$ 150,000	$250,000
		Installation of Piping and Valving	1	LS	$ 100,000	$100,000
7	Site Work	General Site Work and Restoration	1	LS	$ 100,000	$100,000
		Asphalt Surfacing	1	LS	$ 30,000	$30,000
		Painting	1	LS	$ 200,000	$200,000
		Signage/Labels	1	LS	$ 2,000	$2,000
		Misc TESC Items	1	LS	$ 5,000	$5,000
		Relocation of Existing Utilities	1	LS	$ 30,000	$30,000
8	Electrical	Controls, Wiring, Lighting, Service Equip, Feeders, Devices, Etc.	1	LS	$ 300,000	$300,000
	Subtotal					$2,701,000
	Contractor Profit (15%)					$540,200
	Contingency (15%)					$405,150
	Sales Tax (8.3%)					$258,000
	Total Construction Cost					$3,904,000
	Engineering Services (20%)					$781,000

	Grand Total					$4,690,000

Table 7-5: Membrane Bio-Reactor Construction Cost Estimate

Item	Description	Approx. Quantity	Unit	$/Unit	Total $
Mob / De-Mob	Assume 10% of Total	1	LS	$ 457,800	$ 458,000
Demolition	Removal of Existing Yard Piping	1	LS	$ 50,000	$ 50,000
Equipment	MBR	1	LS	$ 2,500,000	$ 2,500,000
	MBR Installation	1	LS	$ 1,000,000	$ 1,000,000
Concrete	Dividing Walls	137	CY	$ 1,100	$ 151,000
Yard Piping	Site Piping and Valving	1	LS	$ 200,000	$ 200,000
Site Work	General Site Work and Restoration	1	LS	$ 10,000	$ 10,000
	Signage / Labels	1	LS	$ 2,000	$ 2,000
	Misc TESC Items	1	LS	$ 5,000	$ 5,000
	Anoxic Basin	1	LS	$ 360,000	$ 360,000
Electrical	Controls, Wiring, Lighting, Service Equip, Feeders, Devices, Ect.	1	LS	$ 300,000	$ 300,000
Subtotal					$ 5,036,000
Contractor Profit (15%)					$ 755,000
Contingency (15%)					$ 755,000
Sales Tax (8.3%)					$ 481,000.00
Total Construction Cost					$ 7,027,000
Engineering Services (20%)					$ 1,405,000
Grand Total					**$ 8,430,000**

Projected Operations and Maintenance Costs

The operations and maintenance (O&M) costs were estimated for each treatment alternative. Tables 7-6, 7-7, and 7-8 show detailed estimates of the projected Extended Aeration, SBR and MBR operation and maintenance costs. After comparing the O&M costs of the Extended Aeration and SBR alternatives, the Extended Aeration O&M costs were determined to be roughly $60,000 dollars less per year than the SBR O&M costs. This difference is mainly due to the extra man-hours expected for SBR operation and the higher energy requirements of the SBR components. From discussion with plant operators of similar treatment plants it was determined that the SBR process demands higher attention than the Extended Aeration alternative. The Extended Aeration process is very forgiving to peak flows and shock loads, and therefore requires less supervision, especially over weekend hours when labor is more expensive. In addition, it is anticipated that the Extended Aeration process will provide more digestion and produce solids at a higher concentration than the SBR process, which in turn will result in lower solids handling costs.

Table 7-6: Operation & Maintenance Costs for the Extended Aeration Process

Labor	Full Time Employees	Hourly Wage	Hours per Week	-	Labor Cost per Year
Labor Cost	3.5	$22.04	40		$ 160,451.20
				Total	**$ 160,451.20**
Powered Equipment	**Quantity**	**Equipment Hp**	**Equipment Run Time (% of 24hrs)**	**Expected Annual Power Draw (KWHr)**	**Expected Annual Operation Cost**
Blowers (250 SCFM) (Aeration/ Airlift)	2	14.75	60%	128521	$12,000.00
Misc. Loads	1	1	100%	6535	$1,000.00
				Total	**$13,000.00**
Replacement Parts	**Quantity**	**Replacements per Year**	**Replacement Cost**		**Annual Replacement Parts Cost**
Diffusers / Sleeves	1	5	$500.00		$ 2,500.00
Valving	1	0.2	$10,000.00		$ 2,000.00
				Total	**$ 4,500.00**
Maintenance and Repair	**Estimated Construction Cost**	**Misc. Repairs**			
Misc. Maintenance (.5% of Total Construction Cost)	$1,970,000.00	$9,850.00			$ 9,850.00
				Total	**$ 9,850.00**
Total Annual Cost					**$ 187,800.00**

Table 7-7: Operation & Maintenance Costs for the Sequencing Batch Reactor Expansion Process

Labor	Full Time Employees	Hourly Wage	Hours per Week	-	Labor Cost per Year
Labor Cost	4.5	$22.04	40		$ 206,294.40
				Total	**$ 206,294.40**
Powered Equipment	**Quantity**	**Equipment Hp**	**Equipment Run Time (% of 24hrs)**	**Expected Annual Power Draw (KWHr)**	**Expected Annual Operation Cost**
Jet Pumps, 25Hp	3	25	33	248831	$24,000.00
Blowers	2	20	50	146853	$14,000.00
Misc. Loads	1	1	100	6535	$1,000.00
				Total	**$39,000.00**
Replacement Parts	**Quantity**	**Replacements per Year**	**Replacement Cost**		**Annual Replacement Parts Cost**
Impellers & Seals	3	1	$1,000.00		$ 3,000.00
Valves and Switches	1	1	$3,000.00		$ 3,000.00
Sludge Exclusion Valves	48	0.2	$500.00		$ 4,800.00
				Total	**$ 10,800.00**
Maintenance and Repair	**Estimated Construction Cost**	**Misc. Repairs**			
Misc Maintenance (.5% of Total Construction Cost)	$1,920,000.00	$9,600.00			$ 9,600.00
				Total	**$ 9,600.00**

	Total Annual Cost	**$ 265,700.00**

Table 7-8: Operation & Maintenance Costs for the Membrance Bio-Reactor Process

Labor	**Full Time Employees**	**Hourly Wage**	**Hours per Week**	**-**	**Labor Cost per Year**
Labor Cost	4.5	$22.04	40		$ 206,294.40
				Total	**$ 206,294.40**
Powered Equipment	**Quantity**	**Equipment Hp**	**Equipment Run Time (% of 24hrs)**	**Expected Annual Power Draw (KWHr)**	**Expected Annual Operation Cost**
Equalization Zone Transfer Pump (465 GPM)	2	5	50%	23065	$2,000.00
Anoxic Zone Basin Mixer	2	4.21	100%	58261	$6,000.00
Feed Forward Pump (2 Duty 2 Stdby1,628 GPM)	2	36	75%	249097	$24,000.00
Permeate Pump (2 Duty, 1 Stdby - 556 GPM)	2	7.5	50%	34597	$3,000.00
MBR Blower (2 Duty, 1 Stdby - 437 SCFM)	2	40	70%	365958	$35,000.00
PA Blower (2 Duty, 1 Stdby - 173 SCFM)	2	20	75%	196049	$19,000.00
Misc. Loads	1	1	100%	6535	$1,000.00
				Total	**$90,000.00**
Replacement Parts	**Quantity**	**Replacements per Year**	**Replacement Cost**		**Annual Replacement Parts Cost**
Impellers & Seals	10	1	$1,000.00		$ 10,000.00
Valving	2	1	$800.00		$ 1,600.00
Electrical	1	1	$1,000.00		$ 1,000.00
Membrane Cassettes	48	0.2	$500.00		$ 4,800.00
				Total	**$ 17,400.00**
Maintenance and Repair		**Misc. Repairs**			
Misc Maintenance		$10,000			**$ 10,000.00**
				Total	$ 10,000.00
				Total Annual Cost	**$ 323,700.00**

Miscellaneous Related Improvements

During the evaluation of the Friday Harbor Wastewater Treatment Plant, items auxiliary to the treatment process were noted that need improvement. These auxiliary items are important to this facility plan and would help to fine tune the treatment process and avoid possible problems in the future. The cost estimates for each of the miscellaneous improvement items are presented below.

<u>Utility Water System Improvements</u>

Table 7-9: Utility Water System Improvements – Reconfigure 2W Pumps / Controls

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total		LS	$12,000.00	$12,000.00
2	Yard Piping	New Valves & Piping	1	LS	$10,000.00	$10,000.00
3	Electrical	Variable Frequency Drives	2	EA	$4,000.00	$8,000.00
		VFD Installation	1	LS	$2,000.00	$2,000.00
		Inverter Rated 5 Hp Motor	2	EA	$10,000.00	$20,000.00
		Motor Installation	1	LS	$2,000.00	$2,000.00
		Pressure Transducer and PLC Control Logic	1	LS	$3,000.00	$3,000.00
		Conduit, Wiring, Controls	1	LS	$15,000.00	$15,000.00
	Subtotal					$72,000.00
	Contingency (20%)					$14,400.00
	Sales Tax (8.3%)					$7,171.20
	Total Construction Cost					$94,000.00
	Engineering Services					$18,800.00
	Grand Total					**$112,800.00**

Solids Handling Facility Improvements

Table 7-10: Solids Handling Facility Improvements – Centrifuge Dewatering Unit

Item #	Description of Work	Total Estimated Construction Cost (Yr-2020)
	Dewatering Building Improvements:	
1	Building Construction	$0
2	New HVAC System for dewatering building	$15,000
3	Foul Air Piping System for Bldg & Equipment	$12,000
4	Concrete	$22,000
5	Earthwork	$0
6	Asphalt Pavement Restoration (0 tons x $400/ton)	$0
7	New Rolling Door (10' W x 10' T), including wall rebuild	$32,000
8	New 5 Ton Trolley Hoist with Steel Support System	$44,000
9	Yard Piping to Building	$0
10	One Andritz D4LL Centrifuge or equal (Capacity = 100 to 150 gpm)	$452,000
11	Polymer blend system	$29,000
12	Polymer scale, ramp, and cradle	$22,000
13	New Electrical Service, MCC, Feeders, & Instrumentation	$290,000
14	Painting (misc. items)	$29,000
15	Non Potable Water System (piping & valves for dewatering bldg only)	$22,000
16	Misc Demo (existing piping, pavement, curb, sidewalk areas, etc.)	$0
17	Demo	$73,000
	Conveyance and Sludge Storage Improvements:	
18	Screw Conveyor System (Shaftless, Configured for Reversing)	$80,000
19	Two 30 CY Sludge Storage Boxes ($10k EA)	$29,000
20	Sludge Box Lid with Auger Conveyor, Supports, and Lift System	$189,000
	Digester Improvements:	
21	New Sludge Feed Pump (sized for new centrifuge equipment)	$51,000
22	New Concrete Top Slab for Digester Sludge Pump Area	$51,000
23	Decant System for Digester (Piping, Valves, pH/DO/Level Sensor)	$118,000
	Total Estimated Construction Cost =	$1,560,000
	Sales Tax (8.3%) =	$129,000
	Engineering/Permits/Survey (20%) =	$338,000
	Total =	$2,027,000

Effluent Channel Area Improvements

Table 7-11: Effluent Disinfection Area Improvements – Shelter Structure

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total	1	LS	$5,200.00	$5,200.00
2	Shelter	Metal Shelter Structure, open, galvanized steel members	400	SF	$65.00	$26,000.00
	Subtotal					$31,200.00
	Contingency (20%)					$6,240.00
	Sales Tax (8.3%)					$3,107.52
	Total Construction Cost					$41,000.00
	Engineering Services					$8,200.00
	Grand Total					**$49,200.00**

Table 7-12: Effluent Disinfection Area Improvements – Parshall Flume Replacement

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total	1	LS	$3,480.00	$3,480.00
2	Equipment	Parshall Flume	1	LS	$1,700.00	$1,700.00
		Flume Installation	1	LS	$1,000.00	$1,000.00
3	Concrete	Grouting Flume in Place	1	CY	$700.00	$700.00
4	Site Work	Demo / Removal of existing Parshall Flume	1	LS	$2,000.00	$2,000.00
		Bypass Equipment	3	DAY	$3,000.00	$9,000.00
5	Electrical	Controls, Wiring, Conduit, Etc.	1	LS	$3,000.00	$3,000.00
	Subtotal					$20,880.00
	Contingency (20%)					$4,176.00
	Sales Tax (8.3%)					$2,079.65
	Total Construction Cost					$27,000.00
	Engineering Services					$5,400.00
	Grand Total					**$32,400.00**

Building Roof Improvements

Table 7-13: Building Roof Improvements – Operations Annex Building

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total	1	LS	$3,240.00	$3,200.00
2	Buildings	Metal Roof	448	SF	$10.00	$4,500.00
		Pre-Engineered Wood Truss System	448	SF	$15.00	$6,700.00
3	Site Work	Demolition of Existing Roof (as needed), Waterproof Joints	1	LS	$5,000.00	$5,000.00
	Subtotal					$19,400.00
	Contingency (20%)					$3,880.00
	Sales Tax (8.3%)					$1,932.24
	Total Construction Cost					$25,000.00
	Engineering Services					$5,000.00
	Grand Total					**$30,000.00**

Table 7-14: Building Roof Improvements – Water Utilities Building

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total	1	LS	$3,240.00	$3,240.00
2	Buildings	Metal Roof	448	SF	$10.00	$4,500.00
		Pre-Engineered Wood Truss System	448	SF	$15.00	$6,700.00
3	Site Work	Demolition of Existing Roof (as needed), Waterproof Joints	1	LS	$5,000.00	$5,000.00
	Subtotal					$19,440.00
	Contingency (20%)					$3,888.00
	Sales Tax (8.3%)					$1,936.22
	Total Construction Cost					$25,000.00
	Engineering Services					$5,000.00
	Grand Total					**$30,000.00**

Table 7-15: Building Roof Improvements – Blower Building

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total	1	LS	$11,000.00	$11,000.00
2	Buildings	Metal Roof	2,000	SF	$10.00	$20,000.00
		Pre-Engineered Wood Truss System	2,000	SF	$15.00	$30,000.00
3	Site Work	Demolition of Existing Roof (as needed), Waterproof Joints	1	LS	$5,000.00	$5,000.00
	Subtotal					$66,000.00
	Contingency (20%)					$13,200.00
	Sales Tax (8.3%)					$6,573.60
	Total Construction Cost					$86,000.00
	Engineering Services					$17,200.00
	Grand Total					**$103,200.00**

Table 7-16: Building Roof Improvements – Operations Building

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
1	Mob / Demob	Assume 20% of Total	1	LS	$10,000.00	$10,000.00
2	Buildings	Metal Roof	1,800	SF	$10.00	$18,000.00
		Pre-Engineered Wood Truss System	1,800	SF	$15.00	$27,000.00
3	Site Work	Demolition of Existing Roof (as needed), Waterproof Joints	1	LS	$5,000.00	$5,000.00
	Subtotal					$60,000.00
	Contingency (20%)					$12,000.00
	Sales Tax (8.3%)					$5,976.00
	Total Construction Cost					$78,000.00
	Engineering Services					$15,600.00
	Grand Total					**$93,600.00**

Outfall Replacement

Table 7-17: Outfall Replacement

Description	Unit	Quantity	Unit Cost	Extension
Mobilization (10%)	LS	1	$ 102,700.00	$ 102,700.00
Trench Safety and Shoring	LS	1	$ 25,000.00	$ 25,000.00
Temporary Erosion Control	LS	1	$ 10,000.00	$ 10,000.00
Temporary Traffic Control	LS	1	$ 5,000.00	$ 5,000.00
Temporary Sewer By-pass	LS	1	$ 10,000.00	$ 10,000.00
Demolition of Abandoned Pump Station Dry Well	LS	1	$ 25,000.00	$ 25,000.00
HDD 18" HDPE	LF	1100	$ 800.00	$ 880,000.00
18" PVC	LF	10	$ 200.00	$ 2,000.00
Sewer Manhole	EA	2	$ 5,000.00	$ 10,000.00
Connect to Existing 16" HDPE	LS	1	$ 25,000.00	$ 25,000.00
Clean up	LS	1	$ 10,000.00	$ 10,000.00
Minor Changes	FA	1	$ 25,000.00	$ 25,000.00
Subtotal				**$1,129,700.00**
15% Contingency				$ 169,455.00
Sub-total				$1,299,155.00
8.3% Tax				$ 107,829.87
Total Construction Cost				**$ 1,406,985**

Note: Based on 90% plans by Wilson Engineering LLC dated 10-18-2019

Dryer Facility vs. Alternatives #1 through #4 – Cost Comparison

The projected cost for the proposed biosolids dryer improvements is estimated to be in the range of $3M to $5M. This includes a new building with adequate clearance for a belt dryer unit sized for processing at least 1.0 wet ton per hour. In addition, the projected hauling cost for dried biosolids is $470,000 for Yr-2020 to Yr-2040. See Appendix B – Solids Hauling Cost Evaluation.

Since the dryer facility capital + hauling + engineering cost (year 2020 to 2040) is the most expensive option when compared to dewatering and hauling cake, the dryer facility improvements will be omitted for now. However, this can be re-evaluated if the situation should change in the future.

Alternative #1 – Continue Dewatering with Existing Belt Filter Press Equipment (Existing Solids Building):

Construction Contractor Work:

- Overhaul/Rebuild Belt Filter Press: $400,000
- Painting: $15,000

- Remove Drum Dryer Equipment: $36,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $969,000

Tax: $80,000

Engineering/Permits/Survey: $210,000

Total for Construction Contract Work: $1,259,000

Direct Contract Work:

- Haul and Dispose of Liquid Sludge: $500,000

Total for Construction Contract + Direct Contract Work: $1,759,000 (See Appendix C)

Hauling Costs (Yr 2020 to Yr 2040): $2,490,000 (See Appendix B)

Combined Total: $4,249,000

Alternative #2 – Replace Belt Filter Press Equipment with New Centrifuge Equipment (Existing Solids Building):

Construction Contractor Work:

- Construct Centrifuge Dewatering Facility Inside Existing Solids Bldg: $1,042,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $1,560,000

Tax: $129,000

Engineering/Permits/Survey: $338,000

Capital Improvements Total Cost: $2,027,000 (See Appendix C)

Hauling Costs (Yr 2020 to Yr 2040): $2,176,000 (See Appendix B)

Combined Total: $4,203,000

Alternative #3 – Construct New Dewatering Facility (with Centrifuge) Adjacent to Digester:

Construction Contractor Work:

- Construct Centrifuge Dewatering Facility Adjacent to Digester: $1,807,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $2,325,000

Tax: $193,000

Engineering/Permits/Survey: $504,000

Capital Improvements Total Cost: $3,022,000 (See Appendix C)

Hauling Costs (Yr 2020 to Yr 2040): $2,176,000 (See Appendix B)

Combined Total: $5,198,000

Alternative #4 – Construct New Dewatering Facility (with Centrifuge) Adj. to Headworks:

Construction Contractor Work:

- Construct Centrifuge Dewatering Facility Adjacent to Headworks: $1,807,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $2,325,000

Tax: $193,000

Engineering/Permits/Survey: $504,000

Capital Improvements Total Cost: $3,022,000 (See Appendix C)

Hauling Costs (Yr 2020 to Yr 2040): $2,176,000 (See Appendix B)

Combined Total: $5,198,000

8.0 - WATER RECLAMATION AND REUSE EVALUATION

The purpose of this section is to evaluate water reclamation and reuse requirements and alternatives for the Town of Friday Harbor WWTP. As required by RCW 90.48.112, this Report must evaluate the "opportunities for the use of reclaimed water". Reclaimed water is defined in RCW 90.46.0 1 0 as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur, and is no longer considered wastewater."

Key differences between the requirements for water reuse and those for effluent disposal are the levels of reliability required within the treatment process, distribution, and use areas. The State of Washington's reuse treatment standards call for continuous compliance, meaning that the treatment standards must be met on a constant basis or the treated water cannot be used as reclaimed water.

Allowable Uses for Reclaimed Water

The Washington State Water Reclamation and Reuse Standards describe several allowable uses for reclaimed water, including:

- Agricultural irrigation;
- Landscape irrigation;
- Impoundments and wetlands;
- Groundwater recharge;
- Streamflow augmentation;
- Industrial and commercial uses; and
- Municipal uses.

Depending upon its end use, there are four categories of reclaimed water: Class A, Class B, Class C, and Class D. Class A has the highest degree of effluent treatment. In general, when unlimited public access to the reclaimed water is involved or when irrigation of crops for human consumption is the intended end use, the criteria will require Class A reclaimed water.

Reuse Evaluation

Factors that could lead a wastewater treatment provider to pursue reclaimed water include the following:

- Regulatory Requirements. Regulatory conditions are such that making reclaimed water is a viable option compared to continuing to discharge secondary effluent.
- Water Rights. The ability to make and reuse reclaimed water could benefit the Town's water rights situation.
- Environmental Benefits. There can be environmental benefits in the right circumstances to making reclaimed water versus secondary effluent.
- Cost Effectiveness. The cost to make and reuse reclaimed water is typically higher than the cost to make secondary effluent. In addition, control of the WWTP is more complex at a reclaimed water facility then a typical WWTP.

An evaluation of how each of these factors relates to the Town’s wastewater treatment utility is provided in the following sections.

Regulatory Requirements

Current regulatory requirements do not make reclaimed water a more viable option than continuing to make secondary effluent.

Water Rights

RCW 90.46.120 states that the owner has the exclusive right to any reclaimed water generated by the wastewater treatment facility. Consequently, reclaimed water has the potential to benefit water purveyors who are water right deficient. The Town is currently not deficient with respect to its water rights.

Environmental Benefits

The Town does not have any large industrial users of water. The majority of water is sold to single- and multi-family residences.

The significant capital cost, on-going operational cost, and higher energy usage of an MBR facility would not be outweighed by the minor water quality improvement that the Town's discharge would provide to the Friday Harbor Marina.

Cost Effectiveness

The Town believes that if water reclamation and reuse is to be seriously considered, it must be cost effective and affordable for its customers. There are two substantial cost factors that make it unlikely that water reclamation would be economically attractive on its own without a substantial benefit, such as regulatory compliance, to balance its considerable costs.

The first major cost factor is that the Town's WWTP would require significant improvements in addition to those already outlined in Chapter 6 with regard to disinfection, filtration and SCADA monitoring and alarm systems. Additional improvements would be required to the plant to provide the process control required to reliably produce reclaimed water. This is particularly true if use of the reclaimed water would include human contact, a condition that would require the plant to produce Class A reclaimed water. It is estimated that these capital costs would be at least $7.5 million. In addition, a reclaimed water plant would increase operation and maintenance costs by $300,000-$400,000 per year.

The second cost factor is that there is very little potential for a substantial amount of reclaimed water use by the Town’s public utilities and there have been no opportunities identified to sell the produced reclaimed water. The Town can not financially justify a reclaimed water system for municipal uses because most of the reclaimed water would go unused and be discharged, which as stated above would be a minor environmental benefit in comparison to the capital, operational and maintenance costs.

Summary

After evaluating the potential for water reclamation and reuse, the Town does not believe there is currently a clear regulatory, environmental, or water right benefit to water reclamation and reuse. The costs are much too great to consider water reuse as being a cost effective alternative to its current collection and treatment system. Consequently, the Town does not plan to pursue the construction of water reclamation and reuse facilities at this time.

APPENDIX A

Issuance Date:	August 21, 2017
Effective Date:	September 1, 2017
Expiration Date:	August 31, 2022

National Pollutant Discharge Elimination System Waste Discharge Permit No. WA0023582

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

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.

Town of Friday Harbor Wastewater Treatment Plant

PO Box 219

Friday Harbor, WA 98250

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

Plant Location:	Receiving Water:
375 Tucker Avenue Friday Harbor, WA 98250	Friday Harbor, San Juan Channel
Treatment Type: Sequencing Batch Reactor Activated Sludge	

Mark Henley, P.E.
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report (DMR)	Monthly	October 15, 2017
S3.A	Discharge Monitoring Report (DMR)	Quarterly	January 15, 2018
S3.A	Permit Renewal Application Monitoring Data	Quarterly 2021 only	April 15, 2021
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	1/permit cycle	June 1, 2020
S5.F	Bypass Notification	As necessary	
S5.G	Operations & Maintenance Manual Update	As necessary	
S6.E	Submit copies of Industrial User notifications letters	As necessary	
S8	Engineering Documents	As necessary	
S9	Compliance Schedule: Engineering Report for a Headworks Improvements Project	1/permit cycle	December 31, 2017
S9	Compliance Schedule: Plans and Specifications for the Headworks Improvements Project	1/permit cycle	September 1, 2018
S9	Compliance Schedule: Quality Assurance Plan for Headworks Improvements Project	1/permit cycle	December 31, 2018
S9	Compliance Schedule: Operation and Maintenance Manual related to the new headworks components	1/permit cycle	December 31, 2018
S9	Compliance Schedule: Notification of Construction Completion of Headworks Improvements Project	1/permit cycle	December 31, 2018
S10	Outfall Evaluation	1/permit cycle	January 1, 2020
S11	Application for Permit Renewal	1/permit cycle	March 1, 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	
G13	Payment of fees	As assessed	
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.

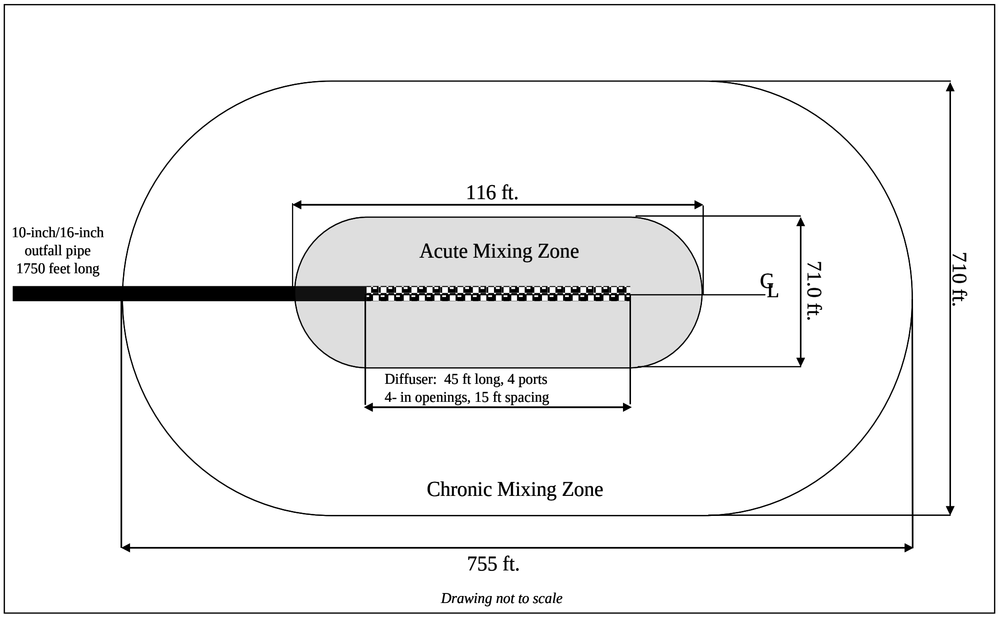
Beginning on the effective date of this permit, the Permittee may discharge treated domestic wastewater to Friday Harbor at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 **Latitude: 48.541111 Longitude: -123.013333**		
Parameter	**Average Monthly** [a]	**Average Weekly** [b]
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 173 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 260 lbs/day
Total Suspended Solids (TSS)	30 mg/L 173 lbs/day 85% removal of influent TSS	45 mg/L 260 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]	200/100 milliliter (mL)	400/100 mL
Parameter		**Maximum Daily** [e]
Total Residual Chlorine [d]		0.75 mg/L

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	Chlorine limits apply only during periods when chlorine is used for partial or full disinfection of the effluent. When UV disinfection is the only disinfection method used, chlorine limits do not apply. When not using chlorine for disinfection during the monitoring period, enter qualifier code "M" into the WQWebDMR form.
e	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 paragraphs define the maximum boundaries of the mixing zones. Figure 1 illustrates the approximate relationship and sizes of the chronic and acute mixing zones around the diffuser.



Available Dilution (dilution factor)	
Acute Aquatic Life Criteria	200
Chronic Aquatic Life Criteria	518

Chronic mixing zone

The authorized chronic mixing zone extends horizontally from each port for a distance of 355 feet. The complete chronic mixing zone is an elliptical region centered on the diffuser that extends 755 feet along the diffuser's center line and 710 feet in the direction perpendicular to the diffuser. The mixing zone extends from the top of the diffuser to the water surface. The concentration of pollutants at the edge of the chronic zone must meet chronic aquatic life criteria and human health criteria.

Acute mixing zone

The authorized acute mixing zone extends horizontally from each discharge port for a distance of 35.5 feet. The complete acute mixing zone is an elliptical region centered on the diffuser that extends 116 feet along the diffuser's center line and 71.0 feet in the direction perpendicular to the diffuser. The mixing zone extends from the top of the diffuser to the water surface. The concentration of pollutants at the edge of the acute zone must meet acute aquatic life criteria.

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 into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.			
BOD_5	mg/L lbs/day [2]	2/week 2/week	24-hr Composite [1] Calculated
TSS	mg/L lbs/day	2/week 2/week	24-hr Composite Calculated
Salinity (max)	mg/L	Daily	Continuous [3]
(2) Final Wastewater Effluent			
Final Wastewater Effluent means treated and disinfected wastewater exiting the UV or Chlorine disinfection basins. 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	Daily	Continuous
BOD_5	mg/L lbs/day	2/week 2/week	24-hr Composite Calculated
BOD_5	% removal [4]	1/month	Calculated
TSS	mg/L lbs/day	2/week 2/week	24-hr Composite Calculated
TSS	% removal	1/month	Calculated
Fecal Coliform [5]	#Organisms /100 ml	2/week	Grab [6]
pH [7]	Standard Units	5/week	Grab
UV Intensity (Min)	mW/cm2	Daily	Continuous
Total Residual Chlorine	mg/L	Daily, as needed [8]	Grab
Total Ammonia	mg/L as N	Quarterly	24-hr Composite
Nitrate-Nitrite Nitrogen	mg/L as N	Quarterly	24-hr Composite
Total Kjeldahl Nitrogen (TKN)	mg/L as N	Quarterly	24-hr Composite
(3) Effluent Characterization for Permit Renewal Application – *Conduct testing once per calendar quarter during 2021, prior to reapplication; report in next NPDES Permit application*			
Dissolved Oxygen	mg/L	Quarterly in 2021	Grab
Temperature [9]	Degrees centigrade (°C)	Quarterly in 2021	Grab
Oil and Grease	mg/L	Quarterly in 2021	Grab
Total Dissolved Solids	mg/L	Quarterly in 2021	24-hr Composite
Total Phosphorus	mg/L – P	Quarterly in 2021	24-hr Composite

Footnotes for wastewater monitoring tables	
1	*24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.*

2	*Calculate mass loading and discharge values concurrently with the respective samples, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day.*
3	*Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance. The time interval for the associated data logger must be no greater than 30 minutes.*
4	*Calculate the percent (%) removal of BOD_5 and TSS based on the average daily concentration and average daily flow for the month using the following equation:* $\%\ \text{removal} = \dfrac{\text{Influent concentration (mg/L)} - \text{Effluent concentration (mg/L)}}{\text{Influent concentration (mg/L)}} \times 100$
5	*Report a numerical value for fecal coliforms following the procedures in Ecology's Information Manual for Wastewater Treatment Plant Operators, Publication Number 04-10-020 available at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html . Do not report a result as too numerous to count (TNTC).*
6	*Grab means an individual sample collected over a fifteen (15) minute, or less, period.*
7	*Report the daily pH and the minimum and maximum for the monitoring period.*
8	*Permittee must monitor the final effluent daily for total residual chlorine on each day that chlorine is used for disinfection.*
9	*Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which usually occurs in the late afternoon. If measuring temperature continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.*

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. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
4. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
5. 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 the effective date of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

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 15^{th} day of the following month.
   b. Submit quarterly DMRs, unless otherwise specified in the permit, by the 15^{th} day of the month following the monitoring period. Quarterly sampling periods are January through March, April through June, July through September, and October through December. The Permittee must submit the first quarterly DMR by January 15, 2018, for the quarter beginning on October 1, 2017.
   c. Submit first quarter of permit renewal application monitoring data in WQWebDMR as required in Special Condition S2 by April 15, 2021.
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.

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
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.

5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

   a. Immediate reporting

   The Permittee must **immediately** report to Ecology and the Department of Health, Shellfish Program, and the San Juan County Health Department (at the numbers listed below), all:

   - Failures of the disinfection system.
   - Collection system overflows.
   - Plant bypasses discharging to marine surface waters.
   - Any other failures of the sewage system (pipe breaks, etc.)

Northwest Regional Office	425-649-7000
Department of Health, Shellfish Program	360-236-3330 (business hours) 360-789-8962 (after business hours)
San Juan County Health Department	Office: 360-378-4474

   b. Twenty-four-hour reporting

   The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at 425-649-7000, 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:

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	0.69 MGD
BOD_5 Influent Loading for Maximum Month	1,600 lb/day
TSS Influent Loading for Maximum Month	1,110 lb/day

S4.B. Plans for maintaining adequate capacity

a. Conditions triggering plan submittal

The Permittee must continue long-term facility planning and submit engineering documents as specified in Special Condition S8 of this permit. The Permittee must also provide a written status update on facility planning and design efforts with any DMR that reports the following conditions:

1. Actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. Actual flow or waste load exceeds 100 percent of any design criteria in S4.A in the reporting month.

b. Plan and schedule content

The planning update must describe the progress made towards completing engineering documents identified in Special Condition S8, including completed planning milestones and upcoming tasks.

When appropriate, the Permittee should identify short-term measures it is implementing to minimize facility overloading. Short-term measures may include, but are not limited to:

1. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
2. Limits on future sewer extensions or connections or additional waste loads.
3. Reduction of industrial or commercial flows or waste loads.

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

S4.C. Duty to mitigate

The Permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

S4.D. Notification of new or altered sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:
    a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.
    b. Is not part of an approved general sewer plan or approved plans and specifications.
    c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.
2. This notice must include an evaluation of the wastewater treatment plant's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

S4.E. Infiltration and inflow evaluation

1. The Permittee must conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, I/I Analysis and Project Certification, available as Publication No. 97-03 at:
   http://www.ecy.wa.gov/programs/wq/permits/guidance.html
2. The Permittee may use monitoring records to assess measurable infiltration and inflow.
3. The Permittee must perform a comprehensive assessment of existing conditions by a) determining I&I condition through flow monitoring, b) evaluating structural integrity through physical inspections (including smoke testing) and c) assessing hydraulic performance with computer modeling and field measurements.
4. 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. The report must address roof drains connected to the collection system by identifying the number of roof drains and quantify the flow to the WWTP from these drains.
5. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by June 1, 2020.

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 II 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 I 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 new or existing 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 September 1st of each year. Verify contents conform to requirements of WAC 173-240-080(1) and with recommendations in the most recent version of Ecology's *Criteria for Sewage Works Design* (Orange Book; Section G1-4.4).
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. Maintenance schedule for solids exclusion and removal.

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. Annual submittal of list of industrial users

The Permittee must annually submit to Ecology a list summarizing all existing and proposed SIUs and PSIUs. The Permittee must submit this list to Ecology by September 1st of each year of the permit.

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. Engineering documents

1. The Permittee must prepare and submit all approvable engineering reports or facility plans in accordance with chapter 173-240-060 WAC to Ecology for review and approval.
2. As required by RCW 90.48.112, the engineering report must address the feasibility of using reclaimed water as defined in RCW 90.46.010.
3. The report must contain any appropriate requirements as described in the following guidance:
   a. Criteria for Sewage Works Design (Washington State Department of Ecology, Publication No. 98-37 WQ, 2008).
   b. Design Criteria for Municipal Wastewater Land Treatment Systems for Public Health Protection (Washington State Department of Health, 1994).

c. Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems (Washington State Department of Ecology, Publication No. 93-36, 1993).

d. Water Reclamation and Reuse Standards (Washington State Department of Ecology and Department of Health Publication No. 97-23, 1997).

4. The Permittee must prepare and submit approvable plans and specifications to Ecology for review and approval in accordance with chapter 173-240-070 WAC. In addition to the electronic copy required by Special Condition S3.B, the Permittee must submit one full size paper copy to Ecology for its use to the address listed in Special Condition S3.B. If the Permittee wants Ecology to provide a stamped approved copy it must submit an additional paper copy (total of 2 paper copies).

5. Prior to the start of construction, the Permittee must submit to Ecology a construction quality assurance plan as required by chapter 173-240-075 WAC.

S9. Compliance schedule

In order to achieve the greatest reasonable reduction of TSS at the earliest possible date, the Permittee must complete the following tasks by the dates below and submit the following reports 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 for a Headworks Improvements Projects (WAC 173-240-060)	December 31, 2017
2	Submit design documents (plans and specifications) for the Headworks Improvements Project (WAC 173-240-070)	September 1, 2018
3	Submit a construction quality assurance plan prior to the start of construction (WAC 173-240-075)	December 31, 2018
4	Submit revisions to the operation and maintenance (O&M) manual related to the new headworks components (WAC 173-240-080)	December 31, 2018
5	Submit a declaration of construction completion for the Headworks Improvements Project (WAC 173-240-090)	December 31, 2018

S10. Outfall evaluation

The Permittee must inspect, the submerged portion of the outfall line and diffuser to document its integrity and continued function. If conditions allow for a photographic verification, the Permittee must include such verification in the report. The Permittee must submit the inspection report to Ecology through the Water Quality Permitting Portal – Permit Submittals application. The Permittee must submit hard-copies of any video files to Ecology as required by Permit Condition S3.B. The Portal does not support submittal of video files.

The inspector must at a minimum:

- Assess the physical condition of the outfall pipe, diffuser, and associated couplings.
- Determine the extent of sediment accumulation in the vicinity of the diffuser.
- Ensure diffuser ports are free of obstructions and are allowing uniform flow.
- Confirm physical location (latitude/longitude) and depth (at MLLW) of the diffuser section of the outfall.
- Assess physical condition of the submarine line, including side sewer laterals up to the ordinary high water line.
- Assess physical condition of anchors used to secure the submarine line.

Permittee must submit an inspection report to Ecology by January 1, 2020. The Permittee must include in the report a schedule for performing any necessary repairs if inspection reveals any damage or deterioration to the outfall line, diffuser, submarine line or anchors.

S11. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by March 1, 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.

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

   Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

   This permit may be automatically transferred to a new Permittee if:

   a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.

   b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

   c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.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.

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
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
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

APPENDIX B

Chapter 173-240 WAC

SUBMISSION OF PLANS AND REPORTS FOR CONSTRUCTION OF WASTEWATER FACILITIES

Chapter Listing

WAC Sections

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

173-240-105 Form—Certificate of construction of water pollution control facilities. [Statutory Authority: RCW 90.48.110 . WSR 79-02-033 (Order DE 78-10), § 173-240-105, filed 1/23/79. Formerly chapter 372-20 WAC.] Repealed by WSR 83-23-063 (Order DE 83-30), filed 11/16/83. Statutory Authority: Chapters 43.21A and 90.48 RCW.

173-240-010
Purpose and scope.

The purpose of this chapter is to implement RCW 90.48.110. The department interprets "plans and specifications" as mentioned in RCW 90.48.110 as including "engineering reports," "plans and specifications," and "general sewer plans," all as defined in WAC173-240-020. This chapter also includes provisions for review and approval of proposed methods of operation and maintenance.

[Statutory Authority: Chapters 43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-010, filed 11/16/83. Statutory Authority: RCW90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-010, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-020
Definitions.

(1) "Approval" means written approval.

(2) "Construction quality assurance plan" means a plan describing the methods by which the professional engineer in responsible charge of inspection of the project will determine that the facilities were constructed without significant change from the department approved plans and specifications.

(3) "Department" means the Washington state department of ecology.

(4) "Domestic wastewater" means water carrying human wastes, including kitchen, bath, and laundry wastes from residences, buildings, industrial establishments or other places, together with the groundwater infiltration or surface waters that may be present.

(5) "Domestic wastewater facility" means all structures, equipment, or processes required to collect, carry away, treat, reclaim or dispose of domestic wastewater together with the industrial waste that may be present. In the case of subsurface sewage treatment and disposal, the term is restricted to mean those facilities treating and disposing of domestic wastewater only from:

(a) A septic tank system with subsurface sewage treatment and disposal and an ultimate design capacity exceeding fourteen thousand five hundred gallons per day at any common point; or

(b) A mechanical treatment system or lagoon followed by subsurface disposal with an ultimate design capacity exceeding three thousand five hundred gallons per day at any common point.

Where the proposed system using subsurface disposal has received a state construction grant or a federal construction grant under the Federal Water Pollution Control Act as amended, such a system is a "domestic wastewater facility" regardless of size.

(6) "Engineering report" means a document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130. In the case of a domestic wastewater facility project, the report describes the recommended financing method.

The facility plan described in federal regulation 40 C.F.R. 35 is an "engineering report." This federal regulation describes the Environmental Protection Agency's municipal wastewater construction grants program.

(7) "General sewer plan" means the:

(a) Sewerage general plan adopted by counties under chapter36.94 RCW; or

(b) Comprehensive plan for a system of sewers adopted by sewer districts under chapter 56.08 RCW; or

(c) Plan for a system of sewerage adopted by cities under chapter 35.67 RCW; or

(d) Comprehensive plan for a system of sewers adopted by water districts under chapter 57.08 RCW; or

(e) Plan for sewer systems adopted by public utility districts under chapter 54.16 RCW and by port districts under chapter 53.08 RCW.

(f) The "general sewer plan" is a comprehensive plan for a system of sewers adopted by a local government entity. The plan includes the items specified in each respective statute. It includes the general location and description of treatment and disposal facilities, trunk and interceptor sewers, pumping stations, monitoring and control facilities, local service areas and a general description of the collection system to serve those areas. The plan also includes preliminary engineering in adequate detail to assure technical feasibility, provides for the method of distributing the cost and expense of the sewer system, and indicates the financial feasibility of plan implementation.

(8) "Industrial wastewater" means the water or liquid that carries waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feedlots, poultry houses, or dairies. The term includes contaminated stormwater and also leachate from solid waste facilities.

(9) "Industrial wastewater facility" means all structures, equipment, or processes required to collect, carry away, treat, reclaim or dispose of industrial wastewater.

(10) "Owner" means the state, county, city, town, federal agency, corporation, firm, company, institution, person or persons, or any other entity owning a domestic or industrial wastewater facility.

(11) "Plans and specifications" means the detailed drawings and specifications used in the construction or modification of domestic or industrial wastewater facilities. Except as otherwise allowed, plans and specifications are preceded by an approved engineering report. For some industrial facilities final conceptual drawings for all or parts of the system may be substituted for plans and specifications with the permission of the department.

(12) "Sewerage system" means a system of sewers and appurtenances for the collection, transportation, pumping, treatment and disposal of domestic wastewater together with industrial waste that may be present. By definition a sewerage system is a "domestic wastewater facility."

(13) "Sewer line extension" means any pipe added or connected to an existing sewerage system, together with any pump stations: Provided, That the term does not include gravity side sewers that connect individual building or dwelling units to the sewer system when these side sewers are less than one hundred fifty feet in length and not over six inches in diameter.

(14) "Subsurface sewage treatment and disposal" means the physical, chemical, or bacteriological treatment and disposal of domestic wastewater within the soil profile by placement beneath the soil surface in trenches, beds, seepage pits, mounds, or fills.

(15) "Waters of the state" means all lakes, rivers, ponds, streams, inland waters, groundwaters, salt waters, and all other waters and watercourses within the jurisdiction of the state of Washington.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-020, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-020, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-020, filed 1/23/79. Formerly WAC 372-20-010.]

173-240-030
Submission of plans and reports.

(1) Before constructing or modifying domestic wastewater facilities, engineering reports and plans and specifications for the project must be submitted to and approved by the department, except as noted in WAC 173-240-030(5).

(2) All reports and plans and specifications must be submitted by the owner or the owner's authorized representative consistent with a compliance schedule issued by the department or at least sixty days before the time approval is desired.

(3) Construction or modification of domestic wastewater facilities shall conform to the following schedule of tasks unless otherwise modified by these rules:

(a) Submission and approval of engineering report;

(b) Submission and approval of plans and specifications;

(c) Submission and approval of construction quality assurance plan;

(d) Submission and approval of draft operation and maintenance manual;

(e) Declaration of completion of construction by the project engineer; and

(f) Submission of complete operation and maintenance manual.

(4) Where two or more years has lapsed since approval of the engineering report or plans and specifications and construction has not begun, it may be necessary to update that document to reflect changed conditions such as: Water quality, services availability, regulatory requirements, or engineering technology.

(5) If the local government entity has received department approval of a general sewer plan and standard design criteria, engineering reports and plans and specifications for sewer line extensions, including pump stations, are not required to be submitted for approval. In this case the entity need only provide a description of the project and written assurance that the extension is in conformance with the general sewer plan. However, in the following situations specific department approval is necessary for sewer line extensions before construction:

(a) The proposed sewers, or pump stations involve installation of overflows or bypasses; or

(b) The proposed sewers, pump or lift stations discharge to an overloaded treatment, collection, or disposal facility.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-030, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-030, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-030, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-035
Restrictions—Subsurface disposal systems.

Domestic wastewater facilities using subsurface sewage treatment and disposal, as defined in WAC 173-240-020(5), are prohibited except under those extraordinary circumstances where no other reasonable alternatives exist and: Providing that

(1) The facility is owned, operated, and maintained by a public entity, except as noted in WAC 173-240-104; and

(2) Adequate facility construction oversight is provided by the public entity; and

(3) The proposed project is consistent with local health and land use rules; and

(4) Loading rates do not exceed 1,570 gallons per day per acre of gross land area in medium sands or finer grained soils and may not exceed 900 gallons per day per acre of gross land in coarser grained soils or other soils where conditions do not provide for adequate treatment. For the purposes of this section gross land area is defined as the contiguous land area of a proposed development that might include the centerline of adjoining road or street right-of-ways.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-035, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-035, filed 11/16/83.]

173-240-040
Review standards.

(1) The department will review general sewer plans, engineering reports, plans and specifications, and operation and maintenance manuals for domestic wastewater facilities to determine whether the proposed facilities will be designed, constructed, operated, and maintained to meet effluent limitations and other requirements of an NPDES or state waste discharge permit, if applicable, and to meet the policies and requirements of chapters 90.48 and 90.54 RCW pertaining to prevention and control of pollution of waters of the state.

(2) In addition to the above, the department will review documents submitted under this chapter to determine whether they are reasonably consistent with the appropriate sections of the state of Washington, "Criteria for sewage works design." Additional references may include, but are not limited to, the following:

(a) Manuals of Practice, Water Pollution Control Federation.

(b) Manuals of Engineering Practice, American Society of Civil Engineering.

(c) Standard Specifications for Municipal Public Works Construction, American Public Works Association.

(d) Considerations for Preparation of Operation and Maintenance Manuals, United States Environmental Protection Agency.

(e) Process Design Manuals, United States Environmental Protection Agency.

(f) Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, United States Environmental Protection Agency.

(g) Design Manual: Onsite Wastewater Treatment and Disposal Systems, U.S.E.P.A. October 1980.

(h) Guidelines for Larger On-Site Sewage Disposal Systems, Washington State Department of Social and Health Services and Department of Ecology.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-040, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-040, filed

11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-040, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-050
General sewer plan.

(1) All general sewer plans required of any governmental agency before providing sewer service are "plans" within the requirements of RCW 90.48.110. Three copies of the proposed general sewer plan and each amendment to it must be submitted to and approved by the department before implementing the plan.

(2) The general sewer plan must be sufficiently complete so that engineering reports can be developed from it without substantial alterations of concept and basic considerations.

(3) The general sewer plan shall include the following information together with any other relevant data as requested by the department. To satisfy the requirements of the local government jurisdiction, additional information may be necessary.

(a) The purpose and need for the proposed plan.

(b) A discussion of who will own, operate, and maintain the systems.

(c) The existing and proposed service boundaries.

(d) Layout map including the following:

(i) Boundaries. The boundary lines of the municipality or special district to be sewered, including a vicinity map;

(ii) Existing sewers. The location, size, slope, capacity, direction of flow of all existing trunk sewers, and the boundaries of the areas served by each;

(iii) Proposed sewers. The location, size, slope, capacity, direction of flow of all proposed trunk sewers, and the boundaries of the areas to be served by each;

(iv) Existing and proposed pump stations and force mains. The location of all existing and proposed pumping stations and force mains, designated to distinguish between those existing and proposed;

(v) Topography and elevations. Topography showing pertinent ground elevations and surface drainage must be included, as well as proposed and existing streets;

(vi) Streams, lakes, and other bodies of water. The location and direction of flow of major streams, the high and low elevations of water surfaces at sewer outlets, and controlled overflows, if any. All existing and potential discharge locations should be noted; and

(vii) Water systems. The location of wells or other sources of water supply, water storage reservoirs and treatment plants, and water transmission facilities.

(e) The population trend as indicated by available records, and the estimated future population for the stated design period. Briefly describe the method used to determine future population trends and the concurrence of any applicable local or regional planning agencies.

(f) Any existing domestic or industrial wastewater facilities within twenty miles of the general plan area and within the same topographical drainage basin containing the general plan area.

(g) A discussion of any infiltration and inflow problems and a discussion of actions that will alleviate these problems in the future.

(h) A statement regarding provisions for treatment and discussion of the adequacy of the treatment.

(i) List of all establishments producing industrial wastewater, the quantity of wastewater and periods of production, and the character of the industrial wastewater insofar as it may affect the sewer system or treatment plant. Consideration must be given to future industrial expansion.

(j) Discussion of the location of all existing private and public wells, or other sources of water supply, and distribution structures as they are related to both existing and proposed domestic wastewater treatment facilities.

(k) Discussion of the various alternatives evaluated, and a determination of the alternative chosen, if applicable.

(l) A discussion, including a table, that shows the cost per service in terms of both debt service and operation and maintenance costs, of all facilities (existing and proposed) during the planning period.

(m) A statement regarding compliance with any adopted water quality management plan under the Federal Water Pollution Control Act as amended.

(n) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-050, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-050, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-050, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-060
Engineering report.

(1) The engineering report for a domestic wastewater facility shall include each appropriate (as determined by the department) item required in WAC 173-240-050 for general sewer plans unless an up-to-date general sewer plan is on file with the department. Normally, an engineering report is not required for sewer line extensions or pump stations. See WAC 173-240-020(13) and 173-240-030(5). The facility plan described in federal rule 40 C.F.R. 35 is an "engineering report."

(2) The engineering report must be sufficiently complete so that plans and specifications can be developed from it without substantial changes. Three copies of the report must be submitted to the department for approval, except as waived under WAC 173-240-030(5).

(3) The engineering report shall include the following information together with any other relevant data as requested by the department:

(a) The name, address, and telephone number of the owner of the proposed facilities, and the owner's authorized representative.

(b) A project description that includes a location map and a map of the present and proposed service area.

(c) A statement of the present and expected future quantity and quality of wastewater, including any industrial wastes that may be present or expected in the sewer system.

(d) The degree of treatment required based upon applicable permits and rules, the receiving body of water, the amount and strength of wastewater to be treated, and other influencing factors.

(e) A description of the receiving water, applicable water quality standards, and how water quality standards will be met outside any applicable dilution zone.

(f) The type of treatment process proposed, based upon the character of the wastewater to be handled, the method of disposal, the degree of treatment required, and a discussion of the alternatives evaluated and the reasons they are unacceptable.

(g) The basic design data and sizing calculations of each unit of the treatment works. Expected efficiencies of each unit and also of the entire plant, and character of effluent anticipated.

(h) Discussion of the various sites available and the advantages and disadvantages of the site or sites recommended. The proximity of residences or developed areas to any treatment works. The relationship of the twenty-five-year and one hundred-year flood to the treatment plant site and the various plant units.

(i) A flow diagram that shows general layout of the various units, the location of the effluent discharge, and a hydraulic profile of the system that is the subject of the engineering report and any hydraulically related portions.

(j) A discussion of infiltration and inflow problems, overflows and bypasses, and proposed corrections and controls.

(k) A discussion of any special provisions for treating industrial wastes, including any pretreatment requirements for significant industrial sources.

(l) Detailed outfall analysis or other disposal method selected.

(m) A discussion of the method of final sludge disposal and any alternatives considered.

(n) Provision for future needs.

(o) Staffing and testing requirements for the facilities.

(p) An estimate of the costs and expenses of the proposed facilities and the method of assessing costs and expenses. The total amount shall include both capital costs and also operation and maintenance costs for the life of the project, and must be presented in terms of total annual cost and present worth.

(q) A statement regarding compliance with any applicable state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended.

(r) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.

(4) The engineering report for projects that use land application, including seepage lagoons, irrigation, and subsurface disposal, shall include information on the following together with appropriate parts of subsection (3) of this section, as determined by the department:

(a) Soils and their permeability;

(b) Geohydrologic evaluation of factors such as:

(i) Depth to groundwater and groundwater movement during different times of the year;

(ii) Water balance analysis of the proposed discharge area;

(iii) Overall effects of the proposed facility upon the groundwater in conjunction with any other land application facilities that may be present;

(c) Availability of public sewers;

(d) Reserve areas for additional subsurface disposal.

(5) The engineering report for projects funded by the Environmental Protection Agency shall, in addition to the requirements of subsection (3) or (4) of this section, follow EPA facility plan guidelines contained in the EPA publication, "Guidance for Preparing a Facility Plan" (MCD-46), and shall indicate how the special requirements contained in 40 C.F.R. 35.719-1 will be met.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-060, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters**43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-060, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-060, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-070
Plans and specifications.

(1) The plans and specifications for a domestic wastewater facility are the detailed construction documents by which the owner or his or her contractor bid and construct the facility. The content and format of the plans and specifications must be as stated in the state of Washington, "Criteria for sewage works design," and shall include a list of the facility design criteria and a plan for interim operation of facilities during construction.

(2) Plans and specifications for sewer line extensions shall include, as a separate report, an analysis of the existing collection and treatment system's ability to transport and treat additional flow and loading.

(3) Two copies of the plans and specifications must be submitted to the department for approval before starting construction, except as waived under WAC **173-240-030**(5).

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-070, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters**43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-070, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-070, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-075
Construction quality assurance plan.

(1) Before construction a detailed plan must be submitted to the department that shows how adequate and competent construction inspection will be provided.

(2) The construction quality assurance plan shall include a:

(a) Construction schedule with a summary of planned construction activities, their sequence, interrelationships, durations, and terminations.

(b) Description of the construction management organization, management procedures, lines of communication, and responsibility.

(c) Description of anticipated quality control testing that includes type of test, frequency, and who will perform the tests.

(d) Description of the change order process that includes who will initiate change orders, as well as who will review, negotiate, and approve change orders.

(e) Description of the technical records handling methodology that includes where plans and specifications, as-built drawings, field orders, and change orders will be kept.

(f) Description of the construction inspection program that includes inspection responsibility, anticipated inspection frequency, deficiency resolution, and inspector qualifications.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-075, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-075, filed 11/16/83.]

173-240-080
Operation and maintenance manual.

(1) The proposed method of operation and maintenance of the domestic wastewater facility must be stated in the engineering report or plans and specifications and must be approved by the department. The statement must be a discussion of who will own, operate, and maintain the facility and what the staffing and testing requirements are. The owner shall follow the approved method of operation after the facility is constructed, unless changes have been approved by the department.

(2) In those cases where the facility includes mechanical components, a detailed operation and maintenance manual must be prepared before completing the construction. The purpose of the manual is to present technical guidance and regulatory requirements to the operator to enhance operation under both normal and emergency conditions. Two copies of the manual must be submitted to the department for approval before completing the construction.

(3) In order to assure proper operation during construction and timely review and approval of the final operation and maintenance manual, a draft manual must be submitted in the early stages of the construction of a facility. In addition, manufacturer's information on equipment must be available to the plant operator before unit start up.

(4) The operation and maintenance manual shall include the following list of topics. For those projects funded by the Environmental Protection Agency the manual shall also follow the requirements of the EPA publication, "Considerations for Preparation of Operation and Maintenance Manuals."

(a) The assignment of managerial and operational responsibilities, including plant classification and classification of required operators.

(b) A description of plant type, flow pattern, operation, and efficiency expected.

(c) The principal design criteria.

(d) A process description of each plant unit, including function, relationship to other plant units, and schematic diagrams.

(e) A discussion of the detailed operation of each unit and description of various controls, recommended settings, fail-safe features, etc.

(f) A discussion of how the treatment facilities are to be operated during anticipated maintenance procedures, and under less than design loading conditions, if applicable, such as initial loading on a system designed for substantial growth.

(g) A section on laboratory procedures, including sampling techniques, monitoring requirements, and sample analysis.

(h) Recordkeeping procedures and sample forms to be used.

(i) A maintenance schedule that incorporates manufacturer's recommendations, preventative maintenance and housekeeping schedules, and special tools and equipment usage.

(j) A section on safety.

(k) A section that lists the spare parts inventory, address of local suppliers, equipment warranties, and appropriate equipment catalogues.

(l) Emergency plans and procedures.

(5) In those cases where the facility does not include mechanical components, an operation and maintenance manual, which may be less detailed than that described in subsection (4) of this section, must be submitted to the department for approval before completing construction. The manual shall fully describe the treatment and disposal system and outline routine maintenance procedures needed for proper operation of the system.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-080, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-080, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-080, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-090
Declaration of construction completion.

(1) Within thirty days after acceptance by the owner of the construction or modification of a domestic wastewater facility, the professional engineer in responsible charge of inspection of the project shall submit to the department:

(a) One complete set of record drawings or as-builts;

(b) A declaration stating the facilities were constructed in accordance with the provisions of the construction quality assurance plan and without significant change from the department approved plans and specifications.

(2) The declaration will be furnished by the department and will be the same form as WAC 173-240-095, declaration of construction of water pollution control facilities. The submission of the declaration is not necessary for sewer line extensions where the local government entity has received approval of a general sewer plan and standard design criteria.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-090, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-090, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-090, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-095
Form—Declaration of construction of water pollution control facilities.

DECLARATION OF CONSTRUCTION OF WATER POLLUTION CONTROL FACILITIES

Instructions:

A. Upon completion, and before using any project or portions thereof, a professional engineer shall complete and sign this form, declaring that the project was constructed in accordance with the provisions of the construction quality assurance plan and with the plans and specifications and major change orders approved by the department of ecology.

B. If a project is being completed in phased construction, a map must be attached showing that portion of the project to which the declaration applies. A declaration of construction must be submitted for each phase of a project as it is completed. Additional declaration forms are available upon request from the department of ecology offices listed below.

NAME AND BRIEF DESCRIPTION OF PROJECT: . . . .

. . . .

. . . .

NAME OF OWNER . . . . DOE PROJECT NO. . . . .

ADDRESS . . . . DATE PROJECT OR PHASE COMPLETED . . . .

CITY . . . . STATE . . . . ZIP . . . .

DOE PLAN AND SPECIFICATION APPROVAL DATE . . . .

I hereby declare that I am the project engineer of the above identified project and that the project was reviewed and observed by me or my authorized agent in accordance with the provisions of the construction quality assurance plan. I further declare that the project was, to the best of my knowledge and information, constructed and completed in accordance with the plans and specification and major change orders approved by the department of ecology and as shown on the owner's "as-built" plans.

. . . .
Signature of Professional Engineer

SEAL OF ENGINEER

DATE . . . .

Please return completed form to the department of ecology office checked below.

□ SW Regional Office Department of Ecology P.O. Box 47600 Olympia, WA 98504-7600	□ Central Regional Office Department of Ecology 15 W. Yakima Ave., Suite 200 Yakima, WA 98902-3401
□ NW Regional Office Department of Ecology 3190 160th Ave. S.E. Bellevue, WA 98008-5452	□ Eastern Regional Office Department of Ecology N. 4601 Monroe, Ste. 100 Spokane, WA 99205-1295
□ Water Quality Program Department of Ecology	

P.O. Box 47600
Olympia, WA
98504-7600

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-095, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-095, filed 11/16/83.]

173-240-100
Requirement for certified operator.

Each owner of a domestic wastewater treatment facility is required by chapter 70.95B RCW to have an operator, certified by the state, in responsible charge of the day to day operation of the facility. This requirement does not apply to a septic tank using subsurface disposal. The certification procedures are set forth in chapter 173-230 WAC.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-100, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-100, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-100, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-104
Ownership and operation and maintenance.

(1) Except as provided in subsections (2) and (3) of this section, domestic sewage facilities will not be approved unless ownership and responsibility for operation and maintenance is by a public entity. If a waste discharge permit is required it must be issued to the public entity. Nothing in this rule precludes a public entity from contracting operation and maintenance of domestic sewage facilities.

(2) Ownership by nonpublic entities may be approved if the department determines the ownership is in the public interest: Provided, That there is an enforceable contract, approved by the department, between the nonpublic entity and a public entity with an approved sewer general plan that will assure immediate assumption of the system under the following conditions:

(a) Treatment efficiency is unsatisfactory either as a result of plant capacity or physical operation; or

(b) If such an assumption is necessary for the implementation of a general sewer plan.

(3) The following domestic wastewater facilities would not require public entity ownership, operation, and maintenance:

(a) Those facilities existing or approved for construction as of the effective date of this section, until such a time the facility is expanded to accommodate additional development.

(b) Those facilities which serve a single nonresidential, industrial, or commercial establishment. Commercial/industrial complexes serving multiple owners or tenants and multiple residential dwelling facilities such as mobile home parks, apartments, and condominiums are not considered commercial establishments for the purpose of this section.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-104, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-104, filed 11/16/83.]

173-240-110
Submission of plans and reports.

(1) Before constructing or modifying industrial wastewater facilities, engineering reports and plans and specifications for the project must be submitted to and approved by the department.

(2) All engineering reports and plans and specifications should be submitted by the owner consistent with a compliance schedule issued by the department or at least thirty days before the time approval is desired. The department will generally review and either approve (or conditionally approve), comment on, or disapprove those plans and reports within the thirty-day period unless circumstances prevent, in which case the owner will be notified and informed of the reason for the delay.

(3) Construction or modification of industrial wastewater facilities shall conform to the following schedule of tasks unless waived in accordance with subsection (5).

(a) Submission and approval of an engineering report;

(b) Submission and approval of plans and specifications;

(c) Submission of an operation and maintenance manual.

(4) Where two or more years has elapsed since approval of the engineering report or plans and specifications, it may be necessary to update that document to reflect changed water quality conditions, regulatory requirements, or engineering technology.

(5) Upon request by the owner, the department may waive the requirement for a three step submission of documents for industrial facilities. In such a case the department will require instead conceptual plans that also include the appropriate (as determined by the department) information from the engineering report and an operation and maintenance manual.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-110, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-110, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-110, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-120
Review standards.

The department will review engineering reports, plans and specifications, and operation and maintenance manuals for industrial wastewater facilities to:

(1) Determine whether the proposed facilities will be designed, constructed, operated and maintained to meet effluent limitations and other requirements of an NPDES or state waste discharge permit, if applicable; and

(2) To meet the policies and requirements of chapters 90.48 and90.54 RCW pertaining to prevention and control of pollution of waters of the state; and

(3) To determine whether the facility will be designed, constructed, and operated consistent with good engineering practices.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-120, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-120, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-120, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-130
Engineering report.

(1) The engineering report for an industrial wastewater facility must be sufficiently complete so that plans and specifications can be developed from it without substantial changes. Two copies of the report must be submitted to the department for approval.

(2) The engineering report shall include the following information together with any other relevant data as requested by the department:

(a) Type of industry or business;

(b) The kind and quantity of finished product;
(c) The quantity and quality of water used by the industry and a description of how it is consumed or disposed of, including:
(i) The quantity and quality of all process wastewater and method of disposal;
(ii) The quantity of domestic wastewater and how it is disposed of;
(iii) The quantity and quality of noncontact cooling water (including air conditioning) and how it is disposed of; and
(iv) The quantity of water consumed or lost to evaporation.
(d) The amount and kind of chemicals used in the treatment process, if any;
(e) The basic design data and sizing calculations of the treatment units;
(f) A discussion of the suitability of the proposed site for the facility;
(g) A description of the treatment process and operation, including a flow diagram;
(h) All necessary maps and layout sketches;
(i) Provisions for bypass, if any;
(j) Physical provision for oil and hazardous material spill control or accidental discharge prevention or both;
(k) Results to be expected from the treatment process including the predicted wastewater characteristics, as shown in the waste discharge permit, where applicable;
(l) A description of the receiving water, location of the point of discharge, applicable water quality standards, and how water quality standards will be met outside of any applicable dilution zone;
(m) Detailed outfall analysis;
(n) The relationship to existing treatment facilities, if any;
(o) Where discharge is to a municipal sewerage system, a discussion of that system's ability to transport and treat the proposed industrial waste discharge without exceeding the municipality's allocated industrial capacity. Also, a discussion on the effects of the proposed industrial discharge on the use or disposal of municipal sludge;
(p) Where discharge is through land application, including seepage lagoons, irrigation, and subsurface disposal, a geohydrologic evaluation of factors such as:
(i) Depth to groundwater and groundwater movement during different times of the year;
(ii) Water balance analysis of the proposed discharge area;
(iii) Overall effects of the proposed facility upon the groundwater in conjunction with any other land application facilities that may be present;
(q) A statement expressing sound engineering justification through the use of pilot plant data, results from other similar installations, or scientific evidence from the literature, or both, that the effluent from the proposed facility will meet applicable permit effluent limitations or pretreatment standards or both;
(r) A discussion of the method of final sludge disposal selected and any alternatives considered with reasons for rejection;
(s) A statement regarding who will own, operate, and maintain the system after construction;
(t) A statement regarding compliance with any state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended;
(u) Provisions for any committed future plans;
(v) A discussion of the various alternatives evaluated, if any, and reasons they are unacceptable;
(w) A timetable for final design and construction;
(x) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable;
(y) Additional items to be included in an engineering report for a solid waste leachate treatment system are:
(i) A vicinity map and also a site map that shows topography, location of utilities, and location of the leachate collection network, treatment systems, and disposal;
(ii) Discussion of the solid waste site, working areas, soil profile, rainfall data, and groundwater movement and usage;
(iii) A statement of the capital costs and the annual operation and maintenance costs;
(iv) A description of all sources of water supply within two thousand feet of the proposed disposal site. Particular attention should be given to showing impact on usable or potentially usable aquifers.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-130, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-130, filed

11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-130, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-140
Plans and specifications.

(1) Upon request of the owner the department may, at its discretion, allow submission of conceptual plans for industrial facilities, as noted in WAC 173-240-110(5). Two copies of the plans and specifications must be submitted to the department for approval before the start of construction.

(2) The plans and specifications shall include the following information together with any other relevant data as requested by the department:

(a) Repeat presentation of the basic engineering design criteria from the engineering report.

(b) If there are any deviations from the concepts of the engineering report, an explanation of the changes that includes as much detail as would have been provided in an engineering report.

(c) The plan and section drawings of major components, such as the treatment units, pump stations, flow measuring devices, sludge handling equipment, and influent and effluent piping. Foundations or soil preparation or both should be shown for major structures.

(d) A general site drawing that shows the location with respect to the entire plant site and a detailed site drawing that shows the component siting.

(e) A schematic drawing that shows flows that include: In plant collection, and wastewater pumping, treatment, and discharge.

(f) A hydraulic profile that shows head under maximum flows. This requirement may be waived where the three step submission of documents has been waived under WAC 173-240-110(5).

(g) Instrumentation, controls, and sampling schematics.

(h) General operating procedures, such as startup, shutdown, spills, etc.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-140, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-140, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-140, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-150
Operation and maintenance manual.

(1) A detailed operation and maintenance manual must be prepared for an industrial wastewater facility that includes mechanical components before completing the construction. The manual is to be submitted to the department for review and approval. The purpose of the manual is to present technical guidance and regulatory requirements to the operator to enhance operation under both normal and emergency conditions.

(2) The operation and maintenance manual shall include the following topics:

(a) The names and phone numbers of the responsible individuals.

(b) A description of plant type, flow pattern, operation, and efficiency expected.

(c) The principal design criteria.

(d) A process description of each plant unit, that includes function, relationship to other plant units, and schematic diagrams.

(e) An explanation of the operational objectives for the various wastewater parameters, such as sludge age, settleability, etc.

(f) A discussion of the detailed operation of each unit and a description of various controls, recommended settings, fail-safe features, etc.

(g) A discussion of how the facilities are to be operated during anticipated startups and shutdowns, maintenance procedures, and less than design loading conditions, so as to maintain efficient treatment.

(h) A section on laboratory procedures that includes sampling techniques, monitoring requirements, and sample analysis.
(i) Recordkeeping procedures and sample forms to be used.
(j) A maintenance schedule that incorporates manufacturer's recommendations, preventative maintenance and housekeeping schedules, and special tools and equipment usage.
(k) A section on safety.
(l) A section that contains the spare parts inventory, address of local suppliers, equipment warranties, and appropriate equipment catalogues.
(m) Emergency plans and procedures.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-150, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-150, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-150, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-160
Requirement for professional engineer.

(1) All required engineering reports, and plans and specifications for the construction or modification of wastewater facilities must be prepared under the supervision of a professional engineer licensed in accordance with chapter 18.43 RCW. All copies of these documents submitted to the department for review shall bear the seal of the professional engineer under whose supervision they have been prepared.
(2) Upon request of the owner, the department may waive the above requirement for construction or modification at industrial wastewater facilities.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-160, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-160, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-160, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-170
Right of inspection.

Under RCW 90.48.090, the department or its authorized representative has the right to enter at all reasonable times in or upon any property, public or private, for the purposes of inspection or investigation relating to the pollution or possible pollution of the waters of the state, including the inspection of construction activities related to domestic or industrial wastewater facilities.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-170, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-170, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-170, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-180
Approval of construction changes.

All wastewater facilities subject to the provisions of this rule must be constructed in accordance with the plans and specifications approved by the department. Any contemplated changes during construction, which are significant deviations from the approved plans, must first be submitted to the department for approval.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-180, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters**43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-180, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-180, filed 1/23/79. Formerly chapter 372-20 WAC.]

APPENDIX C

Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects

Updated 9-23-19

Please contact Cathi Read at cathi.read@commerce.wa.gov if you would like to update your program information or if you would like an electronic version of this document.

PLANNING Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
CDBG Community Development Block Grant – General Purpose Grant Fund – Planning-Only Activities	• Comprehensive plans • Non-routine infrastructure plans • Feasibility studies • Community action plans • Low-income housing assessments	Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties. • Cities or towns with fewer than 50,000 people • Counties with fewer than 200,000 people	Grant • Up to $24,000 for a single jurisdiction.	Pending HUD CDBG funding, applications will be due June 3, 2020. **Contact:** Jeff Hinckle 360-725-3060 jeff.hinckle@commerce.wa.gov Visit www.commerce.wa.gov/cdbg for information and forms.
SOURCE WATER PROTECTION GRANT PROGRAM	Source water protection studies (watershed, hydrogeologic, feasibility studies). Eligible activities can lead to reducing the risk of contamination of a system's drinking water sources(s), or they can evaluate or build resiliency for a public water supply. They must contribute to better protecting one or more public water supply sources.	Non-profit Group A water systems. Local governments proposing a regional project. Project must be reasonably expected to provide long-term benefit to drinking water quality or quantity.	Grants • Funding is dependent upon project needs, but typically does not exceed $30,000.	Applications accepted anytime; grants awarded on a funds available basis. **Contact:** Corina Hayes Source Water Protection Program Manager 360-236-3114 corina.hayes@doh.wa.gov http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/SourceWater/SourceWaterProtection.aspx Grant guidelines https://www.doh.wa.gov/Portals/1/Documents/Pubs/331-552.pdf
ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM State Water Pollution Control Revolving Fund (SRF) Centennial Clean Water Fund	Planning projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes	Loan interest rates (SFY 2021) • 6-20 year loans: 2.0% • 1-5 year loans: 1.0% Pre-Construction Set-aside (Distressed Communities) 50% forgivable principal loan and 50% loan	This year's applications due October 15, 2019. **Contact:** David Dunn 360-407-6503 david.dunn@ecy.wa.gov https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans

PLANNING Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
RD PRE-DEVELOPMENT GRANTS (PPD) U.S. Dept. of Agriculture Rural Development – Rural Utilities Service – Water and Waste Disposal Direct Loans and Grants	Water and/or sewer planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Low-income, small communities and systems serving areas under 10,000 population.	Planning grant to assist in paying costs associated with developing a complete application for RD funding for a proposed project. Maximum $30,000 grant. Requires minimum 25% match.	Applications accepted year-round, on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa
RD 'SEARCH' GRANTS: SPECIAL EVALUATION ASSISTANCE FOR RURAL COMMUNITIES U.S. Dept. of Agriculture Rural Development – Rural Utilities Service – Water and Waste Disposal Direct Loans and Grants	Water and/or sewer planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Low-income, small communities and systems serving areas under 2,500 population.	Maximum $30,000 grant. No match required.	Applications accepted year-round, on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa
CERB PLANNING AND FEASIBILITY GRANTS Community Economic Revitalization Board – Project-Specific Planning Program	Project-specific feasibility and pre-development studies that advance community economic development goals for industrial sector business development.	Eligible statewide • Counties, cities, towns, port districts, special districts. • Federally recognized tribes • Municipal corporations, quasi-municipal corporations w/ economic development purposes.	Grant • Up to $50,000 per application. • Requires 25% (of total project cost) matching funds.	Applications accepted year-round. The Board meets six times a year. **Contact:** Janea Delk 360-725-3151 janea.delk@commerce.wa.gov
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Feasibility and Pre-Development Loans	Water, wastewater, stormwater, and solid waste planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development.	• Typically up to $50,000 for feasibility loan. • Typically up to $350,000 for pre-development loan. • Typically up to a 1-year term. • 5% interest rate.	Applications accepted anytime. **Contact**: Matt Williams 971-772-4063 mwilliams@rcac.org Applications available online at http://www.rcac.org/lending/environmental-loans/

PLANNING Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
DWSRF Drinking Water State Revolving Fund **Consolidation Feasibility Study Grants**	Feasibility studies, preliminary engineering, public outreach, and water system plan update for a consolidation or restructuring project of a Group A water System.	Group A not-for-profit community water system, county, public utility districts, and water districts that consolidate or restructure other Group A water system serving fewer than 10,000 people. Tribal water system that meets the definition of a Group A not-for-profit community water system also eligible to apply.	• All grant. • Up to $30,000 per project • No match required.	2020 applications accepted August 3-31, 2020. On-line application. Contact: Janet Cherry 360-236-3153 Janet.cherry@doh.wa.gov For information and forms visit: http://www.doh.wa.gov/DWSRF

PRECONSTRUCTION ONLY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM State Water Pollution Control Revolving Fund (SRF) Centennial Clean Water Fund Stormwater Financial Assistance Program (SFAP)	Design projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes.	Loan interest rates (SFY 2021) • 6-20 year loans: 2.0% • 1-5 year loans: 1.0% Pre-Construction Set-aside (Distressed Communities) 50% forgivable principal loan and 50% loan	This year's applications due October 15, 2019. A cost effectiveness analysis must be complete at the time of application. **Contact:** David Dunn 360-407-6503 david.dunn@ecy.wa.gov https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans
PWB PRE-CON Public Works Board – Pre-Construction Program	Low-interest loans to fund pre-construction activities that prepare a specific project for construction.	Counties, cities, special purpose districts, and quasi-municipal organizations that meet certain requirements. School districts and port districts are not eligible.	• There is no funding currently available; all funds have been awarded. • However, we are requesting additional funding in the supplemental budget. • Maximum loan amount $1 million per jurisdiction per biennium. • 5-year loan term. • Interest rates vary. • Pre-construction work must be completed within 2 years.	Check the Public Works Board website periodically at http://www.pwb.wa.gov to obtain the latest information on program details or to contact Public Works Board staff. **Contact:** Connie Rivera 360-725-3088 connie.rivera@commerce.wa.gov

PRECONSTRUCTION ONLY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
RCAC RURAL COMMUNITY ASSISTANCE CORPORATION Feasibility and Pre-Development Loans	Water, wastewater, stormwater, or solid waste planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development.	• Typically up to $50,000 for feasibility loan. • Typically up to $350,000 for pre-development loan. • Typically a 1-year term. • 5% interest rate.	Applications accepted anytime. **Contact**: Matt Williams 971-772-4063 mwilliams@rcac.org Applications available online at http://www.rcac.org/lending/environmental-loans/

CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
CDBG-GP Community Development Block Grant – General Purpose Grants	• Final design and construction of wastewater, drinking water, side connections, stormwater, streets, and community facility projects. • Infrastructure in support of economic development or affordable housing. • Planning activities including comprehensive plans, non-routine infrastructure plans, feasibility studies, community action plans, and low-income housing assessments.	Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties. • Cities or towns with fewer than 50,000 people • Counties with fewer than 200,000 people	Maximum grant amounts: • $750,000 for construction projects and acquisition projects. • $500,000 for local housing rehabilitation programs. • $250,000 for local microenterprise assistance programs. • $24,000 for planning-only activities.	Applications will be due June 3, 2020. **Contact:** Jacquie Andresen 360-725-3017 Jacquie.andresen@commerce.wa.gov Visit www.commerce.wa.gov/cdbg and click on the General Purpose Grants menu for information and forms.
RD U.S. Dept. of Agriculture Rural Development - Rural Utilities Service - Water and Waste Disposal Direct Loans and Grants	Pre-construction and construction associated with building, repairing, or improving drinking water, solid waste facilities and wastewater facilities.	• Cities or towns with fewer than 10,000 population. • Counties, special purpose districts, non-profit corporations or tribes unable to get funds from other sources at reasonable rates and terms.	Loans; Grants in some cases • Interest rates change quarterly; contact staff for latest interest rates. • Up to 40-year loan term. • No pre-payment penalty.	Applications accepted year-round on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa

CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
DWSRF Drinking Water State Revolving Fund Construction Loan Program	Drinking water system infrastructure projects aimed at increasing public health protection. There is a limited amount of principal forgiveness for communities with high affordability index numbers and water system restructuring/ consolidation projects.	Group A (private and publicly-owned) community and not-for-profit non-community water systems, but not federal or state-owned systems. Tribal systems are eligible provided the project is not receiving other national set-aside funding for the project.	Loan • 1.5% loan fee (water systems receiving subsidy are not subject to loan fees). • $3 million per jurisdiction per year. • $6 million for jointly-owned projects. • 1.75 – 2.25% interest rate. • Loan repayment period: 20 years or life of the project, whichever is less. • No local match required. • $25 million expected to be available this cycle.	Online applications will be available and accepted October 1 through November 30, 2019. **Contact:** Janet Cherry 360-236-3153 janet.cherry@doh.wa.gov For information and forms visit: http://www.doh.wa.gov/DWSRF
ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM State Water Pollution Control Revolving Fund (SRF) Centennial Clean Water Fund Stormwater Financial Assistance Program (SFAP)	Construction projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes. Hardship Assistance Jurisdictions listed above with a population of 25,000 or less.	Loan interest rates (SFY 2021) • 21-30 year loans: 2.7% • 6-20 year loans: 2.0% • 1-5 year loans: 1.0% Hardship assistance for the construction of wastewater treatment facilities may be available in the form of a reduced interest rate, grant subsidy, or loan forgiveness. Hardship assistance is based on impact to residential ratepayers and the community MHI. Hardship funding is only available for the portion of a facility serving existing residential need. Stormwater grant maximum award per jurisdiction: $5 million, with a required 25% match.	This year's applications due October 15, 2019. A cost effectiveness analysis must be complete at the time of application. **Contact:** David Dunn 360-407-6503 david.dunn@ecy.wa.gov https://ecology.wa.gov/About-us/How-we-operate/Grants-loans/Find-a-grant-or-loan/Water-Quality-grants-and-loans

CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Construction Loans	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities. Can include pre-development costs.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 populations or less if using USDA Rural Development financing as the takeout.	• Typically up to $3 million with commitment letter for permanent financing • Security in permanent loan letter of conditions • Term matches construction period. • 5% interest rate • 1% loan fee	Applications accepted anytime. **Contact**: Matt Williams 971-772-4063 mwilliams@rcac.org Applications available online at http://www.rcac.org/lending/environmental-loans/
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Intermediate Term Loan	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less.	• For smaller capital needs, normally not to exceed $100,000. • Typically up to a 20-year term • 5% interest rate • 1% loan fee	Applications accepted anytime. **Contact**: Matt Williams 971-772-4063 mwilliams@rcac.org Applications available online at http://www.rcac.org/lending/environmental-loans/
RURAL WATER REVOLVING LOAN FUND	Short-term costs incurred for replacement equipment, small scale extension of services, or other small capital projects that are not a part of regular operations and maintenance for drinking water and wastewater projects.	Public entities, including municipalities, counties, special purpose districts, Native American Tribes, and corporations not operated for profit, including cooperatives, with up to 10,000 population and rural areas with no population limits.	• Loan amounts may not exceed $100,000 or 75% of the total project cost, whichever is less. Applicants will be given credit for documented project costs prior to receiving the RLF loan. • Interest rates at the lower of the poverty or market interest rate as published by USDA RD RUS, with a minimum of 3% at the time of closing. • Maximum repayment period is 10 years. Additional ranking points for a shorter repayment period. The repayment period cannot exceed the useful life of the facilities or financed item.	Applications accepted anytime. **Contact**: Tracey Hunter Evergreen Rural Water of WA 360-462-9287 thunter@erwow.org Download application online: http://nrwa.org/initiatives/revolving-loan-fund/

CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
CERB Community Economic Revitalization Board - Construction Program	Public facility projects required by private sector expansion and job creation. Projects must support significant job creation or significant private investment in the state. • Bridges, roads and railroad spurs, domestic and industrial water, sanitary and storm sewers. • Electricity, natural gas and telecommunications • General purpose industrial buildings, port facilities. • Acquisition, construction, repair, reconstruction, replacement, rehabilitation	• Counties, cities, towns, port districts, special districts • Federally-recognized tribes • Municipal and quasi-municipal corporations with economic development purposes.	Loans; grants in unique cases • Projects without a committed private partner allowed for in rural areas. • $2 million maximum per project, per policy. • Interest rates: 1-3% Based on Debt Service Coverage Ratio (DSCR), Distressed County, and length of loan term. • 20-year maximum loan term • Match for committed private partners: 20% (of total project cost). • Match for prospective partners: 50% (of total project cost). • Applicants must demonstrate gap in public project funding and need for CERB assistance. • CERB is authority for funding approvals.	Applications accepted year-round. The Board meets six times a year. **Contact:** Janea Delk 360-725-3151 janea.delk@commerce.wa.gov
PWB Public Works Board - Construction Program	New construction, replacement, and repair of existing infrastructure for stormwater, solid waste, recycling, road or bridge projects.	• Counties, cities, special purpose districts, and quasi-municipal organizations. • No school districts, port districts, or tribes per statute.	• There is no funding currently available; all funds have been awarded. • However, we are requesting additional funding in the supplemental budget.	Please visit: http://www.pwb.wa.gov **Contact:** Connie Rivera 360-725-3088 connie.rivera@commerce.wa.gov

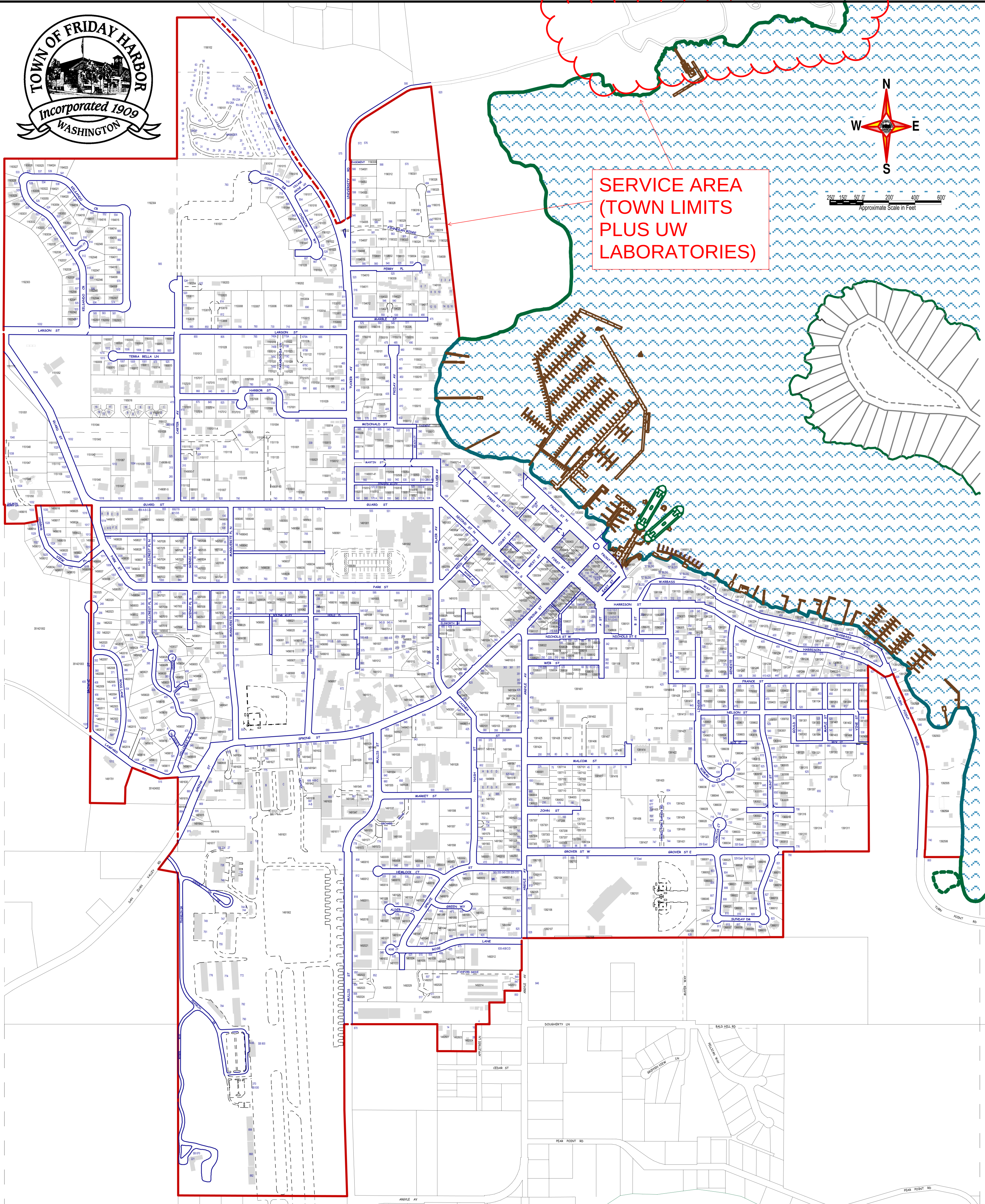
CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
Energy Efficiency and Solar Grants Program: Energy Efficiency Grant Commerce	Projects that will result in reduced energy (electricity, gas, water, etc.) and operational cost savings.	• Washington State public entities, such as municipalities and districts. • 20% of funds reserved for projects in small towns or cities with populations of 5,000 or less. • Applicants who have not received funding previously will be prioritized.	2020: $1,731,450 2021: $1,731,450 • Maximum grant: $500,000 • Minimum match requirements will apply. • Other State funds cannot be used as match.	Contact: Dever Haffner-Ratliffe 360-522-3610 EEandS@commerce.wa.gov Visit https://www.commerce.wa.gov/growing-the-economy/energy/energy-efficiency-and-solar-grants/ for more information.
Energy Efficiency and Solar Grants Program: Solar Grants Commerce	Installation of grid-tied solar photovoltaic (electric) arrays. Additional points for 'Made in Washington' components.	• Washington State public entities, such as municipalities and districts.	2021: $3,465,810 • Maximum grant: $350,000 • Minimum match requirements will apply. • Other State funds cannot be used as match.	Contact: Dever Haffner-Ratliffe 360-522-3610 EEandS@commerce.wa.gov Visit https://www.commerce.wa.gov/growing-the-economy/energy/energy-efficiency-and-solar-grants/ for more information.

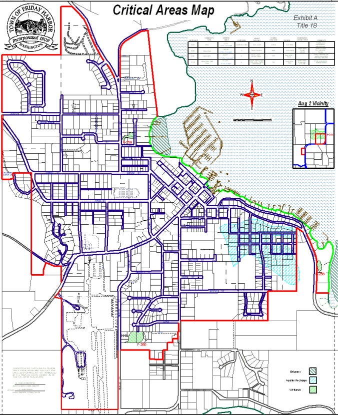
EMERGENCY **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
RD – ECWAG U.S. Dept. of Agriculture Rural Development Emergency Community Water Assistance Grants	Domestic water projects needing emergency repairs due to an incident such as: a drought; earthquake; flood; chemical spill; fire; etc. A significant decline in quantity or quality of potable water supply that was caused by an emergency.	Public bodies, tribes and private non-profit corporations serving rural areas with populations under 10,000.	Grant; pending availability of funds • $150,000 limit for incident related emergency repairs to an existing water system. • $500,000 limit to alleviate a significant decline in potable water supply caused by an emergency.	Applications accepted year-round on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa
DWSRF Department of Health – Drinking Water State Revolving Fund Emergency Loan Program	Will financially assist eligible communities experiencing the loss of critical drinking water services or facilities due to an emergency.	• Publicly or privately owned (not-for-profit) Group A community water systems with a population of fewer than 10,000. • Transient or non-transient non-community public water systems owned by a non-profit organization. Non-profit non-community water systems must submit tax-exempt documentation. • Tribal systems are eligible provided the project is not receiving other national set-aside funding for the project.	6-year loans with the following terms: • Interest rate: 0% • Loan term: 6 years • $500,000 maximum award per jurisdiction. • Time of performance: 2 years from contract execution to project completion date. • Repayment commencing first October after contract execution.	To be considered for an emergency loan, an applicant must submit a completed emergency application package to the department. **Contacts:** Department of Health Regional Engineers or Janet Cherry 360-236-3153 Janet.cherry@doh.wa.gov For information and forms visit: http://www.doh.wa.gov/DWSRF

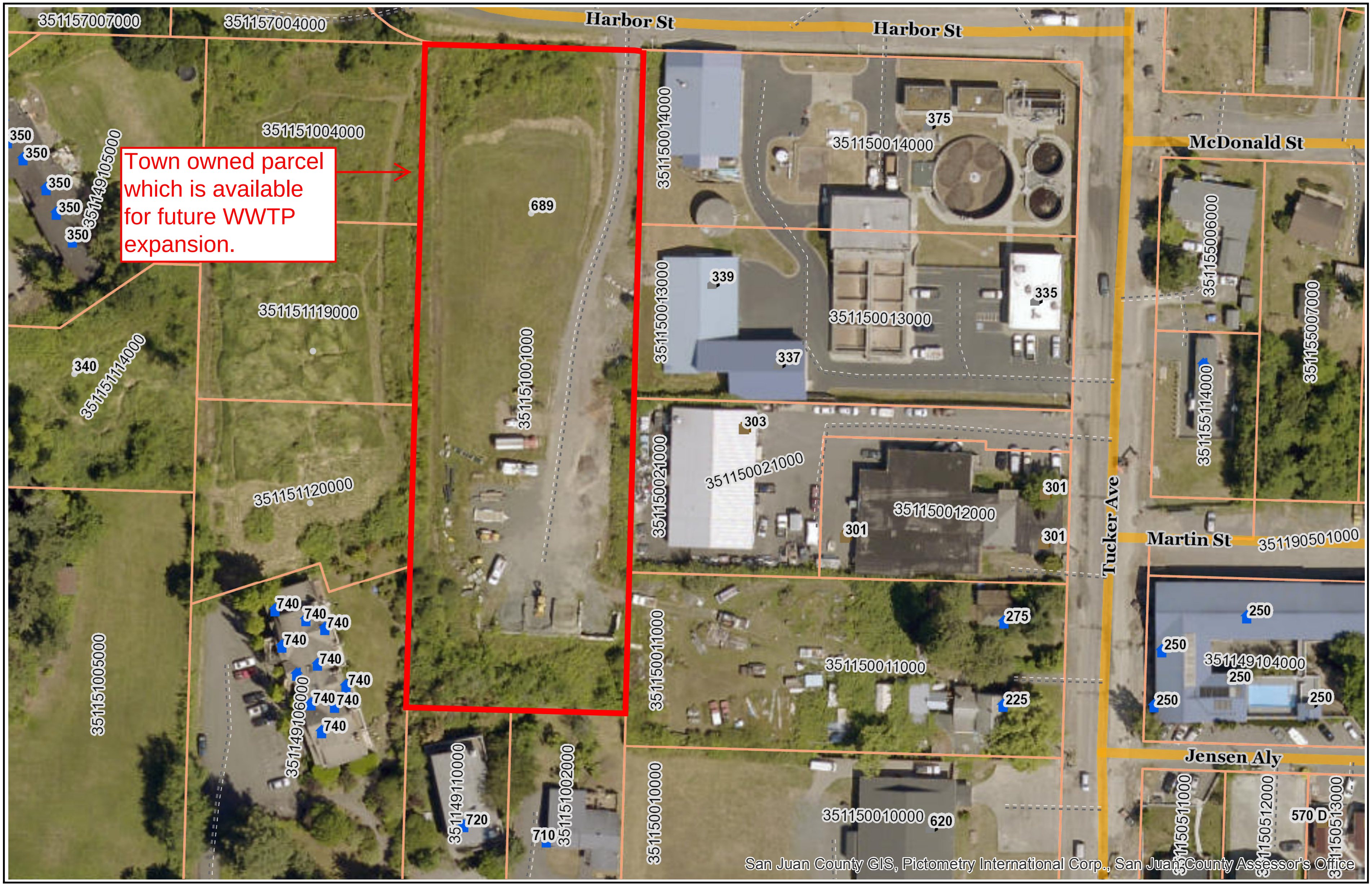
EMERGENCY Programs	Eligible Projects	Eligible Applicants	Funding Available	How To Apply
PWB Public Works Board – Emergency Loan Program: Repair, replace, rehabilitate, or reconstruct eligible systems to current standards for existing users.	A public works project made necessary by a natural disaster, or an immediate and emergent threat to the public health and safety due to unforeseen or unavoidable circumstances. Demonstrate financial need through inadequate local budget resources.	Counties, cities, special purpose districts, and quasi-municipal organizations. No school districts, port districts, or tribes per statute. Water, sanitary sewer, storm water, roads, streets, bridges, solid waste, and recycling facilities.	• Approximately $4 million for emergency loan funding. • Maximum loan amount $1 million per jurisdiction per biennium. • 20-year loan term or life of the improvement, whichever is less. • Interest rates vary. • Application cycle is open until appropriated funds are exhausted.	Check the Public Works Board website periodically at: http://www.pwb.wa.gov to obtain the latest information on program details or to contact Public Works Board staff. **Contact:** Connie Rivera 360-725-3088 connie.rivera@commerce.wa.gov
RURAL WATER REVOLVING LOAN FUND Disaster area emergency loans	Contact staff for more information on emergency loans.	Public entities, including municipalities, counties, special purpose districts, Native American Tribes, and corporations not operated for profit, including cooperatives, with up to 10,000 population and rural areas with no population limits.	90-day, no interest, disaster area emergency loans with immediate turn-around.	Applications accepted anytime. **Contact**: Tracey Hunter Evergreen Rural Water of WA 360-462-9287 thunter@erwow.org Download application online: http://nrwa.org/initiatives/revolving-loan-fund/

APPENDIX D

Parcel Map


TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON
SERVICE AREA
(TOWN LIMITS
PLUS UW
LABORATORIES)
N
W
E
S
Approximate Scale in Feet
LARSON ST
GUARD ST
PARK ST
SPRING ST
MARKET ST
NICHOLS ST
GROVER ST
MALCOM ST
WARBASS WAY
ARGYLE AV
PEAR POINT RD


Critical Areas Map
TOWN OF FRIDAY HARBOR
incorporated 1909
WASHINGTON
Exhibit A
Title 18
Aug 2 Vicinity
N
W
E
S
F-260
F-250
F-260
Eelgrass
Aquifer Recharge
Wetlands

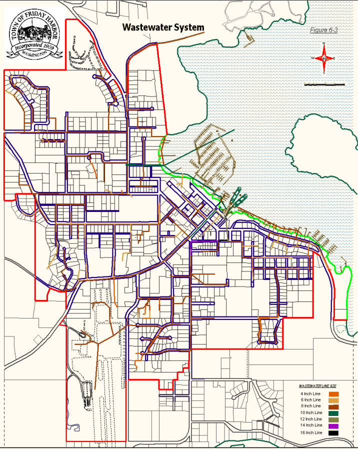


This map is derived from San Juan County's Geographic Information System (GIS). It is intended for reference only and is not guaranteed to survey accuracy. The information represented on this map is subject to change without notice

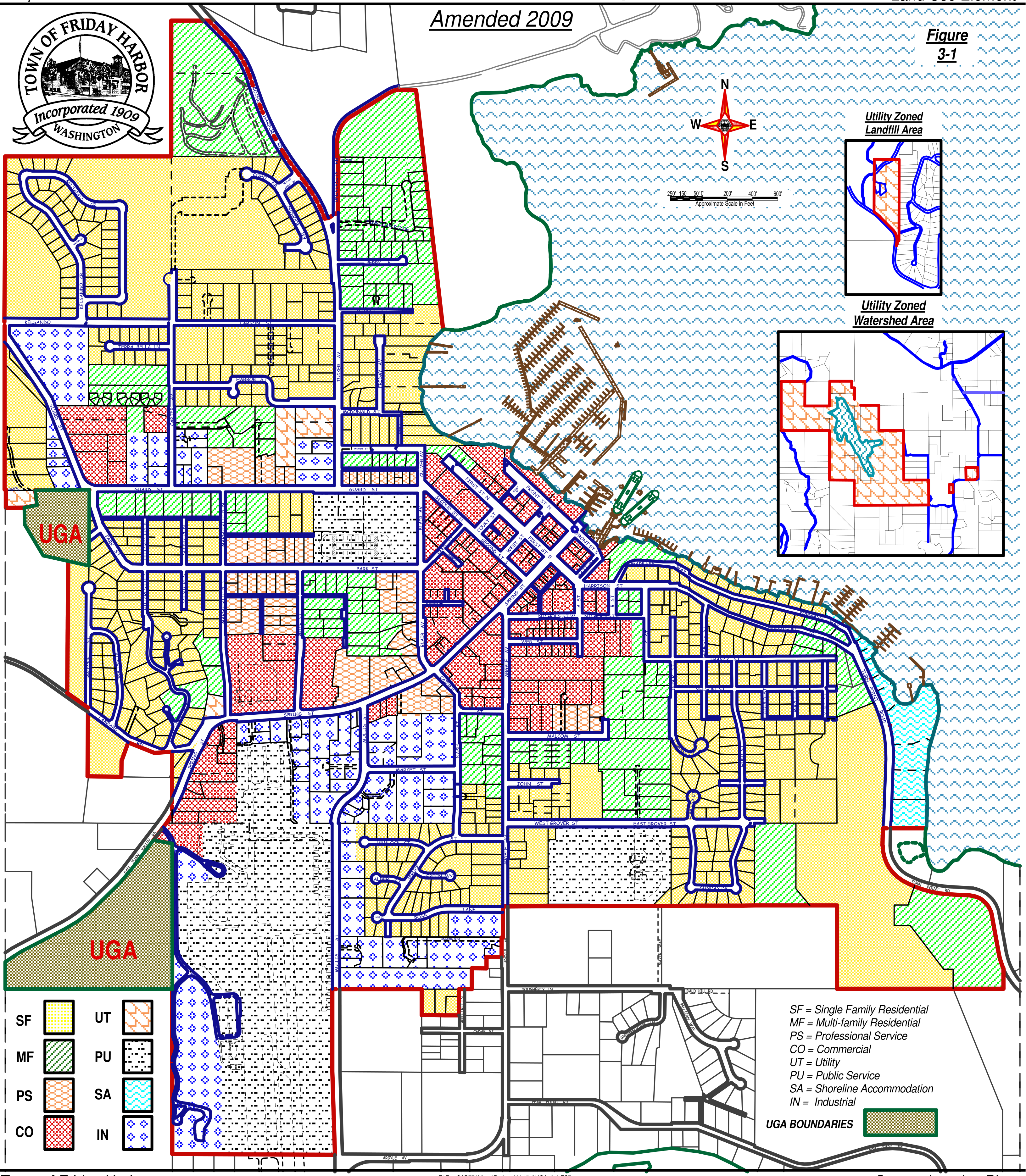
1 in = 100 feet

0 50 100 150 200 ft

My Map


TOWN OF FRIDAY HARBOR
Incorporated 1909
WASHINGTON
Wastewater System
Figure 6-3
WASTEWATER LINE SIZE
4 Inch Line
6 Inch Line
8 Inch Line
10 Inch Line
12 Inch Line
14 Inch Line
16 Inch Line

2002 Urban Growth Area Map



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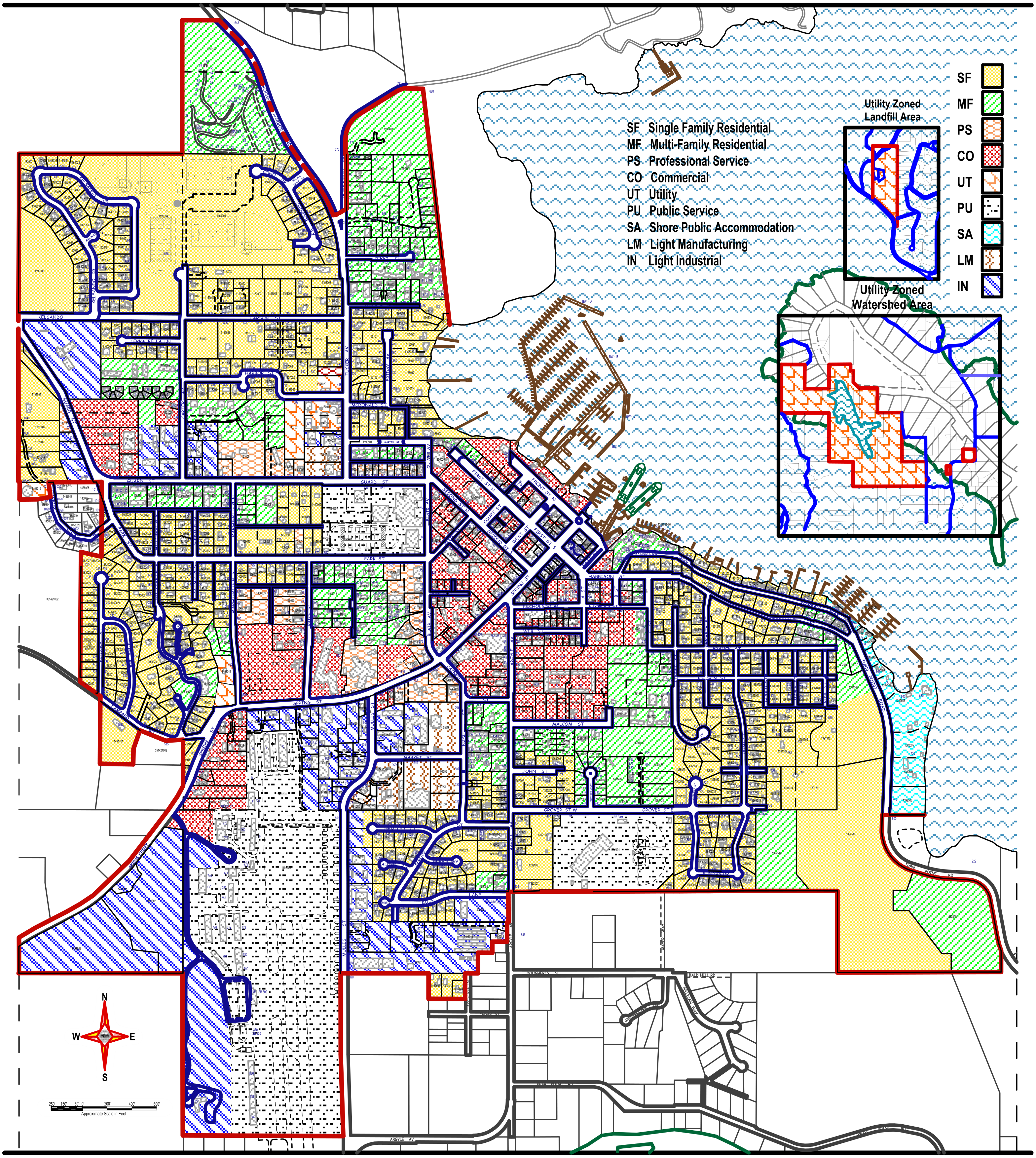
ZONING

04/13/16 std



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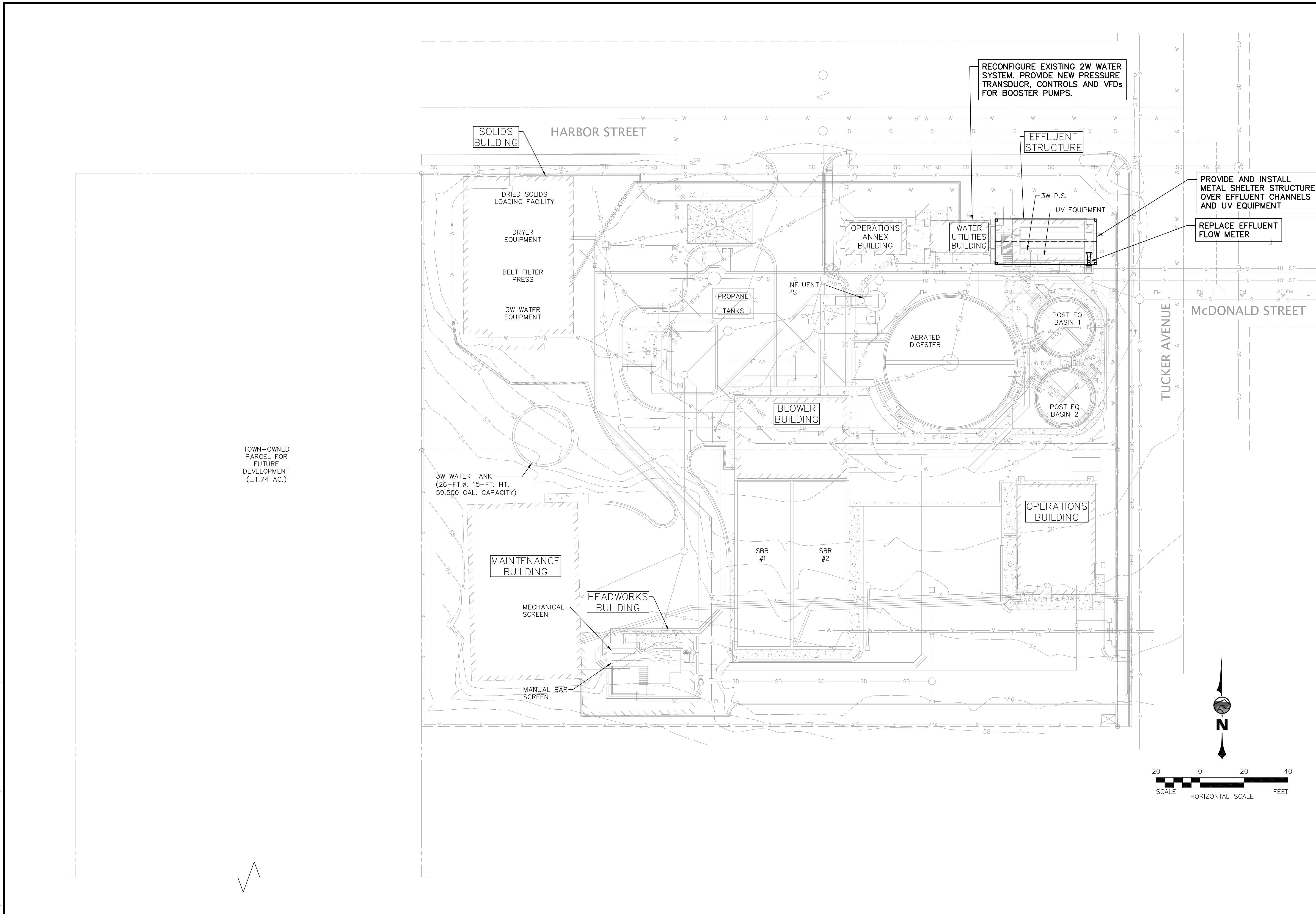
Town of Friday Harbor

APPENDIX E



WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

Wilson SURVEY/ENGINEERING

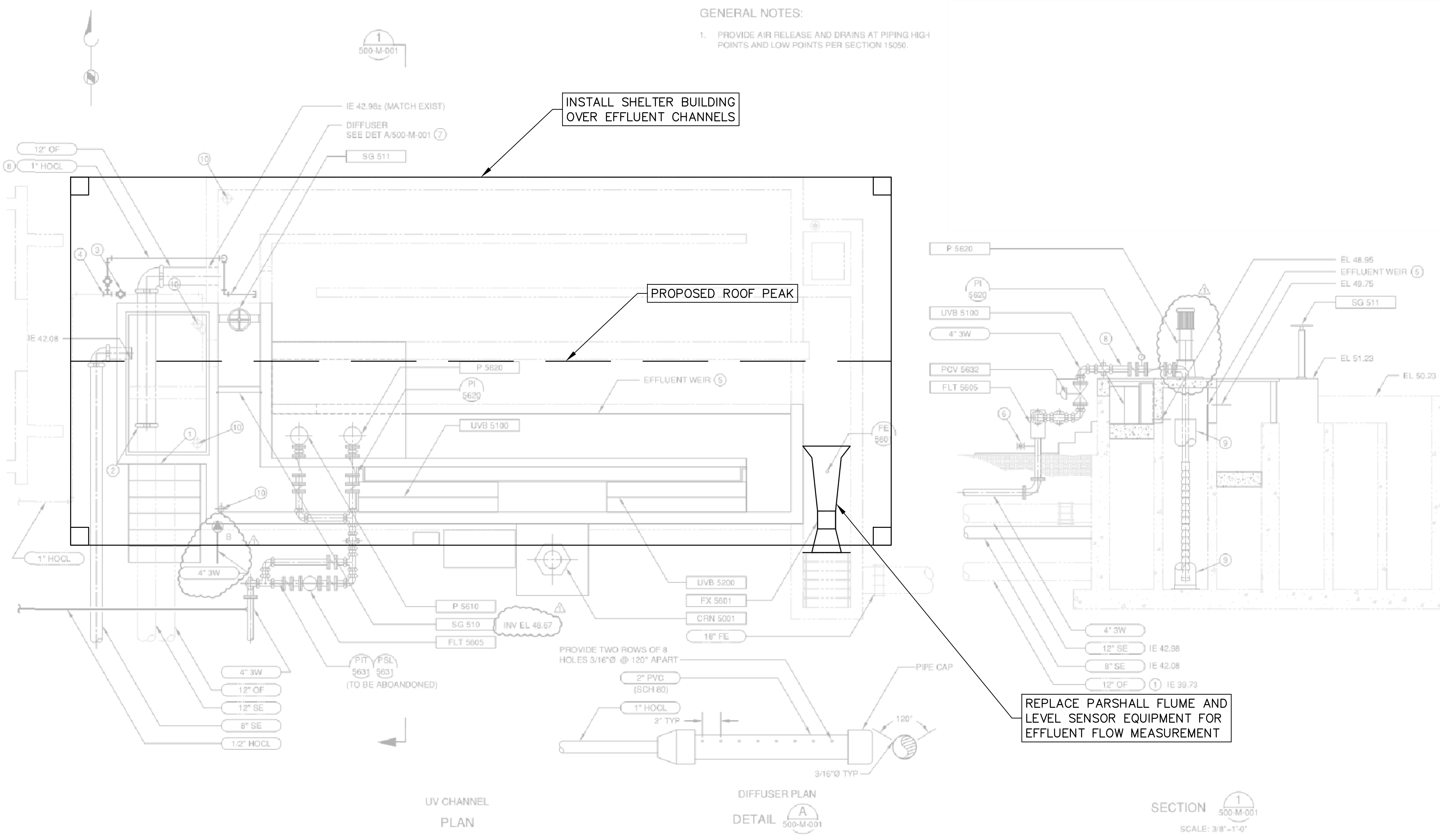
DESIGNED BY	DRAWN BY	CHECKED BY

TOWN OF FRIDAY HARBOR

FRIDAY HARBOR WASHINGTON

WWTP FACILITIES PLAN
2W WATER SYSTEM & DISINFECTION AREA IMPROVEMENTS

DATE	MARCH 2017
SCALE	AS SHOWN
JOB NUMBER	2016-102
SHEET	EXH. 2A



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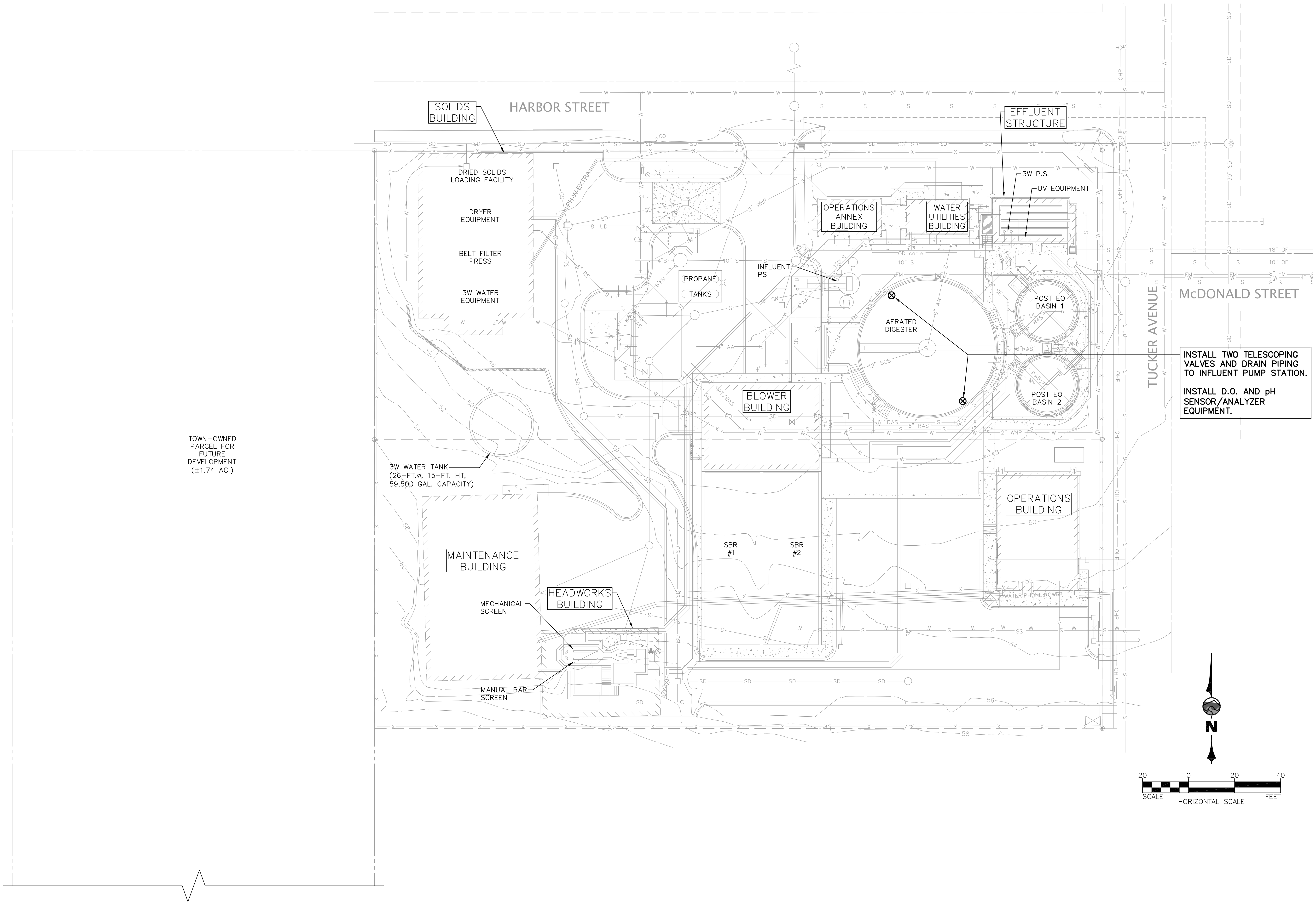
TOWN OF FRIDAY HARBOR

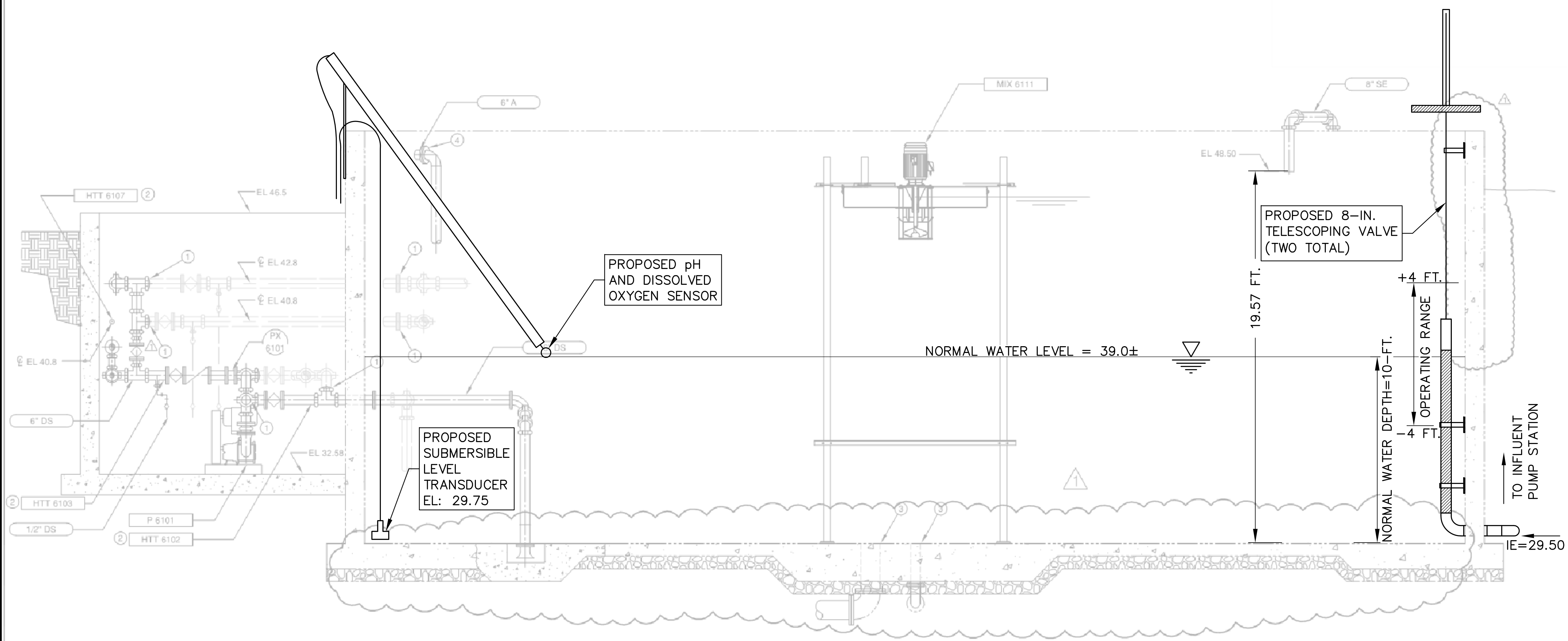
FRIDAY HARBOR WASHINGTON

WWTP FACILITIES PLAN
UV CHANNEL IMPROVEMENTS

DESIGNED BY	
DRAWN BY	
CHECKED BY	
DATE	MARCH 2017
SCALE	AS SHOWN
JOB NUMBER	2016-102
SHEET	EXH. 2B



HARBOR STREET
McDONALD STREET
TUCKER AVENUE
SOLIDS BUILDING
DRIED SOLIDS LOADING FACILITY
DRYER EQUIPMENT
BELT FILTER PRESS
3W WATER EQUIPMENT
PROPANE TANKS
INFLUENT PS
OPERATIONS ANNEX BUILDING
WATER UTILITIES BUILDING
EFFLUENT STRUCTURE
3W P.S.
UV EQUIPMENT
AERATED DIGESTER
POST EQ BASIN 1
POST EQ BASIN 2
INSTALL TWO TELESCOPING VALVES AND DRAIN PIPING TO INFLUENT PUMP STATION.
INSTALL D.O. AND pH SENSOR/ANALYZER EQUIPMENT.
BLOWER BUILDING
TOWN-OWNED PARCEL FOR FUTURE DEVELOPMENT (±1.74 AC.)
3W WATER TANK (26-FT.ø, 15-FT. HT, 59,500 GAL. CAPACITY)
MAINTENANCE BUILDING
HEADWORKS BUILDING
MECHANICAL SCREEN
MANUAL BAR SCREEN
SBR #1
SBR #2
OPERATIONS BUILDING
N
20 0 20 40
SCALE HORIZONTAL SCALE FEET



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Wilson
SURVEY/ENGINEERING

DESIGNED BY

DRAWN BY

CHECKED BY

TOWN OF FRIDAY HARBOR

FRIDAY HARBOR WASHINGTON

WWTP FACILITIES PLAN

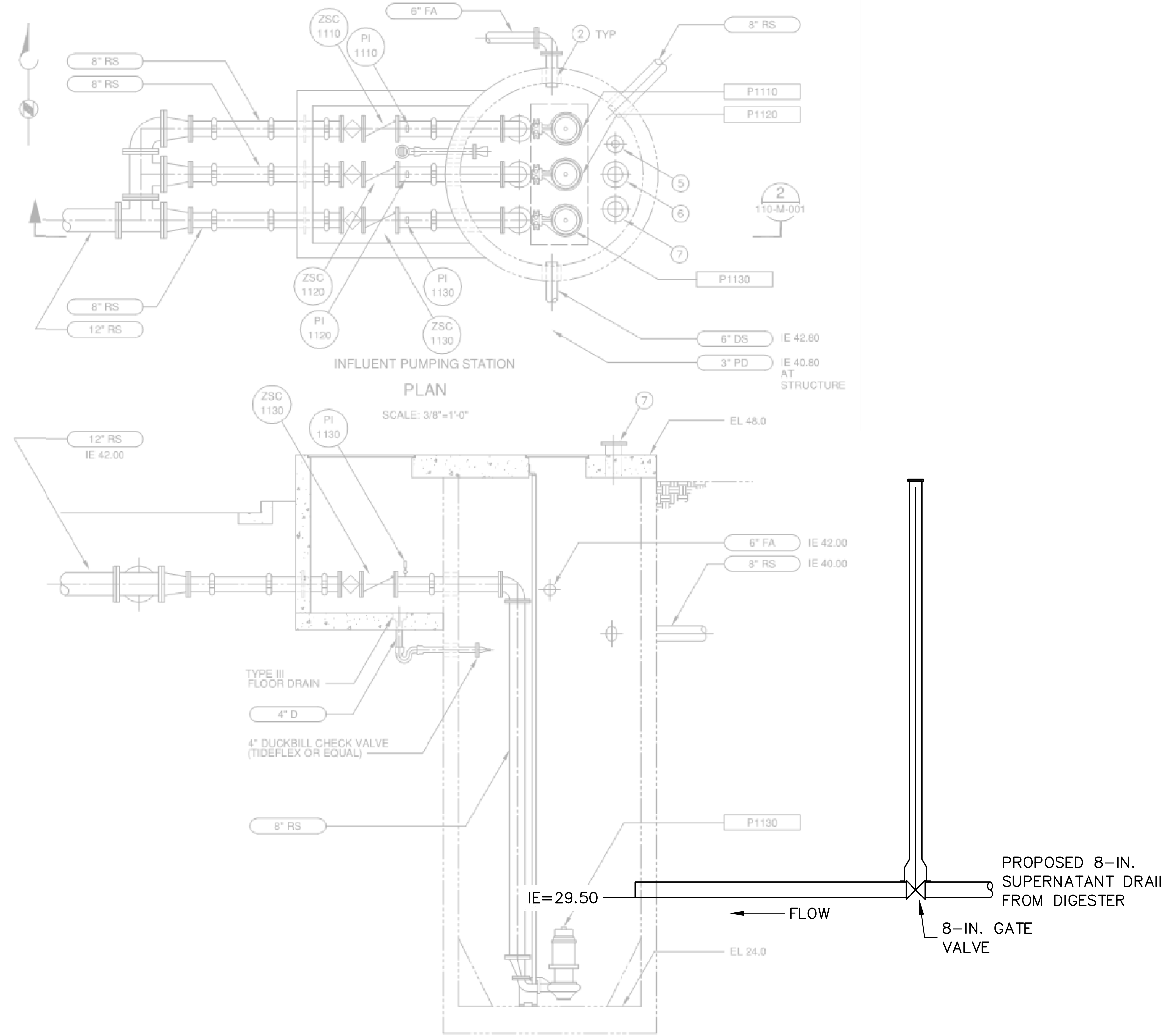
FIGURE Y–A – DIGESTER IMPROVEMENTS

DATE MARCH 2017

SCALE AS SHOWN

JOB NUMBER 2016-102

SHEET EXH. 5B



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Wilson
SURVEY/ENGINEERING

DESIGNED BY
DRAWN BY
CHECKED BY

TOWN OF FRIDAY HARBOR

FRIDAY HARBOR WASHINGTON

WWTP FACILITIES PLAN

DIGESTER P.S. IMPROVEMENTS

DATE MARCH 2017

SCALE AS SHOWN

JOB NUMBER 2016-102

SHEET EXH. 5C

APPENDIX F

Town of Friday Harbor

San Juan County, Washington

Engineering Report

for

WASTEWATER TREATMENT PLANT

PROPOSED SEWER OUTFALL REPLACEMENT

WILSON ENGINEERING, LLC

Consulting Engineers

805 Dupont Street, Suite #7

Bellingham, Washington 98225

June 22, 2016

Revision: November 21, 2017

Project # 2014-099A

Town of Friday Harbor

San Juan County, Washington

Engineering Report

for

WASTEWATER TREATMENT PLANT

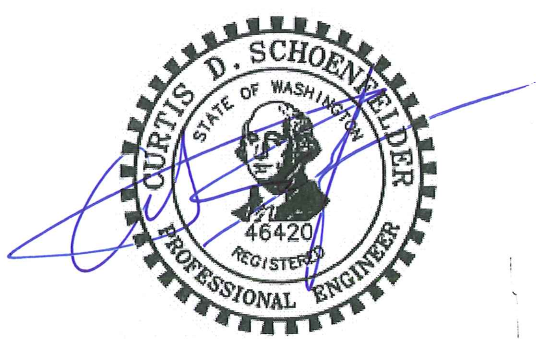
PROPOSED SEWER OUTFALL REPLACEMENT

Prepared for:

Town of Friday Harbor

By:

Wilson Engineering, LLC



11/21/2017

Contents

FIGURES

This report is prepared in accordance with the requirements of the Washington Administrative Code WAC 173-240-060 Engineering report.

(a) The name, address, and telephone number of the owner of the proposed facilities, and the owner's authorized representative.

Town of Friday Harbor – Public Works Department
60 2nd Street S
P.O. Box 219
Friday Harbor, Washington 98250
Phone: (360) 378-2154
Contact: Wayne Haefele, PE, Public Works Director

(b) A project description that includes a location map and a map of the present and proposed service area.

PROPOSED SEWER OUTFALL REPLACEMENT

Background:

The Town of Friday Harbor operates a wastewater treatment plant and treated effluent outfall that discharges in the bay of Friday Harbor. The existing outfall extends approximately 1,865 feet into the bay with a diffuser at the end. The seaward 830 feet of pipe was installed in 1984 and is 16-inch diameter High Density Polyethylene pipe. Approximately 1,035 feet of 10-inch diameter cast iron pipe between shore and the new HDPE pipe was not replaced. The cast iron pipe is now badly corroded and needs to be replaced. Replacing this corroded pipe with new, corrosion resistant materials and ensuring sufficient future capacity are the sole objectives of this project.

Description of Work:

This project proposes to replace the 1,035 feet of 10-inch diameter cast iron outfall pipe with 18-inch diameter High Density Polyethylene (HDPE) pipe. The proposed method of installation of the new 18-inch pipe is by horizontal directional drilling because it will minimize the environmental impact of the project. Due to the site geometry, the installation method requires that the pipe be installed in a large, sweeping radius. The new pipe will fall outside the existing DNR Aquatics Land Lease easement for right of way (Application No. 33841), and a new easement will need to be developed for the new location of the replacement pipe. The project will begin landward of HHW (Higher High Water) on existing right of way between two residential properties. This is where the directional drilling equipment will be set-up for the installation. The new pipe will be installed a minimum of 5 feet below the ground surface. The new pipe will be connected to existing pipe at each end. Because of the adverse environmental impacts of removing the self-buried existing pipe, the plan is for it to be abandoned in place. However, if ultimately required by DNR the old 10-in pipe will be removed. Project completion is anticipated to take up to four weeks.

Construction Techniques:

Construction Sequencing:

- A pit will be excavated for the horizontal directional drilling equipment on shore.
- The >1000 feet of 18" HDPE pipe will be welded together.
- The new pipe will be installed via horizontal directional drilling and pulled from water side to shore.
- The new pipe will be connected to the existing 16-inch diameter HDPE outfall pipe in the submarine environment by divers.
- The new pipe will be connected to the existing outfall pipe on land, and the excavation will be backfilled.
- It is estimated that the tie-in connections for the new pipe to the existing pipe will take 8-hours. During this time available storage capacity at the plant will be utilized. All piping, valving, and pumps are already in place to allow for the temporary storage/bypassing plan to be easily implemented. The temporary storage/bypassing plan will have no adverse effect on plant operations or the treated effluent water quality. Figure 8 shows the plant Process Flow Schematic with the temporary storage/bypassing plan rerouting locations. The plan is summarized as follows:
    - Shut-down of effluent discharge through the outfall for connections of new piping will occur at the end of the dry season and construction window months of July – September. The connections will be made during low flow hours from midnight 12am to 8am (based on diurnal curve review for the plant). The connections will not be made following, during, or prior to significant rain events to ensure normal dry season low flows are encountered.
    - Plant flow will be stored in the aerobic digester. Prior to shut-down the digester will be lowered to a depth of 5-ft (elevation 34), which allows for 13.5-ft of storage (elevation 47.5-ft). The digester is 58-ft diameter and has a capacity of 19,764 gallons per foot or 13.5-ft x 19,764 gallons/ft = 266,814 gallons of available storage.
    - Assuming influent flow of 0.56 MGD (max daily flow Aug/Sep, very conservative given restrictions of connection timing discussed above) or 23,334 gallons per hour, plus 500 gal per hour normal wasting to digester = 23,834 gal per hour. At 8 hours duration the total influent volume = 190,672 gallons of needed storage. This leaves 266,814 gal – 190,672 gal = 76,142 gallons reserve capacity, or 76,142 gal / 23,834 gal per hr = 3.1 hours reserve working time.
    - Assuming influent flow of 0.28 MGD (average annual flow, slightly conservative compared to 2017 annual average night time low flow of approximately 0.25 MGD) or 11,667 gallons per hour, plus 500 gal per hour normal wasting to digester = 12,167 gal per hour. At 8 hours duration the total influent volume = 97,336 gallons of needed storage. This leaves 266,814 gal – 97,336 gal = 169,478 gallons reserve capacity, or 169,478 gal / 12,167 gal per hr = 13.9 hours reserve working time.

- In addition to the digester available storage, there is storage available in the two post-equalization basins. This additional storage will serve as back-up if unforeseen circumstances are encountered.
  - There are two (2) basins 26-ft diameter with safe available depth of 9-ft (from pump 1 "ON" to 1-ft below overflow level). This gives a volume of 35,700 gallons per basin x 2 basins for a total of 71,400 gallons.
  - Assuming 0.56 MGD inflow, or 23,334 gallons per hour, the equalization basins provide 71,400 gallons / 23,334 gal per hr = 3.0 hours reserve working time.
  - Assuming 0.28 MGD, or 11,667 gallons per hour, the equalization basins provide 71,400 gallons / 11,667 gal per hr = 6.1 hours reserve working time.
- Summary: The available storage capacity within the treatment plant provides approximately the following working times for the new tie-in connections to be made:
  - 14.1 hours at 0.56 MGD influent flow,
  - 28.0 hours at 0.28 MGD influent flow.

Site Preparation: No site preparation is expected.

Equipment to be used:

- Horizontal Directional Drilling machinery
- HDPE pipe welding equipment
- Land-based excavator or backhoe for boring pit
- Diver work boat
- Barge

Construction materials to be used:

- 18-inch diameter HDPE pipe and associated fittings
- Directional drilling materials

Work corridor: A 25-ft radius around the directional drilling equipment and sufficient room in the bay for the >1000 feet of welded HDPE pipe.

Staging areas and equipment wash outs: Staging will occur above MHHW in an area that will not require any clearing or ground disturbance. Any equipment washout will take place off-site at an approved washout facility.

Stockpiling areas: No stockpiling will be necessary.

Running of equipment during construction: All equipment will be kept in good running order and will only be running when required.

Soil stabilization needs/techniques: The directional drilling bore pit will be backfilled once work is complete.

Clean-up and re-vegetation: The land-based portion of the work will be restored to preconstruction conditions.

Storm water controls/management: Silt Fence BMP (C233) will be installed on the downhill slope from the directional drilling equipment and pit to control sediment transport.

Source location of any fill used: Native material removed will be used for backfill of the pit.

Location of any spoil disposal: No spoil disposal is expected.

(c) A statement of the present and expected future quantity and quality of wastewater, including any industrial wastes that may be present or expected in the sewer system.

The present and expected future quantity and quality of wastewater is described in the Town's General Sewer Plan and Wastewater Facilities Report (April 2001). A summary of this information is provided below:

The maximum month flow is 0.58 MGD (2001). Projected maximum month flow for year 2015 is 0.69 MGD. Project buildout maximum month flow is 0.91 MGD.

The peak flow is 2.3 MGD (2001). Projected peak flow for 2015 is 2.6 MGD. Projected buildout peak flow is 3.3 MGD.

Maximum month influent BOD loading is 1,290 lb/day (2001). Projected maximum month BOD for year 2015 is 1,600 lb/day. Projected buildout maximum month BOD is 3,310 lb/day.

Maximum month influent TSS loading is 890 lb/day (2001). Projected maximum month TSS for year 2015 is 1,110 lb/day. Projected buildout maximum month TSS is 2,300 lb/day.

Influent wastewater quality is typical of municipal wastewater. Wastewater includes typical small city commercial inputs and no significant industrial inputs.

The Town currently has a DRAFT update Wastewater Faculties Plan (WWFP) (March 2017) in progress. The flows from the draft WWFP have also been evaluated for this proposed project. The projected 24 year (yr-2040) flows from the WWFP are as follows:

Average Daily Flow = 0.42 MGD

Peak Month Flow = 0.67 MGD

Peak Day Flow = 1.44 MGD

Peak Hour Flow = 2.88 MGD

(d) The degree of treatment required based upon applicable permits and rules, the receiving body of water, the amount and strength of wastewater to be treated, and other influencing factors.

Wastewater is treated and discharged in compliance with the existing NPDES Wastewater Discharge Permit.

(e) A description of the receiving water, applicable water quality standards, and how water quality standards will be met outside any applicable dilution zone.

Treated wastewater is discharged to the bay of Friday Harbor, San Juan Channel and generally in compliance with the existing NPDES Wastewater Discharge Permit limits. Refer to the Fact Sheet for NPDES Permit for more information.

(f) The type of treatment process proposed, based upon the character of the wastewater to be handled, the method of disposal, the degree of treatment required, and a discussion of the alternatives evaluated and the reasons they are unacceptable.

The project will not change the treatment process, method of disposal, or degree of treatment. The project will increase the hydraulic capacity of the existing outfall line and improve treatment operations by reducing backwater effects from the restricted capacity of the existing outfall. Evaluation of treatment processes proposed is not applicable to this project.

The first alternative evaluated was to do nothing. This alternative is not acceptable because the cast iron pipe has broken and needed repair several times in recent years. Breaks will continue to be a problem and the pipe needs to be replaced. Additionally, this alternative is not acceptable because of the limited capacity discussed below in item g) of this report.

The second alternative evaluated was to install the outfall line by directly laying and anchoring the pipe on the surface of the seabed. This alternative was eliminated due to permitting challenges. The installation method would likely not get approval from multiple agencies because of environmental impacts, obstruction to navigation, and public safety concerns. Also, due to environmental concerns, the existing pipe is anticipated to be abandoned in place.

The third alternative evaluated was to install the outfall line by shallow trenching and anchoring the pipe. This alternative was eliminated due to permitting challenges. The installation method would likely not get approval from multiple agencies because of environmental impacts. Also, due to environmental concerns, the existing pipe is anticipated to be abandoned in place.

The fourth alternative evaluated was to install the outfall line by horizontal directional drilling. While it is the most expensive installation method, this alternative is preferred because it has the least environmental impacts, creates no obstructions to navigation, and reduces public health risks. This is the proposed alternative.

(g) The basic design data and sizing calculations of each unit of the treatment works. Expected efficiencies of each unit and also of the entire plant, and character of effluent anticipated.

The calculated capacity of the existing outfall line is approximately 1,750 gpm, which is consistent with previously determined capacity (less than 3 mgd = 2,100 gpm) as discussed in the 2001 Update to General Sewer Plan and Wastewater Facilities Report (2001 Plan). The capacity of the outfall line with the proposed improvements installed is approximately 4,150 gpm. The capacity calculations are attached as Figure 4. The theoretical existing capacity is just inadequate for the 2001 Plan design flows for the Phase 1 expansion, which was installed in 2004 and has a peak flow capacity of 2.6 mgd (1,800 gpm). However, the projected buildout peak flows of 3.3 mgd (2,300 gpm) are greater than existing calculated outfall capacity. Draft WWFP update projected yr-2040 peak hour flow of 2.88 MGD (2,000 gpm) also are greater than existing capacity. The proposed outfall capacity significantly exceeds all projected flows for many years to come.

Despite calculated capacities as noted above, the Town operations staff has indicated that the outfall line capacity is limited and will back up into the outfall channel at flows as little as 0.7-0.8 mgd (approx. 500 gpm). The section of 10-inch cast iron piping proposed to be replaced as part of this project is likely highly corroded, possibly collapsed and partially plugged, and should be replaced with a corrosion resistant material.

The character of the effluent is not expected to change as a result of this project. The treatment operations will be improved by eliminating back up at the discharge due to limited capacity through the outfall.

(h) Discussion of the various sites available and the advantages and disadvantages of the site or sites recommended. The proximity of residences or developed areas to any treatment works. The relationship of the twenty-five-year and one hundred-year flood to the treatment plant site and the various plant units.

Not applicable to this project. This is a partial pipe replacement project in which the beginning and end portions of the pipe are not being replaced. The site location will not change.

(i) A flow diagram that shows general layout of the various units, the location of the effluent discharge, and a hydraulic profile of the system that is the subject of the engineering report and any hydraulically related portions.

The following figures are attached to this report.

Figure 5: Plant Process Flow Schematic

Figure 6: Outfall Location Maps (2 pages) (Excerpt from Outfall Inspection Report; January 13, 2013; Jen-Jay, Inc.)

Figure 7: Plant Hydraulic Profile (WWTP Record Drawing; June 30, 2004; B&C)

(j) A discussion of infiltration and inflow problems, overflows and bypasses, and proposed corrections and controls.

Infiltration and inflow (I/I) appears to be high and has been validated in previous efforts in which pump run time data and overflow events were considered (i.e. PS#2 rebuild project). The PS#2 rebuild project indicates that the PS#2 sewer service area, although relatively small, has 60% higher I/I rate than "normal" as defined by the Department of Ecology Criteria for Sewage Works Design. This level of I/I is indicative of the level of I/I presumed throughout the Town. The 2001 Plan identifies that there are no incentives for reducing I/I and enforcement is limited, and it recommends a more formal I/I program be developed. The Town is aware of the apparent problem and has identified certain locations where much I/I likely originate. The Town replaced a failing 10-inch diameter cast iron submarine sewer line between pump stations #1 and #2 with HDPE pipe in 2009. An I/I study conducted in 2010 indicates that replacement of this submarine line eliminated several long-term sources of I/I to the system. The Town is planning to implement an I/I study in the near future to assess the impacts and identify additional areas to target for remediation. Town efforts toward reducing I/I will help ensure that the capacity of the outfall line remains adequate well into the future.

Overflows into Friday Harbor have occurred a few times historically, although they are un-related to the capacity of the outfall line. The last overflow event was in 2010, which was a "perfect storm" of high flows and pump failures. When the WWTP Influent Pump Station (IPS), which pumps to the headworks, is overwhelmed with inflows it backs up and causes the upstream manhole to overflow to PS#2 very near the harbor shore. Until recently PS#2 pumped back up to the IPS and thus created a re-circulation issue that increased the likelihood of an overflow event into the harbor. In 2015 the Town completed a PS#2 Rebuild project in which the pumping capacity of PS#2 was reduced (it has been oversized by approximately 500% since PS#1 discharge was re-routed and removed from its inflow) and its discharge was re-directed to the headworks, thus eliminating the re-circulation issue. Bypass pumping ports were also installed that allow a portable pump to draw from the PS#2 or IPS wet wells and discharge to the headworks. These improvements at PS#2 reduce the likelihood of another overflow into the harbor.

While there have been no known occurrences, there could be overflows at the WWTP due to the insufficient capacity of the outfall line. Based on Town observations the actual capacity is much less than calculated capacity. This could be indicative of significant failures or major line collapse in progress that could continue to degrade and lead to significant overflows at the WWTP.

(k) A discussion of any special provisions for treating industrial wastes, including any pretreatment requirements for significant industrial sources.

Not applicable to this project.

(l) Detailed outfall analysis or other disposal method selected.

Not applicable to this project. The project does not propose to modify the diffuser design or location and only proposes to make the outfall line more consistent in size, materials, capacity, resiliency, and life expectancy with bounding pipe sections.

(m) A discussion of the method of final sludge disposal and any alternatives considered.

Not applicable to this project.

(n) Provision for future needs.

The projected buildout peak flows of 3.3 mgd (approximately 2,300 gpm) are greater than existing theoretical capacity (approximately 1,750 gpm). With the proposed improvements completed the capacity is approximately 4,150 gpm. See the capacity calculations attached as Figure 4. The proposed improvements will provide adequate capacity through projected buildout.

(o) Staffing and testing requirements for the facilities.

No change in requirements.

(p) An estimate of the costs and expenses of the proposed facilities and the method of assessing costs and expenses. The total amount shall include both capital costs and also operation and maintenance costs for the life of the project, and must be presented in terms of total annual cost and present worth.

The capital cost of the project is estimated to be $1,465,000. Cost is rough order of magnitude estimated at the 30% design level based on information provided by a local direction drilling contractor and experience with a nearby similar project. Estimated cost includes the following:

- Design Engineering and Permitting $75,000
- Geotechnical $85,000
- Construction $1,250,000

- Construction Administration $50,000
- DNR Lease $5,000

The annualized cost is estimated to be $118,000 (20 Years at 5% interest).

The additional operating and maintenance costs are zero. Cost savings will actually be realized by eliminating costs due to future repair of the 10-inch diameter cast iron line.

Construction costs are for complete construction and include mobilization, directional drilling of 18-inch diameter HDPE pipe, connecting to existing outfall line at both ends of new proposed pipe, temporary storage/bypass pumping (see (b) for preliminary details), and support services such as diving contractor work (for submarine tie-in).

(q) A statement regarding compliance with any applicable state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended.

Not applicable to this project.

(r) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.

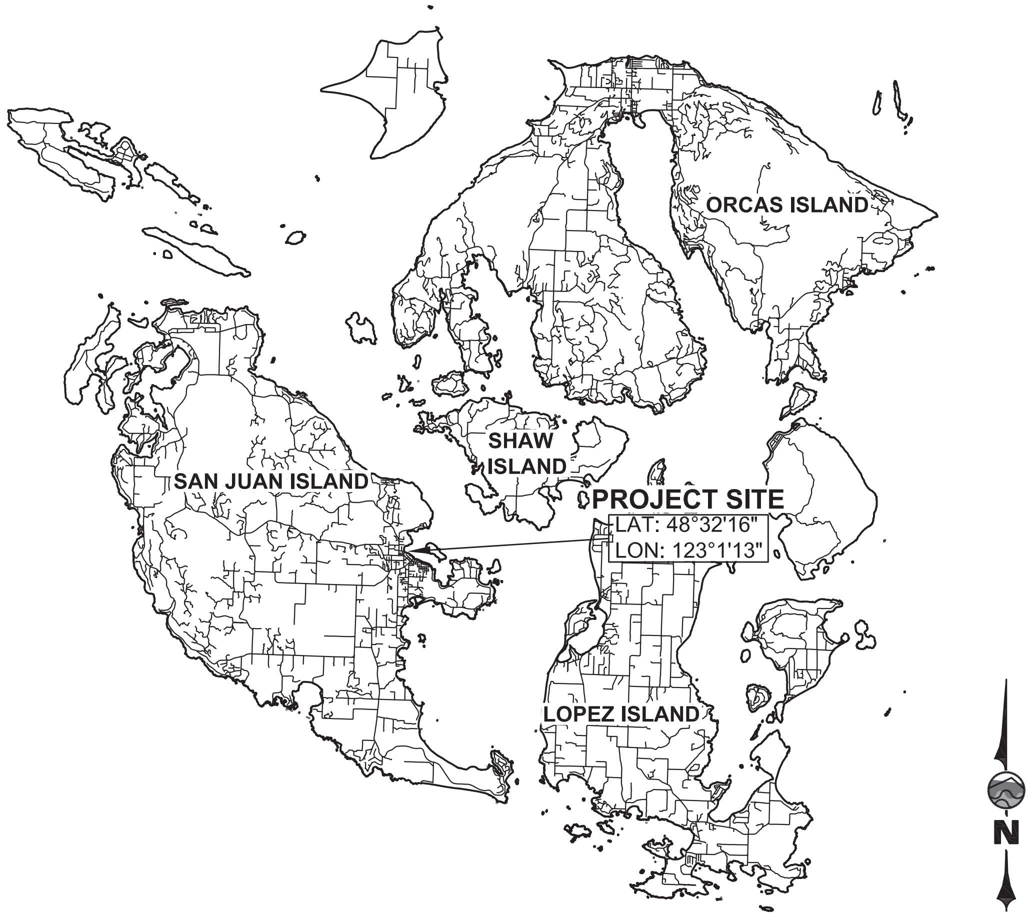
A new SEPA checklist and review process will be completed for this project. The Town has applied for design and construction SRF funding (application submittal October 2017) and the SEPA process is anticipated to begin March, 2018, followed by SERP (including cost effectiveness analysis). These will be completed by July, 2018 when funding agreement is anticipated.

Anticipated permits to be completed for the project include:

- Joint Aquatic Resources Permit Application (JARPA), which includes:
    - Federal:
        - US Army Corps of Engineers (Section 10 and 404)
        - US Coast Guard (PATON), if applicable
    - State:
        - WA Dept. of Ecology (401 WQCert)
        - WA Dept. of Fish and Wildlife (HPA)
        - WA Dept. of Natural Resources (Aquatic Use Authorization)
    - Local:
        - Town of Friday Harbor (Shoreline Exemption)

Other key players that will be coordinated with include the Port of Friday Harbor and adjacent private property owners.

FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 1 - LOCATION MAP



VICINITY MAP 1

PURPOSE: REPLACE EXISTING SEWER OUTFALL PIPE

DATUM: NAVD 88

ADJACENT PROPERTY OWNERS:
#351155014 – EDWARD E & MARGARET O STRICKLAND
#351155013 – JOHN E & KIMBERLY J KRUSE TTEES

APPLICANT:
TOWN OF FRIDAY HARBOR
PUBLIC WORKS
PO BOX 219
FRIDAY HARBOR, WA 98250

SITE: BEACH COURT

REFERENCE #
PROPOSED: REPLACE 1000 LINEAR FEET OF 10" CAST IRON SEWER OUTFALL PIPE WITH 18" HDPE PIPE
IN: SAN JUAN CHANNEL
AT/NEAR: FRIDAY HARBOR
COUNTY: SAN JUAN
DATE: FEBRUARY, 2016

SHEET 1 OF 5

Wilson
SURVEY/ENGINEERING
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BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 2 - VICINITY MAP

VICINITY MAP 2

PURPOSE: REPLACE EXISTING SEWER OUTFALL PIPE

DATUM: NAVD 88

ADJACENT PROPERTY OWNERS:
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#351155013 – JOHN E & KIMBERLY J KRUSE TTEES

APPLICANT:
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SHEET 2 OF 5

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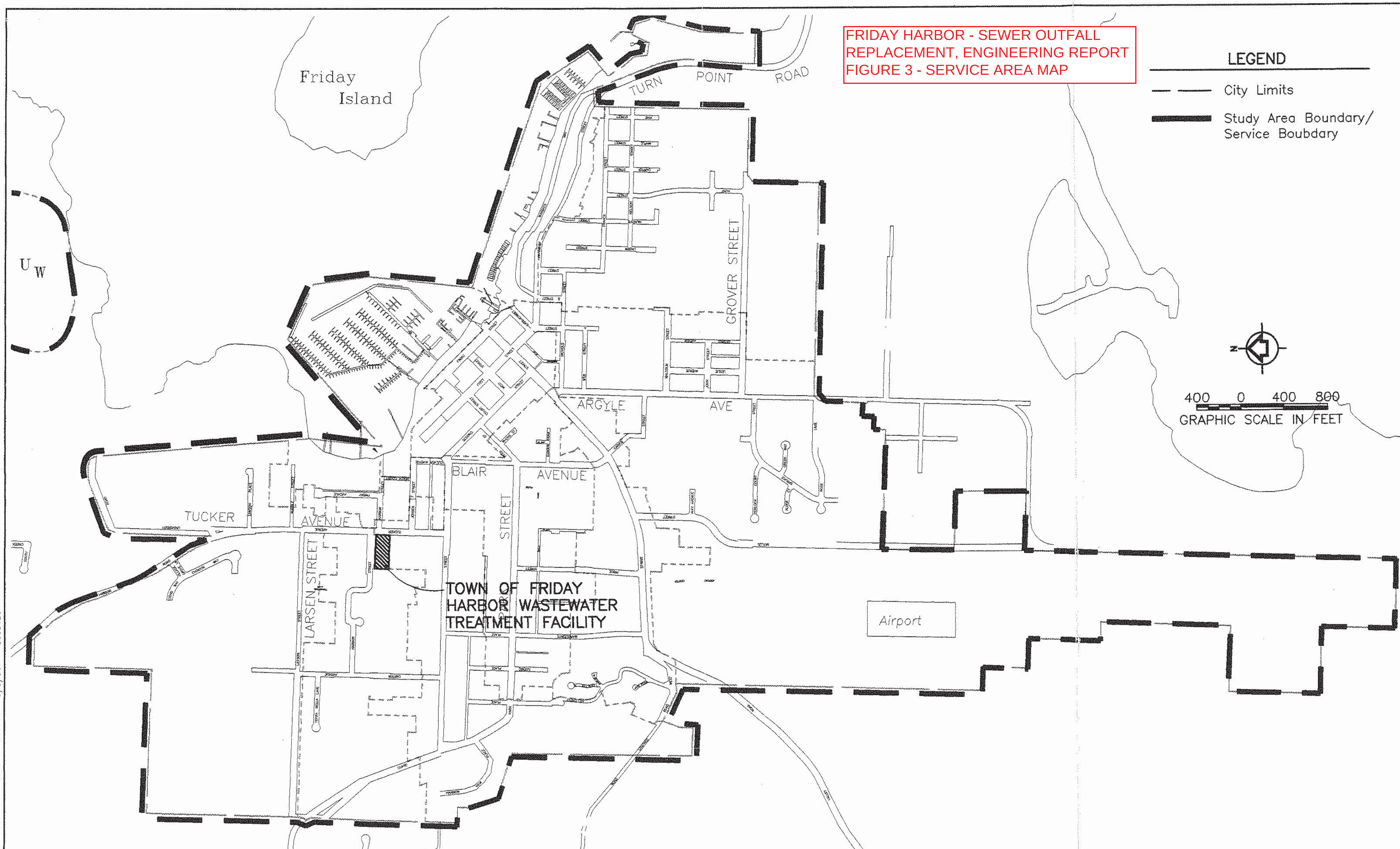
FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 3 - SERVICE AREA MAP



KCM
1917 First Avenue
Seattle, Washington 98101

City of Friday Harbor
GENERAL SEWER PLAN AND WASTEWATER FACILITIES ENGINEERING REPORT ADDEMDUM

ATTACHMENT 1
STUDY AREA MAP

30034A01 1=800 2330034 3/5/96V 30034B01

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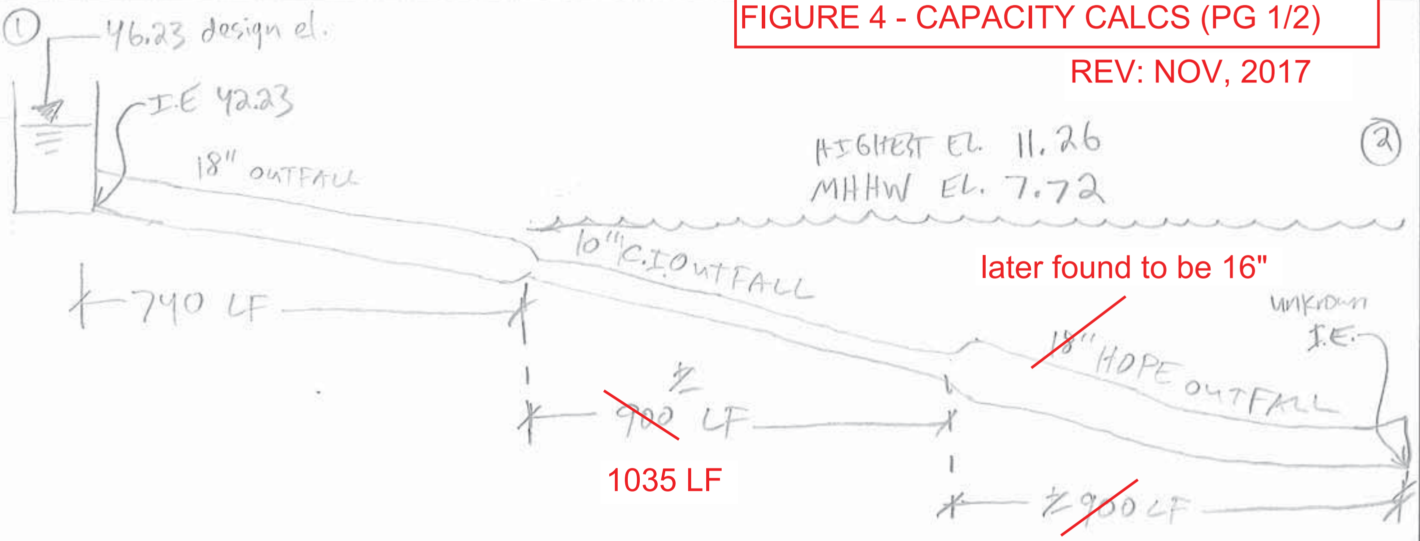
PROJECT Friday Harbor PS#2
PROJECT # 2014-099 PAGE 1 OF 1
BY CDS DATE 10/29/2014
SUBJECT Outfall line capacity

FRIDAY HARBOR - SEWER OUTFALL
REPLACEMENT, ENGINEERING REPORT
FIGURE 4 - CAPACITY CALCS (PG 1/2)

REV: NOV, 2017



*Note: all elevations from the same data source.

→ Full pipe (pressurized flow conditions)

Energy Eq.

$$\cancel{\frac{P_1}{\gamma}}^{0} + \cancel{\frac{V_1^2}{2g}}^{0} + z_1 = \cancel{\frac{P_2}{\gamma}}^{0} + \cancel{\frac{V_2^2}{2g}}^{0} + z_2 + h_{LF} + h_{Lm}$$

MHHW → $46.23 = 7.72 + h_{LF} + h_{Lm}$

$$\underbrace{38.51 = h_{LF} + h_{Lm}}$$

↳ use iterative approach in spreadsheet to determine maximum flow before ① des. el. affected.

~~⇒ Q = 2,100 gpm ±~~

Highest obs tide → $46.23 = 11.26 + h_{LF} + h_{Lm}$

$34.97 = h_{LF} + h_{Lm}$ ⇒ spreadsheet iterations...

~~⇒ Q = 2,000 gpm ±~~

FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 4 - CAPACITY CALCS (PG 2/2)

REV: NOV, 2017

Hazen Williams Head Loss Spreadsheet

11/20/2017
Friday Harbor Outfall Line

Max Total HL @ MHHW = 38.5 ft
Flow = 1750 gpm — Max Total HL @ Highest observed tide = 35.0 ft

EXISTING

Headloss - Pipe	Flow, gpm	Pipe Dia., in	Area, sf	Velocity, fps	Quantity / Length, ft	Roughness C	Headloss Coeff. K	Headloss
18" PVC	1750.0	18	1.77	2.21	740	120		0.86
10" CI Pipe	1750.0	10	0.55	7.16	1035	100		29.41
16" HDPE Pipe SDR 21	1750.0	14.4	1.13	3.45	830	120		2.86
Diffuser (10~ equal 3" orifices)	175.0	3	0.05	7.95	0.1	120		0.01
							Piping HL =	**33.1**

Headloss - Minor	Flow, gpm	Pipe Dia., in	Area, sf	Velocity, fps	Quantity / Length, ft	Roughness C	Headloss Coeff. K	Headloss
Pipe Entrance, Inward Projecting	1750.0	18	1.77	2.21	1		0.50	0.04
Pipe Contraction (18" to 10")	1750.0	10	0.55	7.16	1		0.06	0.05
22-1/2 degree bend	1750.0	10	0.55	7.16	2		0.20	0.32
Pipe Expansion (10" to 16")	1750.0	10	0.55	7.16	1		0.15	0.12
Pipe Exit, Diffuser (10~ equal 3" orifices)	175.0	3	0.05	7.95	1		1.00	0.98
							Fitting HL =	**1.5**
							Total HL =	**34.6**

Flow = 4150 gpm

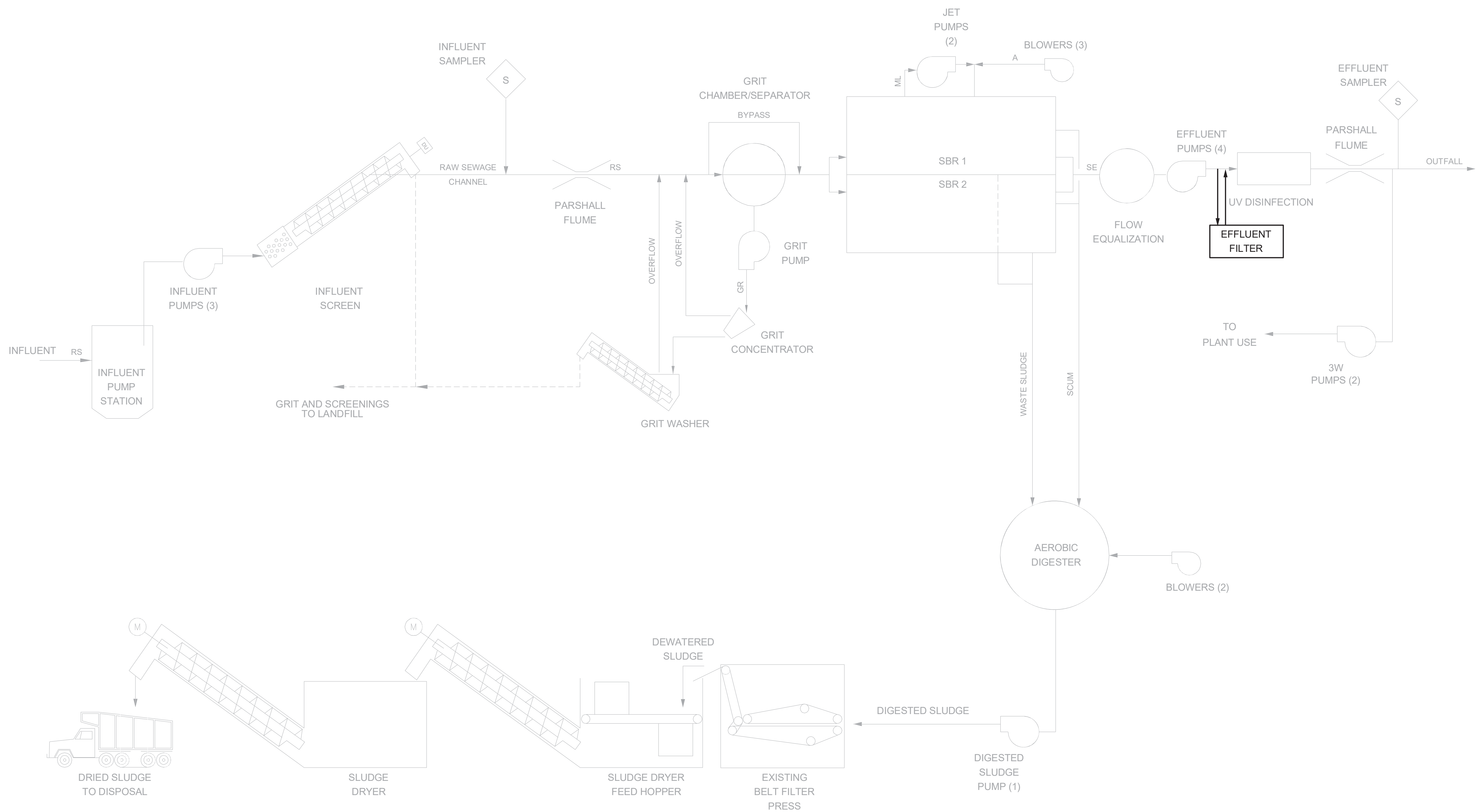
PROPOSED

Headloss - Pipe	Flow, gpm	Pipe Dia., in	Area, sf	Velocity, fps	Quantity / Length, ft	Roughness C	Headloss Coeff. K	Headloss
18" PVC	4150.0	18	1.77	5.24	740	120		4.25
18" HDPE Pipe SDR 21	4150.0	16.18	1.43	6.48	1035	120		9.98
16" HDPE Pipe SDR 21	4150.0	14.4	1.13	8.18	830	120		14.11
Diffuser (10~ equal 3" orifices)	415.0	3	0.05	18.85	0.1	120		0.05
							Piping HL =	**28.4**

Headloss - Minor	Flow, gpm	Pipe Dia., in	Area, sf	Velocity, fps	Quantity / Length, ft	Roughness C	Headloss Coeff. K	Headloss
Pipe Entrance, Inward Projecting	4150.0	18	1.77	5.24	1		0.50	0.21
22-1/2 degree bend	4150.0	18	1.77	5.24	2		0.20	0.17
Pipe Contraction (18" PVC to 18" HDPE)	4150.0	16.18	1.43	6.48	1		0.06	0.04
Pipe Contraction (18" HDPE to 16" HDPE)	4150.0	14.4	1.13	8.18	1		0.06	0.06
Pipe Exit, Diffuser (10~ equal 3" orifices)	415.0	3	0.05	18.85	1		1.00	5.52
							Fitting HL =	**6.0**
							Total HL =	**34.4**

FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 5 - PLANT FLOW SCHEMATIC, REV: NOV

NO.	REVISIONS	BY	DATE



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www.wilsonengineering.com
Wilson
SURVEY / ENGINEERING
SCOTT JAMES WILSON, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER

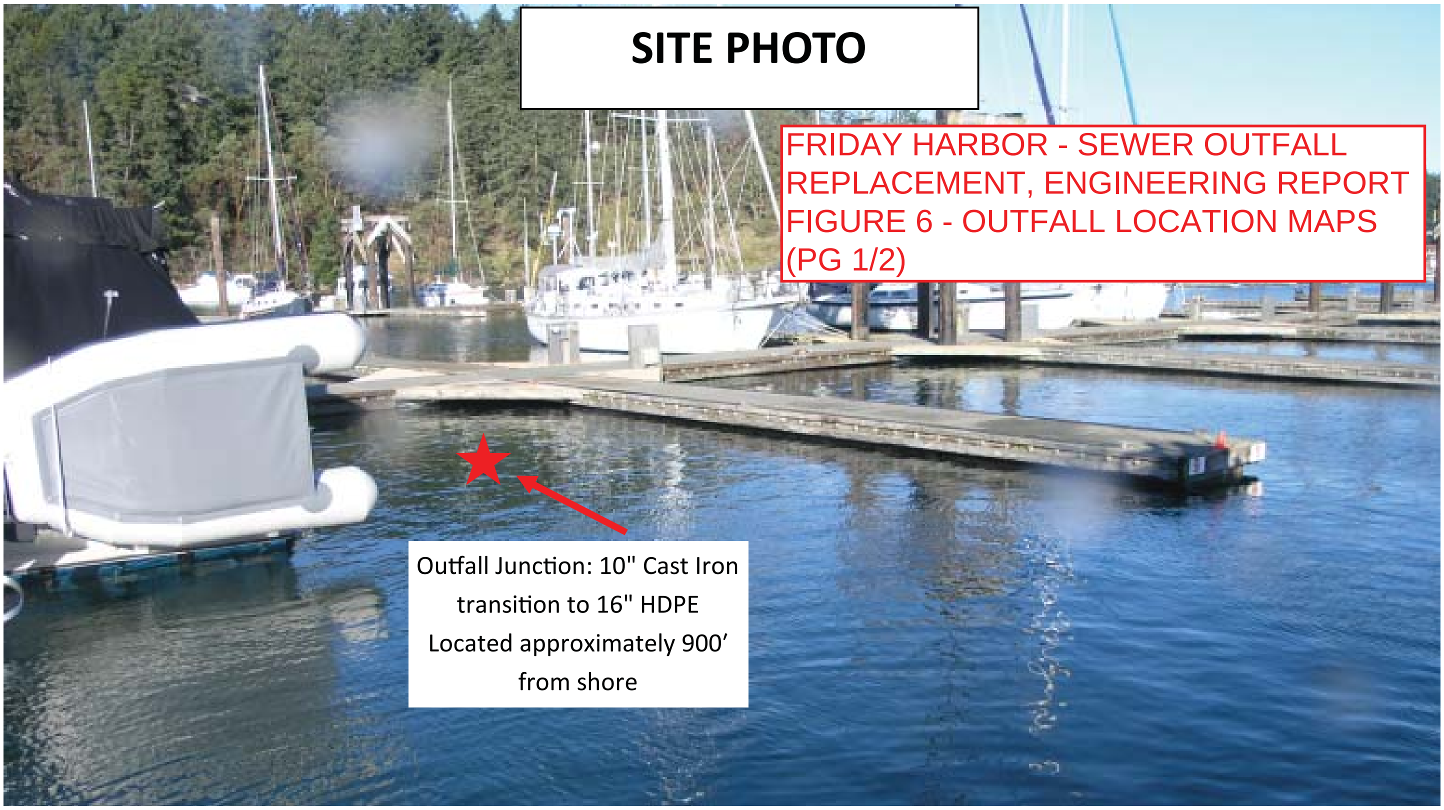
DESIGNED BY SJW
DRAWN BY JRF
CHECKED BY JGC

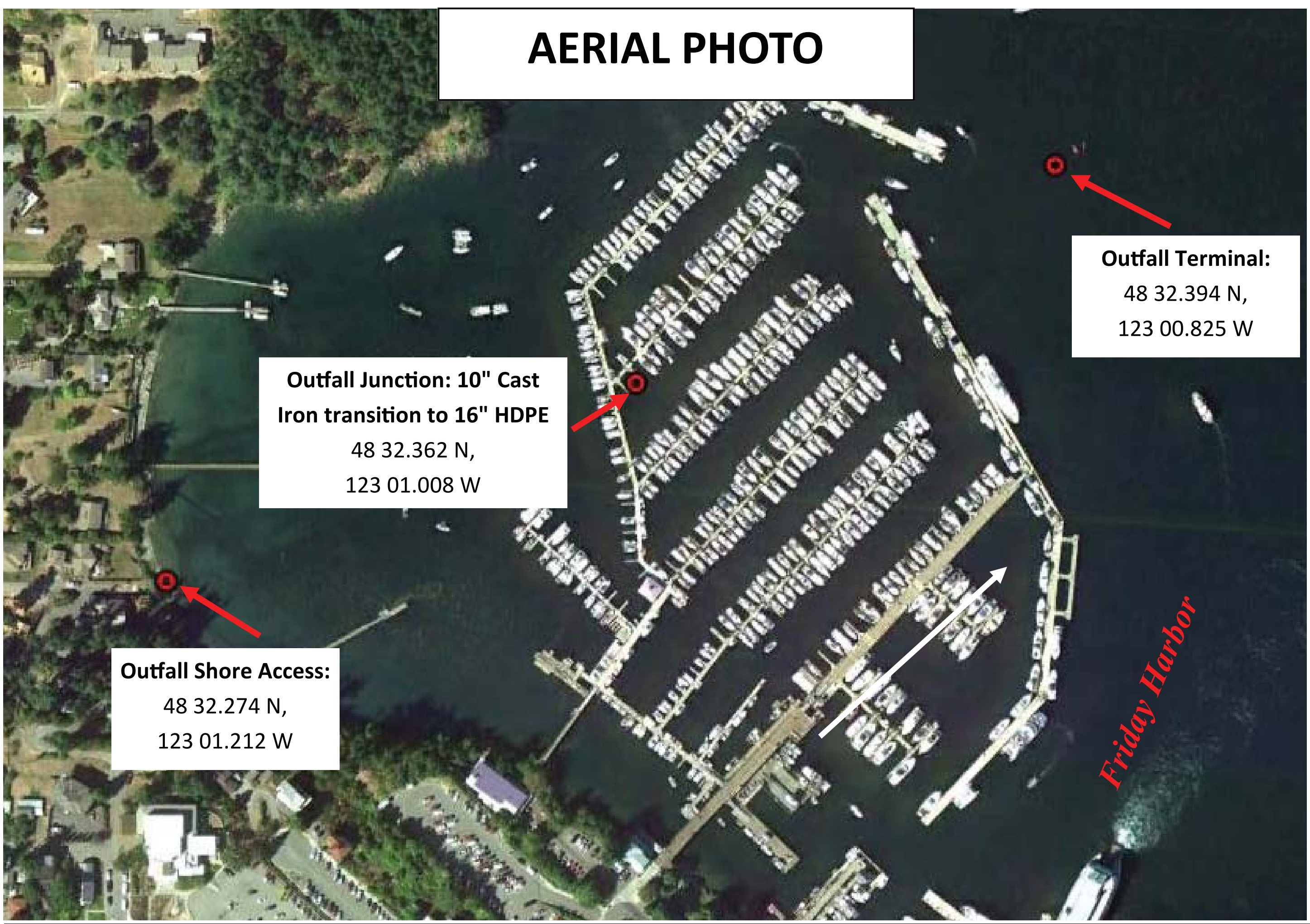
TOWN OF FRIDAY HARBOR

FRIDAY HARBOR WASHINGTON

FRIDAY HARBOR EFFLUENT FILTER
PROCESS FLOW SCHEMATIC

DATE 10-26-17
SCALE AS SHOWN
JOB NUMBER 2017-074
SHEET C2.0
PAGE 3 OF 15


SITE PHOTO
FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT FIGURE 6 - OUTFALL LOCATION MAPS (PG 1/2)
Outfall Junction: 10" Cast Iron transition to 16" HDPE Located approximately 900' from shore

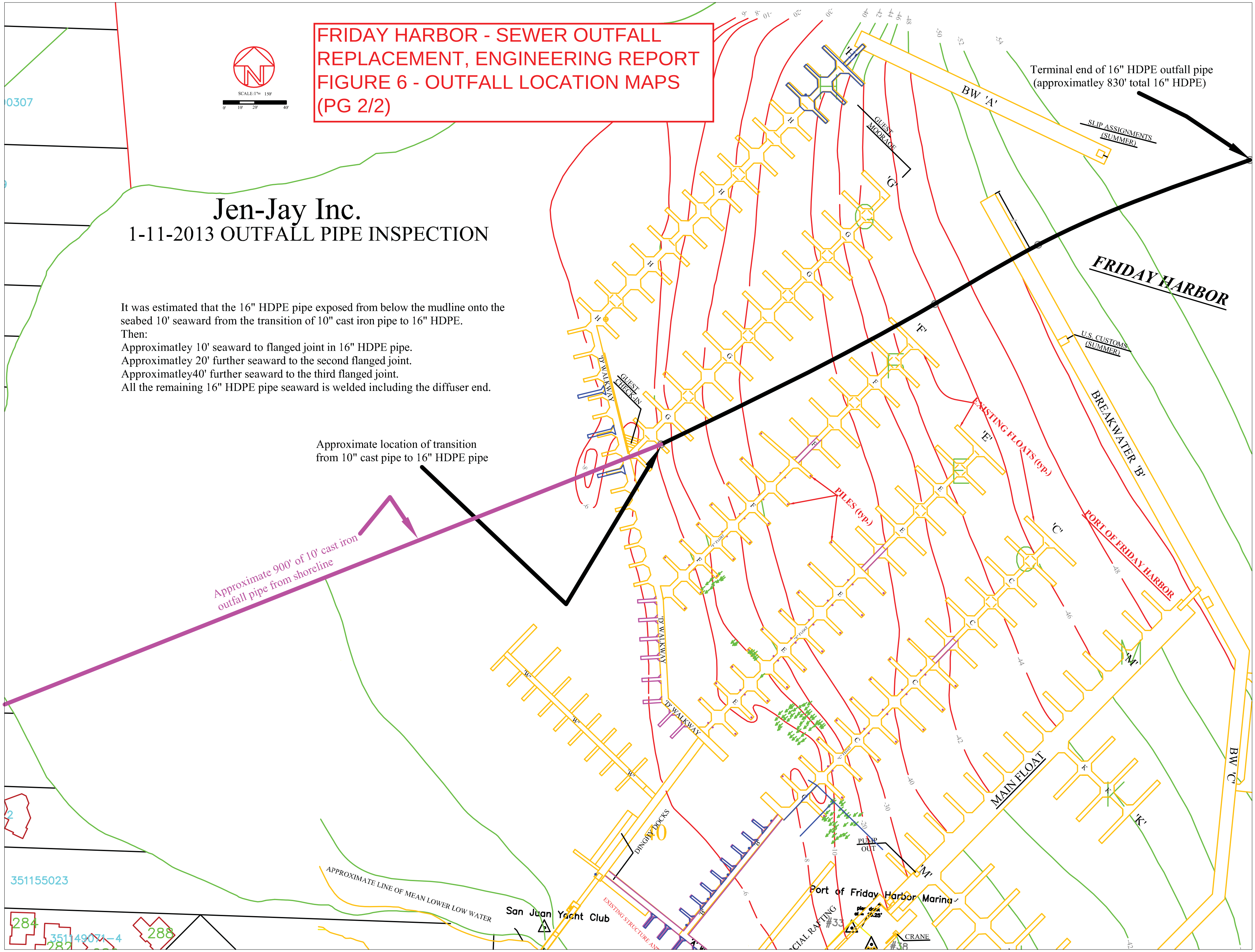

AERIAL PHOTO
Outfall Terminal: 48 32.394 N, 123 00.825 W
Outfall Junction: 10" Cast Iron transition to 16" HDPE 48 32.362 N, 123 01.008 W
Outfall Shore Access: 48 32.274 N, 123 01.212 W
Friday Harbor

FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 6 - OUTFALL LOCATION MAPS
(PG 2/2)

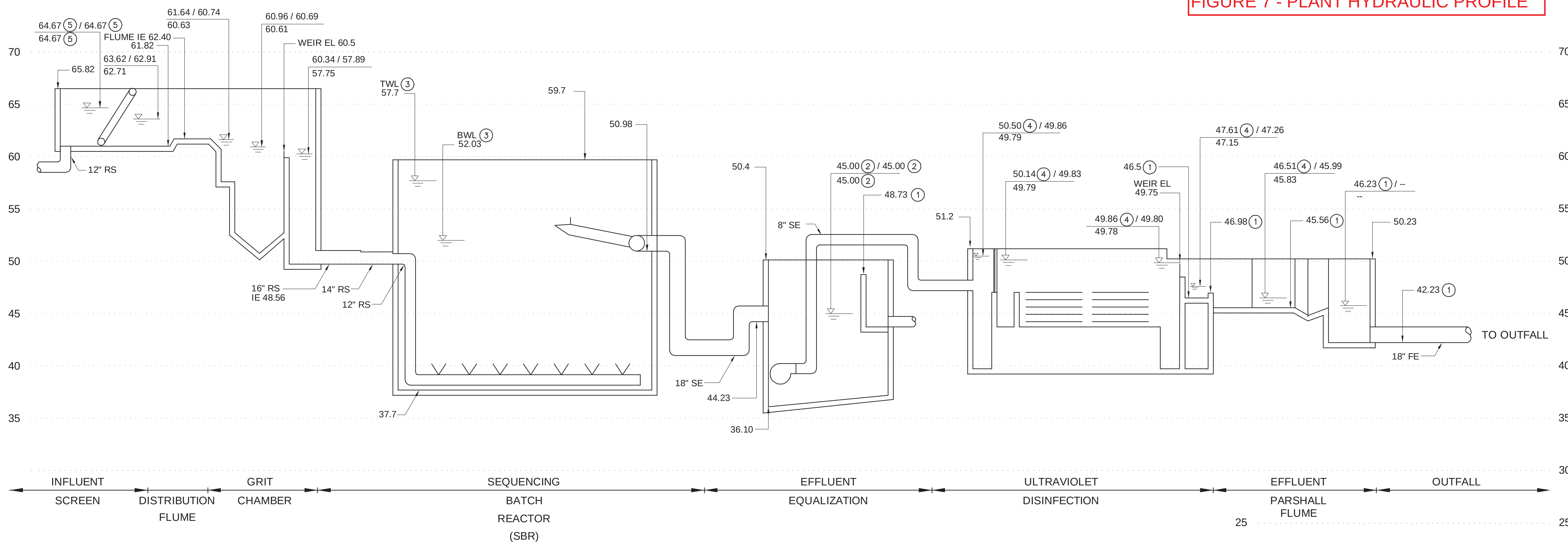
Jen-Jay Inc.

1-11-2013 OUTFALL PIPE INSPECTION

It was estimated that the 16" HDPE pipe exposed from below the mudline onto the seabed 10' seaward from the transition of 10" cast iron pipe to 16" HDPE.
Then:
Approximatley 10' seaward to flanged joint in 16" HDPE pipe.
Approximatley 20' further seaward to the second flanged joint.
Approximatley40' further seaward to the third flanged joint.
All the remaining 16" HDPE pipe seaward is welded including the diffuser end.



FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 7 - PLANT HYDRAULIC PROFILE



KEY NOTES:

1. ELEVATION INFORMATION FROM PREVIOUS DRAWINGS. ACCURACY NOT VERIFIED.
2. LEVEL CONTROLLED BY PUMPING AND VARIES REGULARLY THROUGH FULL DEPTH OF BASIN. MAXIMUM LEVEL SHOWN.
3. BWL AND TWL (*BOTTOM AND TOP WATER LEVEL) CONTROLLED BY SEQUENCING BATCH REACTOR OPERATION; NOT DEPENDENT ON FLOW RATE. PROFILE UPSTREAM OF SBR BASED ON TWL IN SBR.
4. FLOW RATE DOWNSTREAM OF EFFLUENT EQUALIZATION ASSUMED TO BE 2.3 MGD DURING PWWF CONDITION.
5. MAXIMUM LEVEL ABOVE SCREEN CONTROLLED BY CLEANING CYCLE.

LEGEND:

WS EL AT PWWF A,B / WS EL AT MAX MTH A,C
WS EL AT ADWF A,D

A WS EL INDICATES WATER SURFACE ELEVATIONS IN FEET ABOVE MLLW, WITH TIDE AT MHHW

B PWWF = 2.6 MGD

C MAXIMUM MONTH FLOW = 0.69 MGD

D ADWF = 0.33 MGD

BROWN AND CALDWELL
SEATTLE, WASHINGTON

SUBMITTED: ____ PROJECT MANAGER DATE: ____
APPROVED: ____ BROWN AND CALDWELL DATE: ____

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: JDB
DRAWN: CAD TEAM
CHECKED: MVO
CHECKED:
APPROVED:

EXTERNAL REFERENCE FILES

RECORD DRAWING
DATE JUNE 30,2004

THIS RECORD DRAWING WAS PREPARED USING INFORMATION REPORTED TO BROWN AND CALDWELL AND CONTAINS ONLY THE STANDARD AND CUSTOMARY LEVEL OF DETAIL. THE INFORMATION WAS NOT INDEPENDENTLY FIELD VERIFIED. THERE IS NO ONGOING PROGRAM TO UPDATE THE DRAWING TO REFLECT CHANGES SUBSEQUENT TO THE DATE INDICATED. THEREFORE, THIS DRAWING CANNOT BE RELIED UPON AS AN EXACT REPRESENTATION OF ACTUAL CONDITIONS.

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

TOWN OF FRIDAY HARBOR

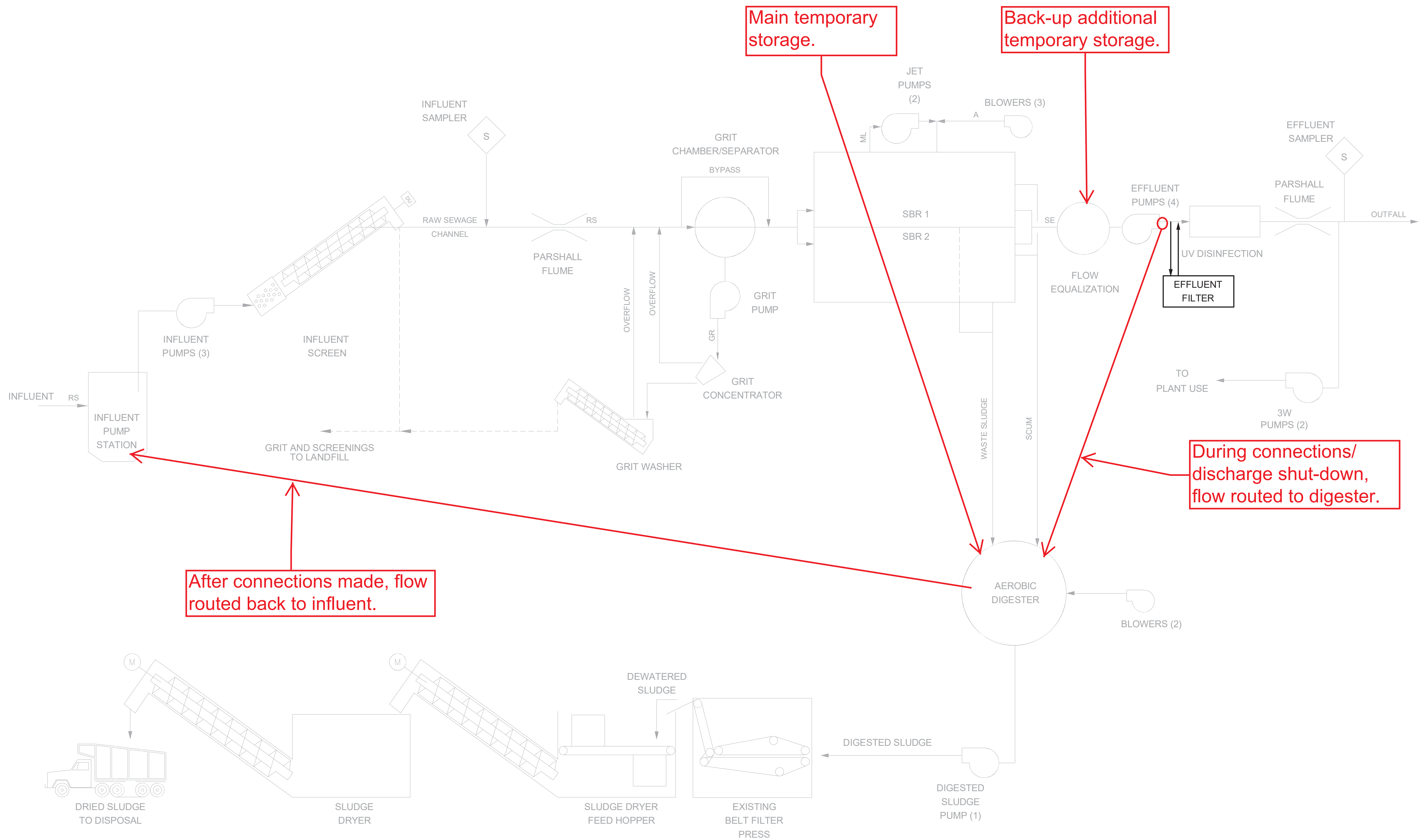
WASTEWATER TREATMENT PLANT IMPROVEMENTS

HYDRAULIC PROFILE

FILENAME 19623-G-013
BC PROJECT NUMBER 19623
CLIENT PROJECT NUMBER
DRAWING NUMBER 000-G-013
SHEET NUMBER 8 OF 188

NO.	REVISIONS	BY	DATE

FRIDAY HARBOR - SEWER OUTFALL REPLACEMENT, ENGINEERING REPORT
FIGURE 8 - UPDATED PROCESS FLOW SCHEMATIC WITH TEMPORARY STORAGE/BYPASS LOCATIONS



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DESIGNED BY SJW | DRAWN BY JRF | CHECKED BY JGC

TOWN OF FRIDAY HARBOR

FRIDAY HARBOR, WASHINGTON

FRIDAY HARBOR EFFLUENT FILTER
PROCESS FLOW SCHEMATIC

DATE 10-26-17 | SCALE AS SHOWN | JOB NUMBER 2017-074

SHEET C2.0 | PAGE 3 OF 15

BID SET

APPENDIX G

WILSON ENGINEERING

805 Dupont Street, Ste. #7, Bellingham, Washington 98225
Telephone: (360) 733-6100 • Facsimile: (360) 647-9061

MEMORANDUM

TO: Don Reitan, Wayne Haefele, Duncan Wilson (Town of Friday Harbor)

FROM: Jeff Christner, Scott Wilson (Wilson Engineering, LLC)

SUBJECT Biosolids Handling Evaluation, Friday Harbor WWTP

JOB NO.: 2019-110

DATE: November 7, 2019

OVERVIEW

The purpose of this memorandum is to evaluate solids handling operations for the Friday Harbor WWTP. Evaluation includes analysis of existing solids equipment layout/operations, and proposed improvements. Also included in this memorandum is an evaluation of the location of a proposed equalization basin. Centrifuge dewatering equipment proposals were received from Andritz, Alfa Laval, and GEA Westfalia. Conveyor equipment proposals were received from Custom Conveyor Corp, Spirac, KWS, and MLM. In addition, the WWTP Operation staff coordinated on-site sludge sampling so that new centrifuge equipment performance could be evaluated.

BACKGROUND

The Town initiated an evaluation of the existing biosolids handling facilities, and potential alternatives.

Wilson Engineering was contracted to assist. The alternatives are to be evaluated based on size, impacts to piping, compatibility with existing equipment, building modifications, cost, O&M impacts, supplier support, and other various requirements associated with this work.

The Major Alternatives Evaluated:
1. Continue Dewatering with Existing Belt Filter Press Equipment – Alternative #1
2. Replace Belt Press Equipment with Centrifuge Equipment – Alternative #2
3. Construct New Dewatering Facility (with Centrifuge) Adjacent to Digester – Alternative #3
4. Construct New Dewatering Facility (with Centrifuge) Adjacent to Headworks – Alternative #4
5. Dryer Facility vs Alternatives #1 through #4 – Cost Comparison

In addition, the following work items were evaluated for all alternatives:
- Digester Improvements (decanting system, level monitoring, pH sensor, and D.O. sensor)
- Conveyance System Information/Improvements
- Hauling Cost Comparison – Belt Filter Press vs Centrifuge vs Dryer
- New Centrifuge Dewatering Equipment Comparison

PLANT OPERATION

The existing digester stores final waste activated sludge (WAS), and has a total capacity of 370,000 gallons. The digester is configured with a floating aerator which can be used on a daily cycle, as needed, to mix, aerate, and digest solids. The digester consistently has a solids concentration range between 3,000 and 5,000 mg/L. The digester is not configured for decanting, so the solids concentration remains relatively constant year round.

Friday Harbor currently pumps liquid from the digester to their gravity belt filter press to thicken and dewater sludge prior to hauling offsite. The belt filter press is only able yield cake with 11% to 13% solids. In addition, it is fairly old (installed in 1995) and ready for a major rebuild.

The dewatered cake is hauled to La Conner's composting facility at the City's WWTP. The hauling and tipping costs are significant, and the Town wants to streamline the process as much as possible. In addition, improvements will need to consider turning radius and sludge box access to minimize haul truck time and noise on site during the pick-up/drop-off periods (typically 5:00am).

DIGESTER IMPROVEMENTS

It is recommended that a decant system is installed. This would allow the existing digester to store a higher solids concentration, which would allow for longer retention time and additional solids digestion.

Also, it is noted that the proposed decant system would be easier to operate with permanent level sensing equipment, permanent pH sensing equipment, and a permanent dissolved oxygen sensor.

Other digester work items include construction of a standard concrete slab above the sludge pump vault (instead of existing metal roof structure) and replacement of the existing sludge transfer pump with new pump downsized slightly for centrifuge capacity and configured for a solids concentration range of 0.4% to 2.0% total solids.

The rough order of magnitude cost for these proposed digester improvements is $298,000.

CONVEYANCE SYSTEM INFORMATION / IMPROVEMENTS

It is recommended that a conveyor is installed to transfer dewatered sludge to a sludge storage box for hauling, when needed. Five screw conveyor manufacturers were evaluated: Custom Conveyor Corporation, Spirac, KWS Environmental, MLM Conveying Systems, and Austin Mac, Inc.

All manufacturers sized equipment for the following:

- Capacity = 120 ft^3/hr
- % Solids = 18% to 20%
- Minimum Conveyor Length = 20 ft
- Reversible Operation.
- Control Panel not included.

- Proposals for equipment included in Appendix E.

CUSTOM CONVEYOR CORPORATION

Custom Conveyor Corporation proposed their Inclined Shaftless Screw Conveyor for this facility. The proposed conveyor has a 10-inch diameter spiral, and is 25 feet long. The equipment quote from Custom Conveyor Corporation is $42,000 for this option. The equipment sales representative is Joe Buckman at APSCO.

SPIRAC

Spirac proposed the U320-SPX/SS model for this facility. The proposed conveyor has an 11.4-inch diameter spiral, and is 22 feet long. The equipment quote from Spirac is $41,000 for this option. The local equipment sales representative is Mike McKamey at Beaver Equipment.

KWS ENVIRONMENTAL

KWS Environmental proposed their Shaftless Screw Conveyor for this facility. The proposed conveyor has a 12-inch diameter spiral, and is 20 feet long. The equipment quote from KWS Environmental is $60,700 for this option. The local equipment sales representative is Bret Kreier at JBI Water & Wastewater.

MLM CONVEYING SYSTEMS

MLM Conveying Systems proposed their Shaftless Conveyor for this facility. The proposed conveyor has a 11.22-inch diameter spiral, and is 20 feet long. The equipment quote from MLM Conveying Systems is $42,250 for this option. The local equipment sales representative is John Simon at Goble Sampson.

AUSTIN MAC, INC.

Austin Mac, Inc., proposed their Shaftless Screw Conveyor for this facility. The proposed conveyor has a 12-inch diameter spiral, and is 24 feet long. The equipment quote from Austin Mac is $29,800 for this option. Austin Mac does not have a local equipment sales representative, and they are located in Seattle, WA.

CONVEYOR RECOMMENDATIONS

It was determined that a shaftless screw conveyor would be the best option compared to shafted screw and belt conveyors for this application. Shaftless and shafted screw conveyors are generally better suited for dewatered sludge than belt conveyors due to their fully-enclosed design. Shafted conveyors typically have a higher capital cost than shaftless, and they feature bearings which require lubrication. Shaftless conveyors provide more efficient conveyance than shafted, and use a replaceable wear liner to protect the trough from being eroded by any grit in the sludge. It is anticipated that the wear liner on the shaftless conveyor would only require replacement every few years.

It is also recommended that the facility's existing Interquip belt conveyor be evaluated as a potential long-term option. Although screw conveyors have a longer life expectancy than belt conveyors and are generally preferable for dewatered sludge conveyance, if the facility's

experience using their existing Interquip belt conveyor for dewatered sludge conveyance has so far been satisfactory, it would be a low-cost alternative to purchasing a new screw conveyor.
All five evaluated screw conveyor manufacturers have extensive experience manufacturing shaftless screw conveyors. Depending on the facility's experience with their existing Interquip belt conveyor, we would recommend bidding these units against each other to obtain the most competitive pricing.

HAULING COST COMPARISON – BELT FILTER PRESS VS CENTRIFUGE VS DRYER

For this comparison we are using the following % solids yield for the each technology:

- Belt Filter Press: 12% solids
- Centrifuge: 17% solids
- Dryer: 90% solids

Since the Town has already negotiated a contract with LaConner's composting facility for dewatered solids and Lautenbach for hauling a 30 CY storage box, we will use actual Yr-2019 unit costs for this analysis. The current tipping fee at LaConner is $58/ton. In addition, Lautenbach's transport cost for one 30CY box is approximately $1,300/trip.

For this analysis we will assume 1 box hauled per week for the centrifuge and belt filter press options. In addition, we will assume 1 box hauled per month for the dried solids (90% solids) option.

Cost calculations are provided in Appendix B – Solids Hauling Cost Evaluation. The year 2020 to year 2040 hauling cost totals are:

- Belt Filter Press: $2.49M
- Centrifuge: $2.18M
- Dryer: $0.47M

NEW CENTRIFUGE DEWATERING EQUIPMENT COMPARISON

The top three centrifuge manufacturers evaluated are Andritz, Alfa Laval, and GEA Westfalia.

All manufacturers sized equipment for the following:

- Hydraulic capacity = 150 gpm
- % Solids Anticipated = 16% to 18%
- Percent capture is assumed to average 95%. Therefore we will account for a 5% return of solids through filtrate.
- Polymer system is anticipated to be an emulsion system.
- Sludge will be entirely waste activated, and unit is to handle the 4,000 mg/L concentration as currently reported, but also anticipate that concentration will increase to 6,000 or 8,000 mg/L in the future when new decanting system is online. Potential increase also when WWTP process is adjusted from SBRs to Extended Aeration.
- Main drive size = 50 HP.
- Control Panel with Allen Bradley PLC components.
- Proposals for equipment included in Appendix D.

ANDRITZ

Andritz proposed the D4LL model for this facility. The equipment quote from Andritz is $260,000 for this option. The equipment sales representative is Joe Buckman at APSCO.

GEA WESTFALIA

GEA proposed the CF 466 model for this facility. The equipment quote from GEA is $265,000 for this option. The equipment sales representative is Bret Kreier at JBI Water & Wastewater.

ALFA LAVAL

Alfa Laval proposed the Aldec 75 model for this facility. The equipment quote from Alfa Laval is $270,000 for this option. The equipment sales rep. is Mike Reilly at Wm. H. Reilly & Co.

ALTERNATIVE #1 – CONTINUE DEWATERING WITH EXISTING BELT FILTER PRESS EQUIPMENT

The existing Roediger Belt Filter Press Unit is 24 years old and has reached a stage where it will need a major overhaul/rebuild, if the Town chooses to continue using it. The work will need to include new belts, new rollers, new drives, and a new sludge conveyor system to a new storage box.

The rough order of magnitude cost to overhaul/rebuild the existing belt filter press equipment is estimated at $400,000 (approx.).

In addition, if the existing belt press equipment is offline for a significant time period, the Town will need to use an alternative method for handling liquid sludge. The digester currently has capacity for 3-4 average weeks of storage, however, operation staff prefers to keep the digester half full (or lower) so they have extra storage available for emergency events.

Rough order of magnitude cost to transport liquid sludge (in 5,000 gallon vactor trucks) during the belt filter press overhaul/rebuild period (assume 10 weeks during summer construction period):
Hauling Cost: $2,000 x 20 trips/week x 10 weeks = $400,000
Tipping fee = $0.10/gallon x 100,000 gal/week x 10 weeks = $100,000

The total cost for all work items planned under Alternative #1:

Construction Contractor Work ($969,000):

- Overhaul/Rebuild Belt Filter Press: $400,000
- Painting: $15,000
- Remove Drum Dryer Equipment: $36,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Direct Contract Work ($500,000):

- Haul and Dispose of Liquid Sludge: $500,000

See Appendix C – Construction and Engineering Cost Estimates – Alternate #1

ALTERNATIVE #2 - REPLACE BELT FILTER PRESS EQUIPMENT WITH CENTRIFUGE EQUIPMENT

The existing solids building is a wood frame structure with metal roof.

Since the building is configured with belt filter press equipment, drum dryer equipment, and plant water (3W) pumps/piping, major modifications will be needed if new dewatering equipment is to be installed. The most feasible concept would be to demo the existing dryer and construct the centrifuge facilities in the area currently occupied by the dryer and dried solids storage areas.

Haul truck access will need to be closely evaluated because the Town desires two sludge storage boxes (30 CY each), and large truck access is somewhat limited to the southern bays inside the existing building.

Rough order of magnitude cost to retrofit/refurbish the existing building for a new centrifuge unit with power, controls, instrumentation, mechanical, conveyance, storage, site work, and digester improvements is $1,560,000.

See Appendix C – Construction and Engineering Cost Estimates – Alternate #2

ALTERNATIVE 3 – CONSTRUCT NEW DEWATERING FACILITY (WITH CENTRIFUGE) ADJACENT TO DIGESTER

Two locations have been selected for the new dewatering building location. Both options are anticipated to have similar costs. Option 1 is located between the digester and the existing solids building just north of the blower building.

Option #1 Pros:
- Ideal access location for haul truck.
- Short distance from digester, odor control unit, and minimal yard piping needed.

Option #1 Cons:
- Geotechnical investigation found soft soils extending 5 to 10 deep in this vicinity, so additional structural fill anticipated.

Option 2 is located on west side of site, between the stormwater detention pond and the new headworks facilities.

Option #2 Pros:
- Existing soils appear to be suitable for proposed loads and building foundations.
- Greenfield construction reduces costs and demolition required.

Option #2 Cons:
- More distance to yard piping connections.
- Additional maneuvering needed for sludge haul truck access, so additional pavement/earthwork required.

The rough order of magnitude cost to construct a new dewatering facility adjacent to the digester (See Appendix C - Construction and Engineering Cost Estimates – Alternate #3) is estimated at $2,325,000.

ALTERNATIVE 4 – CONSTRUCT NEW DEWATERING FACILITY (WITH CENTRIFUGE) ADJACENT TO HEADWORKS

See discussion for Alternative 3, Option 2 above.

The rough order of magnitude cost to construct a new building adjacent to the headworks (See Appendix C - Construction and Engineering Cost Estimates – Alternate #4) specifically for the proposed centrifuge equipment is also estimated at $2,325,000.

DRYER FACILITY VS. ALTERNATIVES #1 THROUGH #4 – COST COMPARISON

The projected cost for the proposed biosolids dryer improvements is estimated to be in the range of $3M to $5M. This includes a new building with adequate clearance for a belt dryer unit sized for processing at least 1.0 wet ton per hour. In addition, the projected hauling cost for dried biosolids is $470,000 for Yr-2020 to Yr-2040. See Appendix B – Solids Hauling Cost Evaluation.

Since the dryer facility capital + hauling + engineering cost (year 2020 to 2040) is the most expensive option when compared to dewatering and hauling cake, the dryer facility improvements will be omitted for now. However, this can be re-evaluated if the situation should change in the future.

SUMMARY

The proposed digester improvements will be beneficial no matter what dewatering technology is selected. The advantages include increased retention time, increased digestion, and improved process control.

Dewatering equipment options have several trade-offs. The new technology options with centrifuge equipment is very favorable since it will produce a higher solids concentration, will require substantially less wash water (2500 gallons per run cycle, approx. 25% of the BFP wash water demand), and will be more effective at containing and mitigating odors. In addition, labor required to clean the centrifuge is minimal, since the wash water cycle is a fully automated process. However, the centrifuge equipment is a substantial investment.

The top three centrifuge units (Andritz, Alfa Laval, and GEA Westfalia) are considered industry leaders, and we would recommend bidding these three units against each other to obtain the most competitive pricing.

Alternative #1 – Continue Dewatering with Existing Belt Filter Press Equipment (Existing Solids Building):

Construction Contractor Work:

- Overhaul/Rebuild Belt Filter Press: $400,000
- Painting: $15,000

- Remove Drum Dryer Equipment: $36,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $969,000
Tax: $80,000
Engineering/Permits/Survey: $210,000

Total for Construction Contract Work: $1,259,000

<u>Direct Contract Work:</u>

- Haul and Dispose of Liquid Sludge: $500,000

Total for Construction Contract + Direct Contract Work: $1,759,000 (See Appendix C)
Hauling Costs (Yr 2020 to Yr 2040): $2,490,000 (See Appendix B)

Combined Total: $4,249,000

<u>Alternative #2 – Replace Belt Filter Press Equipment with New Centrifuge Equipment (Existing Solids Building):</u>

<u>Construction Contractor Work</u>:

- Construct Centrifuge Dewatering Facility Inside Existing Solids Bldg: $1,042,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $1,560,000
Tax: $129,000
Engineering/Permits/Survey: $338,000

Capital Improvements Total Cost: $2,027,000 (See Appendix C)
Hauling Costs (Yr 2020 to Yr 2040): $2,176,000 (See Appendix B)

Combined Total: $4,203,000

<u>Alternative #3 – Construct New Dewatering Facility (with Centrifuge) Adjacent to Digester:</u>

<u>Construction Contractor Work</u>:

- Construct Centrifuge Dewatering Facility Adjacent to Digester: $1,807,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $2,325,000
Tax: $193,000
Engineering/Permits/Survey: $504,000

Capital Improvements Total Cost: $3,022,000 (See Appendix C)
Hauling Costs (Yr 2020 to Yr 2040): $2,176,000 (See Appendix B)

Combined Total: $5,198,000

Alternative #4 – Construct New Dewatering Facility (with Centrifuge) Adj. to Headworks:

Construction Contractor Work:

- Construct Centrifuge Dewatering Facility Adjacent to Headworks: $1,807,000
- Conveyance and Sludge Storage Improvements: $298,000
- Digester Improvements: $220,000

Total: $2,325,000
Tax: $193,000
Engineering/Permits/Survey: $504,000

Capital Improvements Total Cost: $3,022,000 (See Appendix C)
Hauling Costs (Yr 2020 to Yr 2040): $2,176,000 (See Appendix B)

Combined Total: $5,198,000

EQUALIZATION BASIN EVALUATION

The wastewater treatment plant currently does not have an equalization basin to regulate peak flows into the plant. An equalization basin would be beneficial for that reason and for use as a utility basin when other basins need to be taken offline. Wilson Engineering performed a basic evaluation of equalization basin alternatives considering location, costs, and sizing.

Four alternatives were evaluated:

Alternative 1 – Located in the location of the existing biosolids building. This location has the benefit of being lower on the site allowing influent to be sent directly to the equalization basin and potentially removing the need for the influent pump station (IPS). The downside of this location is the required demolition of the biosolids handling building and the site constraints would make this alternative the smallest equalization basin.

Alternative 2 – This alternative would be located in the open space just north of the new decant building. This location has the benefit of being an unused space which would result in very little demolition or conflicts with existing facilities compared with Alternative 1. The location would also allow for the largest equalization basin. The downside of this alternative as well as Alternatives 3 & 4 is influent would need to continue being pumped from the IPS to these equalization basins.

Alternative 3 & 4 – These alternatives are located south and west of the new headworks building. The locations have the benefit of being unused space and minimal conflicts with existing facilities but would require pumping from the IPS. These locations may also conflict with a proposed solar array project by the Town.

A map showing the alternative locations is presented in Appendix G. All equalization basin alternatives would require pumping from the equalization basin to the new headworks.

Table 1 below compares the size and cost of each alternative for the purpose of determining the best location. The size is an approximation of the maximum allowable size given the space constraints for that location. All alternatives were evaluated assuming a side water depth (SWD) of 15 feet. This table only compares the cost associated with each location alternative. There would be similar additional costs for each alternative associated pumps, covers, electrical, piping, engineering, etc.

Table 1 – Equalization Basin Alternative Size and Cost Comparison

ALTERNATIVE	INSIDE LENGTH	INSIDE WIDTH	STORAGE VOLUME	% OF CURRENT PEAK DAY	% OF FUTURE PEAK DAY	% OF FUTURE AVE DAY	CONCRETE COSTS, $/CY	EXCAVATION COSTS, $/CY	BACKFILL COSTS,$/TON	BASE COURSE COSTS, $/TON	TOTAL COST
	FT	FT	GALLONS				$ 1,300.00 / CY	$ 70.00 / CY	$ 70.00 / CY	$ 90.00 / TON	
ALT 1	63	70	495,146	52%	34%	118%	$ 555,966.67	$ 277,699.72	$ 153,257.25	$ 44,566.50	$ 1,031,490.14
ALT 2	78	90	788,192	82%	55%	188%	$ 805,975.93	$ 408,602.96	$ 193,588.11	$ 69,680.25	$ 1,477,847.25
ALT 3	53	83	493,911	51%	34%	118%	$ 560,444.44	$ 279,487.96	$ 156,714.19	$ 44,548.00	$ 1,041,194.59
ALT 4	61	114	780,781	81%	54%	186%	$ 813,511.11	$ 411,154.72	$ 201,654.28	$ 69,264.00	$ 1,495,584.12

RECOMMENDATIONS

Based on our evaluation, Biosolids Alternative #2 would be the most cost effective option and our initial recommendation. This option would utilize the existing biosolids building saving considerable design and construction costs. In this alternative the existing belt press would remain operational while new equipment is installed in the location of the existing drum dryer and biosolids storage area. The new equipment would consist of a centrifuge and conveyance system, along with the necessary mechanical piping and electrical equipment. This option would also allow for future biosolids expansion in the location of the existing belt filter press.

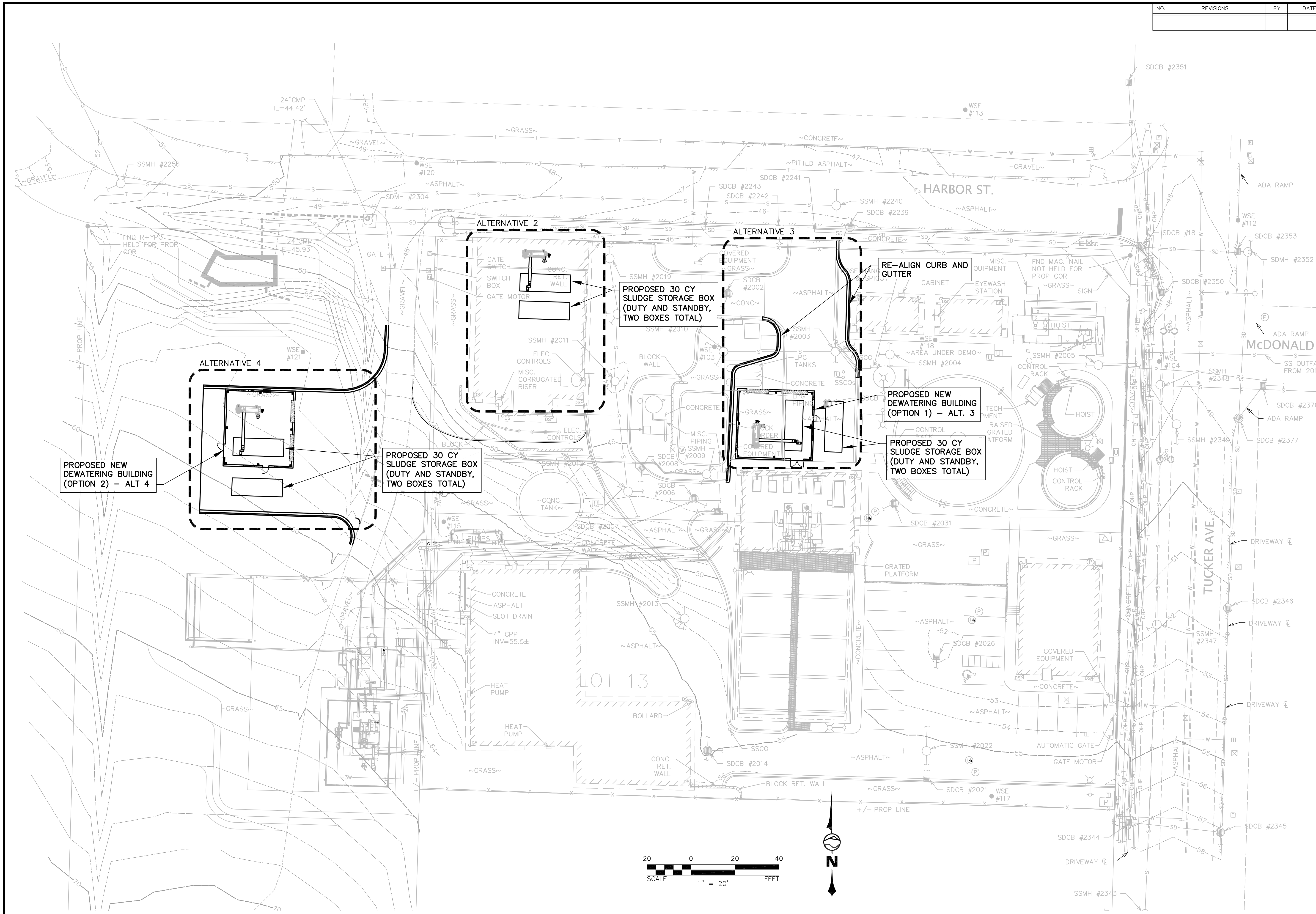
Furthermore, the evaluated centrifuge dewatering facility options are very attractive since they will be able to produce a higher solids concentration, requires less wash water, and is better configured for the odor control system desired. From a financial standpoint the new centrifuge equipment facility will be a larger investment; however, there will be benefits associated with the robust design and low maintenance features included with the centrifuge process.

Based on our evaluation of Equalization Basin alternatives, Equalization Basin Alternative #2 would be our recommendation. Alternative 2 would be the best location for the proposed equalization basin as this would be the most economical in terms of price per gallon of storage and the construction would be simple given the open space available at this location.

Based on this preliminary evaluation, both recommended alternatives would work well with the other and the overall WWTP site. These options would fit well into the long term plans for plant improvements and the Capital Improvement Plan developed in the General Sewer Plan.

It is recommended that the Town reviews these alternatives and our recommendations and ultimately start the planning and design process for a selected alternative.

APPENDIX A – DEWATERING FACILITY ALTERNATIVES



NO.	REVISIONS	BY	DATE

WILSON ENGINEERING

CIVIL
STRUCTURAL
SURVEY

WILSONENGINEERING.COM

TOWN OF FRIDAY HARBOR

SAN JUAN COUNTY WASHINGTON

BIOSOLIDS HANDLING

DEWATERING FACILITY ALTERNATIVES

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DRAWN BY XXX
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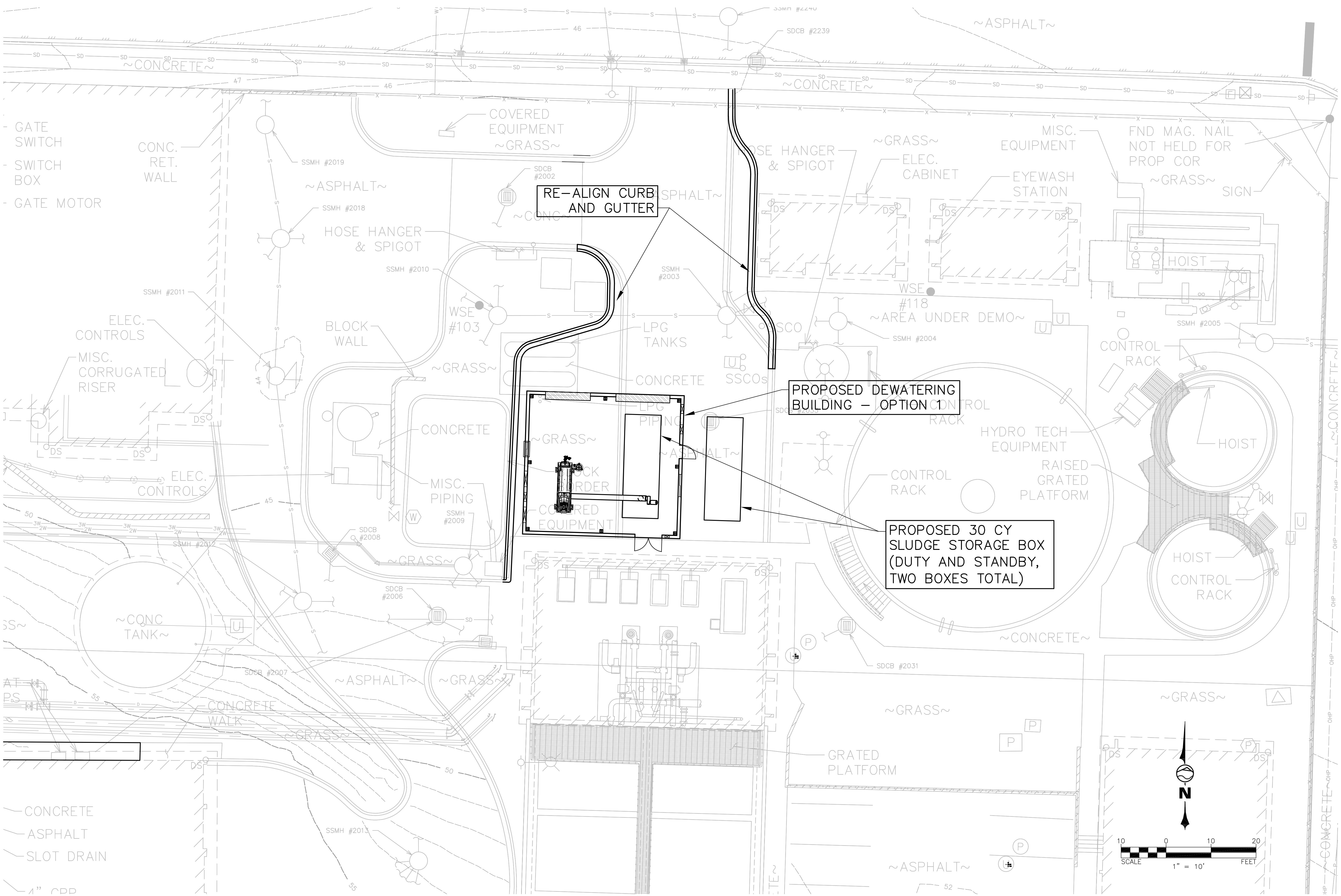

CIVIL STRUCTURAL SURVEY

WILSON ENGINEERING

WILSONENGINEERING.COM

DESIGNED BY XXX

DRAWN BY XXX

CHECKED BY

TOWN OF FRIDAY HARBOR

SAN JUAN COUNTY WASHINGTON

BIOSOLIDS HANDLING

DEWATERING BUILDING LAYOUT - OPTION 1

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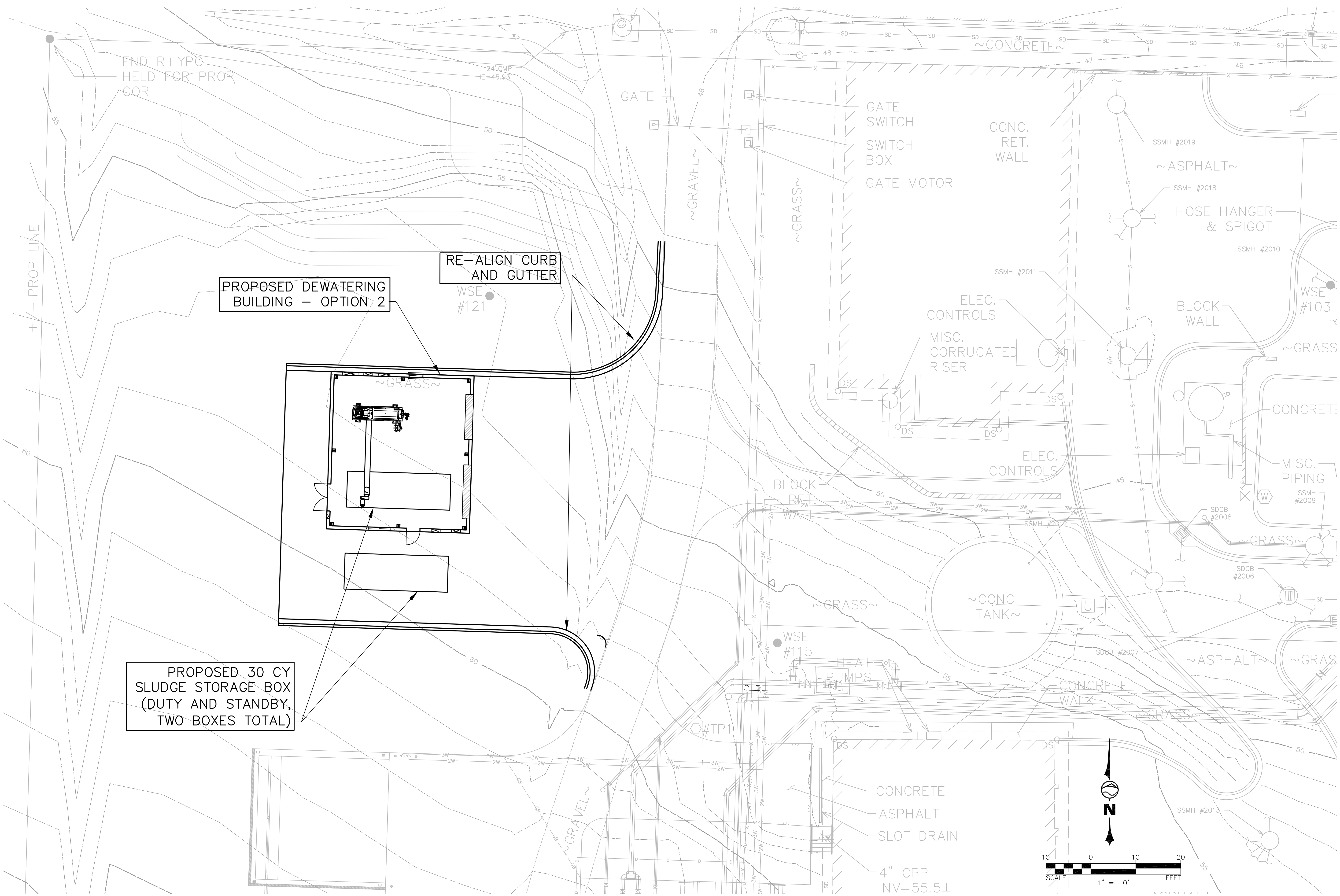

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SAN JUAN COUNTY WASHINGTON
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DEWATERING BUILDING LAYOUT – OPTION 2

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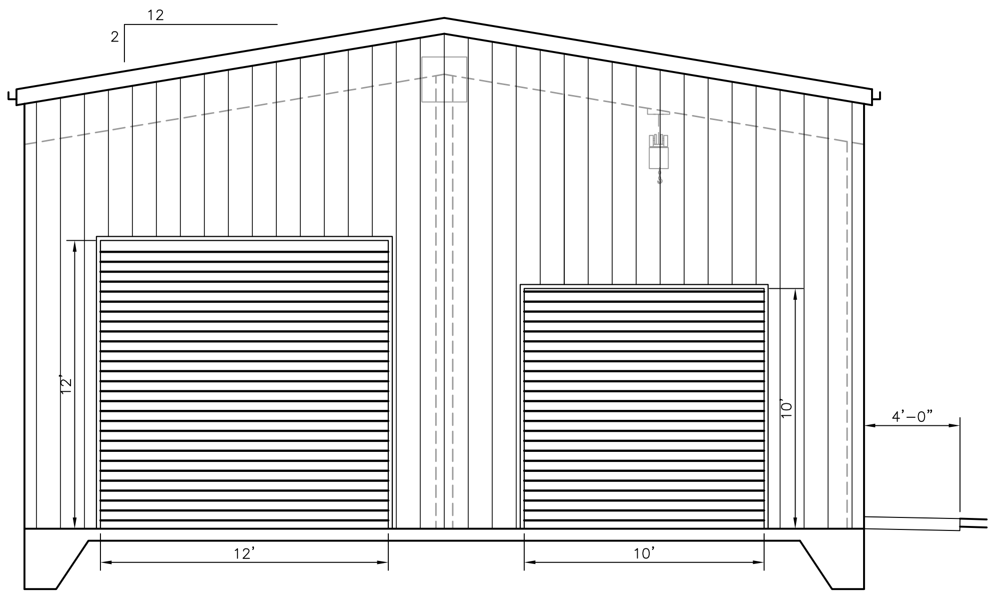

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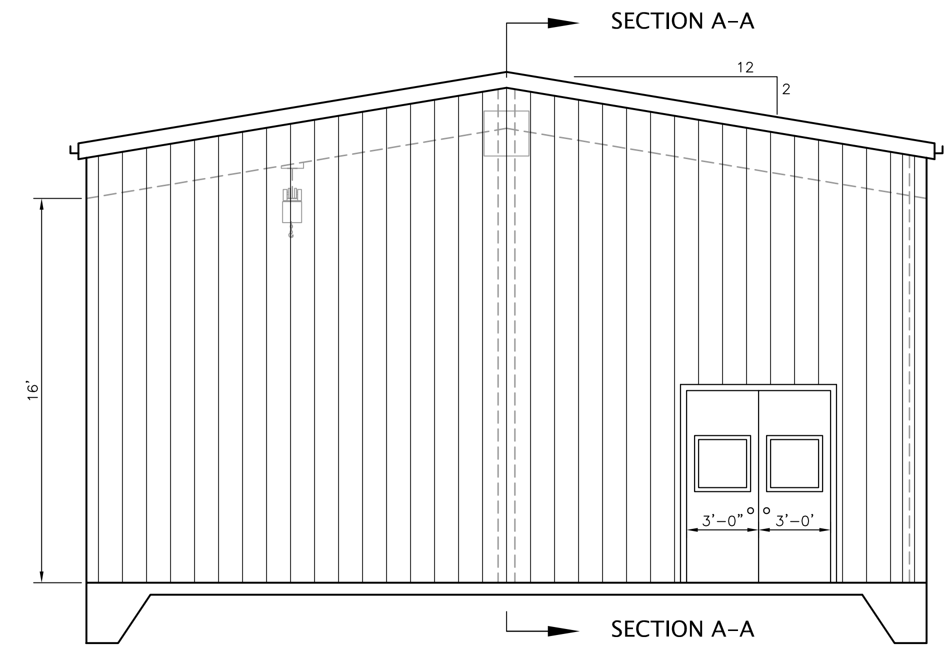

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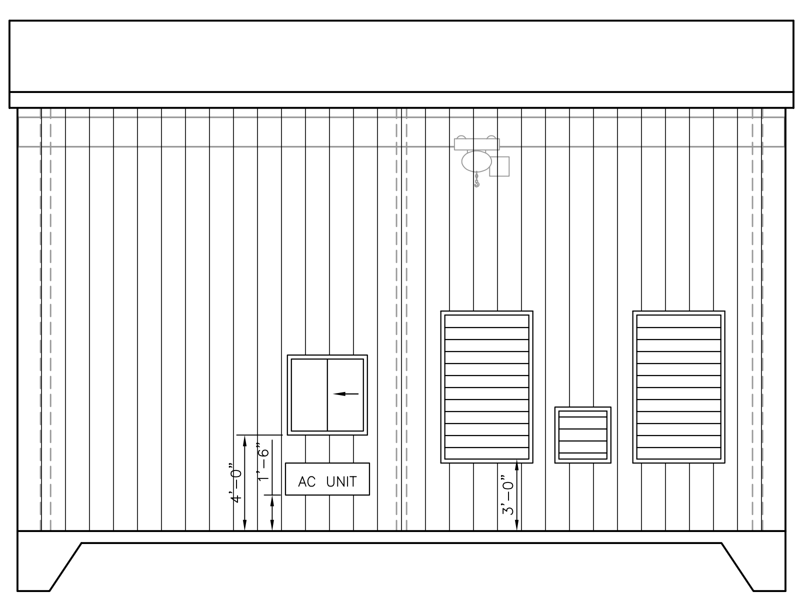

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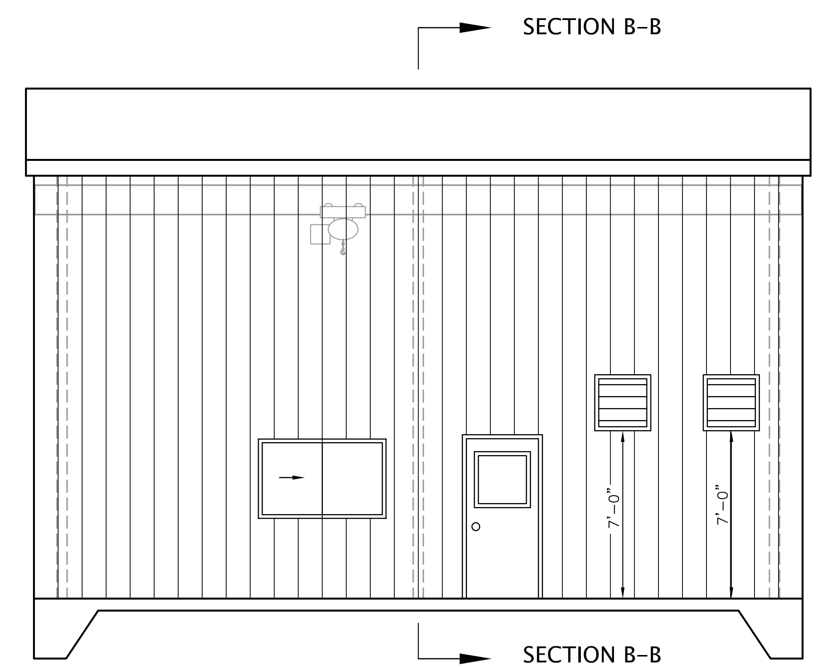

EAST ELEVATION

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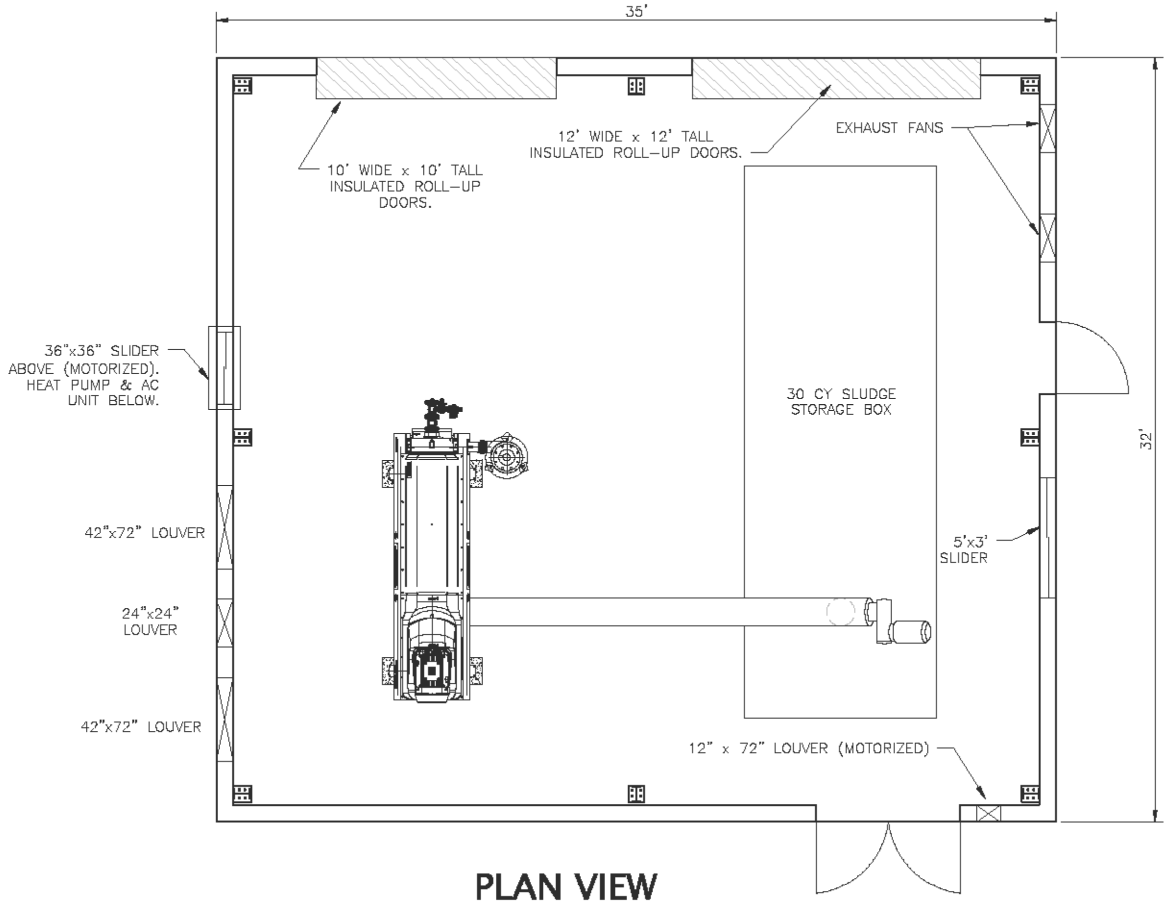

PLAN VIEW

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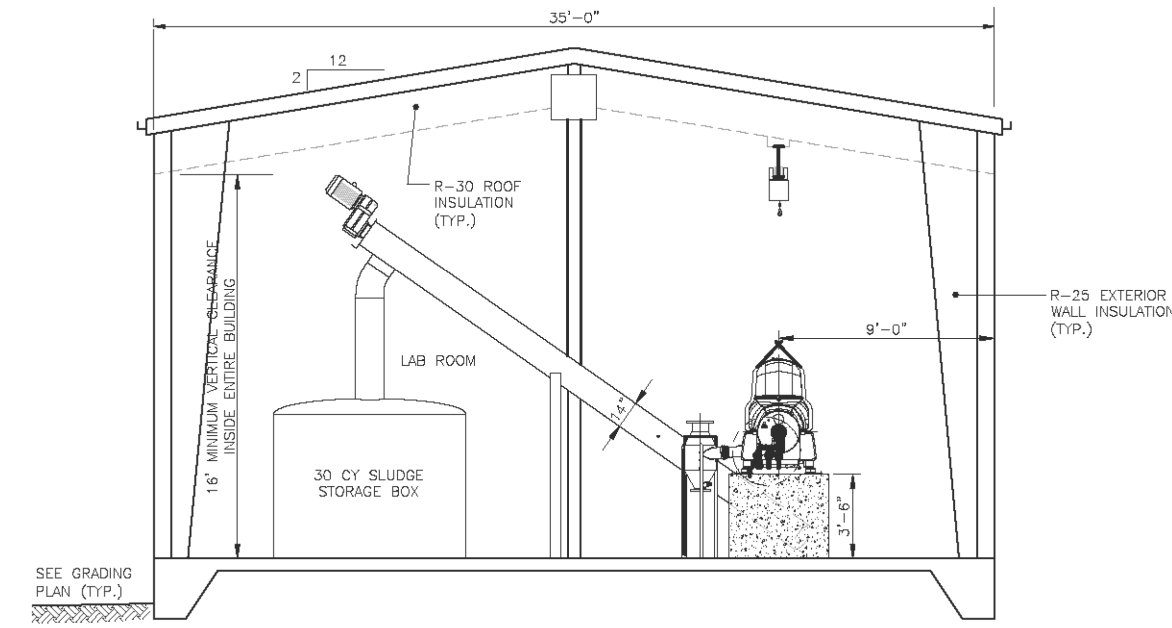

A/A1.2 SECTION A-A

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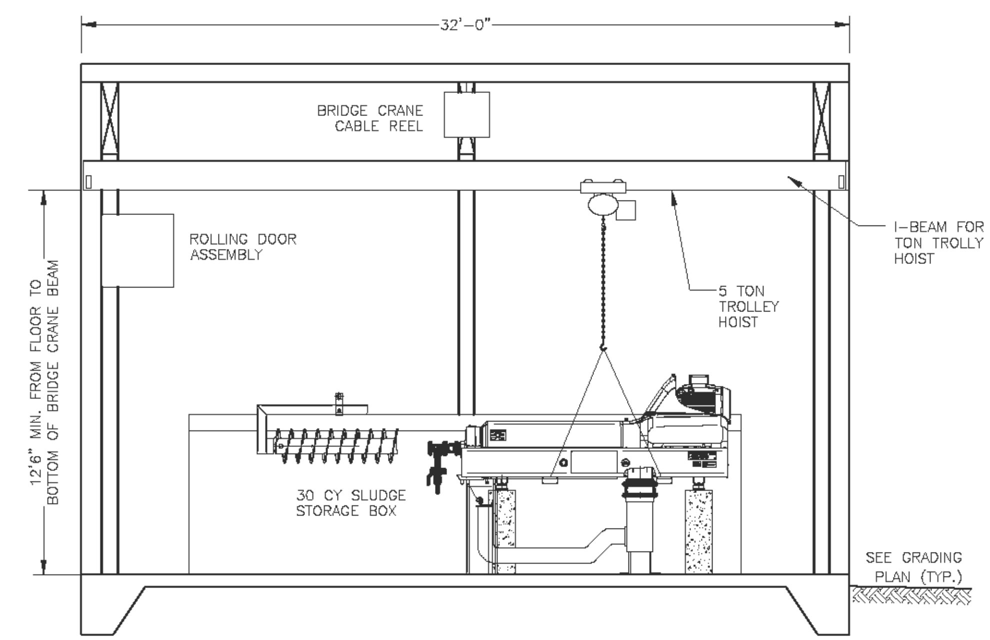

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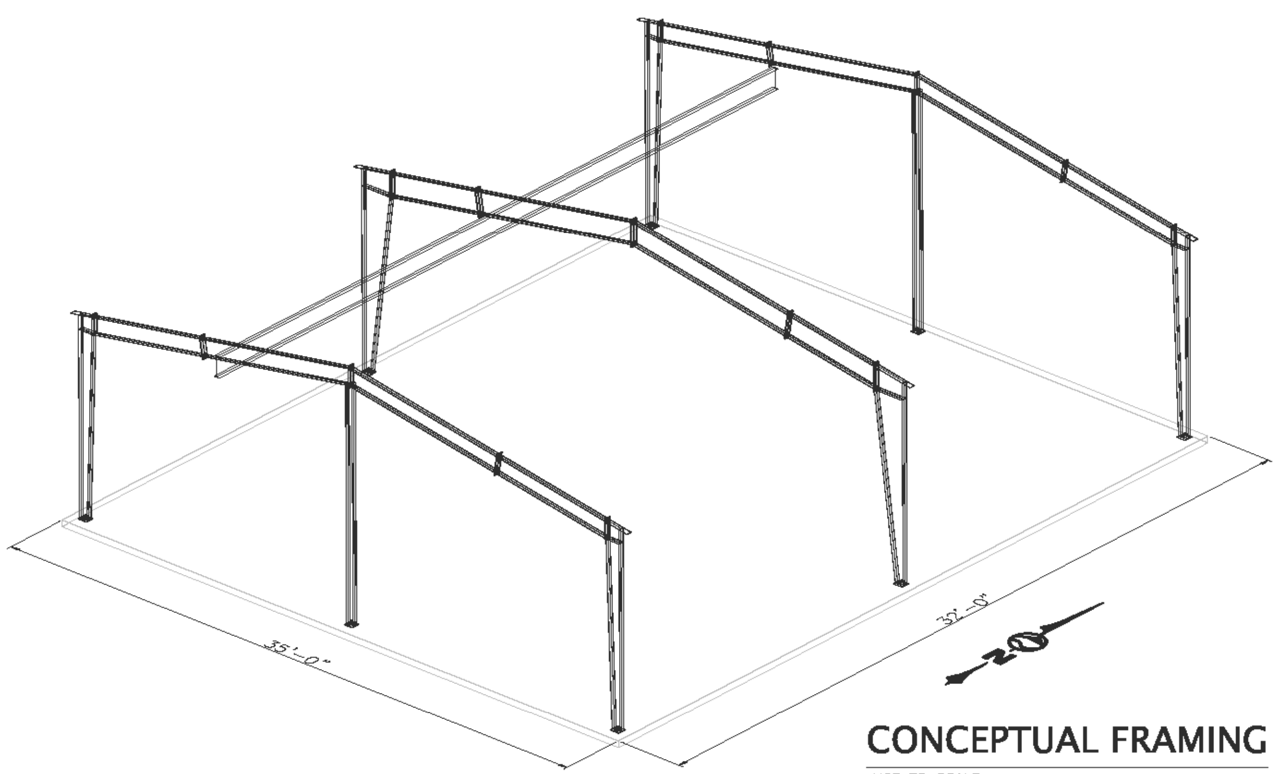

CONCEPTUAL FRAMING

NOT TO SCALE

CONTRACTOR SHALL PROVIDE PRE-ENGINEERED METAL BUILDING WITH SIMILAR COLUMN AND BRACING LAYOUT.

NO.	REVISIONS	BY	DATE

CIVIL STRUCTURAL SURVEY

WILSON ENGINEERING

WILSONENGINEERING.COM

DESIGNED BY JCC | DRAWN BY CJP | CHECKED BY

TOWN OF FRIDAY HARBOR

SAN JUAN COUNTY WASHINGTON

BIOSOLIDS HANDLING

DEWATERING BUILDING VIEWS

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APPENDIX B – SOLIDS HANDLING COST EVALUATION

Biosolids Handling - Cost Analysis
Friday Harbor WWTP
5-Nov-19

Year	Flow	**Belt Filter Press**	Projected		Hauling	Hauling Cost	Tipping Fee	**Centrifuge**	Projected		Hauling	Hauling Cost	Tipping Fee	**Dryer**	Projected		Hauling	Hauling Cost	Tipping Fee
					Assume One Trip Per Week						Assume One Trip Per Week						Assume One Trip Per Month		
			Wet Tons of Cake		Trips/Yr	$1,300	$58		Tons of Cake		Trips/Yr	$1,300	$58		Tons of Dry Biosolids		Trips/Yr	$1,300	$58
	gal/day	% Solids	per week	per year	52	per trip	per wet ton	% Solids	per week	per year	52	per trip	per wet ton	% Solids	per week	per year	12	per trip	per ton
2020	280,000	12	13.52	703.2	52	$67,600	$ 40,786	17	9.55	496.6	52	$67,600	$ 28,803	90	1.80	93.6	12	$15,600	$ 5,429
2021	287,000	12	13.86	720.8	52	$67,600	$ 41,806	17	9.79	509.0	52	$67,600	$ 29,523	90	1.85	95.9	12	$15,600	$ 5,565
2022	294,000	12	14.20	738.4	52	$67,600	$ 42,825	17	10.03	521.4	52	$67,600	$ 30,243	90	1.89	98.3	12	$15,600	$ 5,701
2023	301,000	12	14.54	756.0	52	$67,600	$ 43,845	17	10.27	533.8	52	$67,600	$ 30,963	90	1.94	100.6	12	$15,600	$ 5,837
2024	308,000	12	14.88	773.5	52	$67,600	$ 44,865	17	10.50	546.2	52	$67,600	$ 31,682	90	1.98	103.0	12	$15,600	$ 5,973
2025	315,000	12	15.21	791.1	52	$67,600	$ 45,885	17	10.74	558.7	52	$67,600	$ 32,402	90	2.03	105.3	12	$15,600	$ 6,109
2026	322,000	12	15.55	808.7	52	$67,600	$ 46,904	17	10.98	571.1	52	$67,600	$ 33,122	90	2.07	107.7	12	$15,600	$ 6,245
2027	329,000	12	15.89	826.3	52	$67,600	$ 47,924	17	11.22	583.5	52	$67,600	$ 33,842	90	2.12	110.0	12	$15,600	$ 6,381
2028	336,000	12	16.23	843.9	52	$67,600	$ 48,944	17	11.46	595.9	52	$67,600	$ 34,562	90	2.16	112.4	12	$15,600	$ 6,517
2029	343,000	12	16.57	861.4	52	$67,600	$ 49,963	17	11.70	608.3	52	$67,600	$ 35,282	90	2.21	114.7	12	$15,600	$ 6,653
2030	350,000	12	16.90	879.0	52	$67,600	$ 50,983	17	11.94	620.7	52	$67,600	$ 36,002	90	2.25	117.1	12	$15,600	$ 6,789
2031	357,000	12	17.24	896.6	52	$67,600	$ 52,003	17	12.18	633.1	52	$67,600	$ 36,722	90	2.30	119.4	12	$15,600	$ 6,925
2032	364,000	12	17.58	914.2	52	$67,600	$ 53,022	17	12.41	645.5	52	$67,600	$ 37,442	90	2.34	121.7	12	$15,600	$ 7,061
2033	371,000	12	17.92	931.8	52	$67,600	$ 54,042	17	12.65	658.0	52	$67,600	$ 38,162	90	2.39	124.1	12	$15,600	$ 7,197
2034	378,000	12	18.26	949.3	52	$67,600	$ 55,062	17	12.89	670.4	52	$67,600	$ 38,882	90	2.43	126.4	12	$15,600	$ 7,333
2035	385,000	12	18.59	966.9	52	$67,600	$ 56,082	17	13.13	682.8	52	$67,600	$ 39,602	90	2.48	128.8	12	$15,600	$ 7,469
2036	392,000	12	18.93	984.5	52	$67,600	$ 57,101	17	13.37	695.2	52	$67,600	$ 40,322	90	2.52	131.1	12	$15,600	$ 7,605
2037	399,000	12	19.27	1002.1	52	$67,600	$ 58,121	17	13.61	707.6	52	$67,600	$ 41,041	90	2.57	133.5	12	$15,600	$ 7,741
2038	406,000	12	19.61	1019.7	52	$67,600	$ 59,141	17	13.85	720.0	52	$67,600	$ 41,761	90	2.61	135.8	12	$15,600	$ 7,877
2039	413,000	12	19.95	1037.2	52	$67,600	$ 60,160	17	14.09	732.4	52	$67,600	$ 42,481	90	2.66	138.2	12	$15,600	$ 8,013
2040	420,000	12	20.29	1054.8	52	$67,600	$ 61,180	17	14.32	744.8	52	$67,600	$ 43,201	90	2.70	140.5	12	$15,600	$ 8,149
Cost (2019 dollars)						$ 1,419,600	$ 1,070,644					$ 1,419,600	$ 756,042					$ 327,600	$ 142,569
Total Cost (2019 dollars)							**$ 2,490,244**						**$ 2,175,642**						**$ 470,169**

APPENDIX C – CONSTRUCTION AND ENGINEERING COST ESTIMATES – NEW CENTRIFUGE FACILITY ALTERNATIVES

Town of Friday Harbor
WWTP - Dewatering Facility Improvements
Alternative 1 - Continue Dewatering with Existing Belt Filter Press Equipment
November 6, 2019

Item #	Description of Work	Cost for Labor and Materials Only	Cost Including Overhead & Profit	Construction Contingency Cost	Total Estimated Construction Cost (Yr-2020)
			20%	25%	
	Dewatering Building Improvements:				
1	Building Construction	$0	$0	$0	$0
2	New HVAC System for dewatering building	$0	$0	$0	$0
3	Foul Air Piping System for Bldg & Equipment	$0	$0	$0	$0
4	Concrete work (15 CY, Slab Repair, Supports, Equipment Pads, Curbs, Misc.)	$0	$0	$0	$0
5	Earthwork	$0	$0	$0	$0
6	Asphalt Pavement Restoration (0 tons x $400/ton)	$0	$0	$0	$0
7	New Rolling Door (10' W x 10' T), including wall rebuild	$0	$0	$0	$0
8	New 5 Ton Trolley Hoist with Steel Support System	$0	$0	$0	$0
9	Yard Piping to Building	$0	$0	$0	$0
10	Overhaul/Rebuild Existing Roediger Belt Filter Press	$276,000	$331,200	$69,000	$400,000
11	Polymer blend system	$0	$0	$0	$0
12	Polymer scale, ramp, and cradle	$0	$0	$0	$0
13	New Electrical Service, MCC, Feeders, & Instrumentation	$0	$0	$0	$0
14	Painting (misc. items)	$10,000	$12,000	$2,500	$15,000
15	Non Potable Water System (piping & valves for dewatering bldg only)	$0	$0	$0	$0
16	Misc Demo (existing piping, pavement, curb, sidewalk areas, etc.)	$0	$0	$0	$0
17	Removal and Salvage of Exist Dryer Equip & Appurtenances	$25,000	$30,000	$6,250	$36,000
	Conveyance and Sludge Storage Improvements:				
18	New Conveyor System	$55,000	$66,000	$13,750	$80,000
19	Two New 30 CY Sludge Storage Boxes ($10k EA)	$20,000	$24,000	$5,000	$29,000
20	Sludge Box Lid with Auger Conveyor, Supports, and Lift System	$130,000	$156,000	$32,500	$189,000
	Digester Improvements:				
21	New Sludge Feed Pump	$35,000	$42,000	$8,750	$51,000
22	New Concrete Top Slab for Digester Sludge Pump Area	$35,000	$42,000	$8,750	$51,000
23	Decant System for Digester (Piping, Valves, pH/DO/Level Sensor)	$81,120	$97,344	$20,280	$118,000
	Total Estimated Construction Cost =				$969,000
	Sales Tax (8.3%) =				$80,000
	Engineering/Permits/Survey (20%) =				$210,000
	Total =				$1,259,000

Town of Friday Harbor
WWTP - Dewatering Facility Improvements
Alternative 2 - Replace Belt Filter Press Equipment with Centrifuge Equipment (location = Existing Solids Building)
November 6, 2019

Item #	Description of Work	Cost for Labor and Materials Only	Cost Including Overhead & Profit	Construction Contingency Cost	Total Estimated Construction Cost (Yr-2020)
			20%	25%	
	Dewatering Building Improvements:				
1	Building Construction	$0	$0	$0	$0
2	New HVAC System for dewatering building	$10,000	$12,000	$2,500	$15,000
3	Foul Air Piping System for Bldg & Equipment	$8,000	$9,600	$2,000	$12,000
4	Concrete work (15 CY, Slab Repair, Supports, Equipment Pads, Curbs, Misc.)	$15,000	$18,000	$3,750	$22,000
5	Earthwork	$0	$0	$0	$0
6	Asphalt Pavement Restoration (0 tons x $400/ton)	$0	$0	$0	$0
7	New Rolling Door (10' W x 10' T), including wall rebuild	$22,000	$26,400	$5,500	$32,000
8	New 5 Ton Trolley Hoist with Steel Support System	$30,000	$36,000	$7,500	$44,000
9	Yard Piping to Building	$0	$0	$0	$0
10	One Andritz D4LL Centrifuge or equal (Capacity = 100 to 150 gpm)	$312,000	$374,400	$78,000	$452,000
11	Polymer blend system	$20,000	$24,000	$5,000	$29,000
12	Polymer scale, ramp, and cradle	$15,000	$18,000	$3,750	$22,000
13	New Electrical Service, MCC, Feeders, & Instrumentation	$200,000	$240,000	$50,000	$290,000
14	Painting (misc. items)	$20,000	$24,000	$5,000	$29,000
15	Non Potable Water System (piping & valves for dewatering bldg only)	$15,000	$18,000	$3,750	$22,000
16	Misc Demo (existing piping, pavement, curb, sidewalk areas, etc.)	$0	$0	$0	$0
17	Removal and Salvage of Exist Dewatering/Drying Equip & Appurtenances	$50,000	$60,000	$12,500	$73,000
	Conveyance and Sludge Storage Improvements:				
18	Screw Conveyor System (Shaftless, Configured for Reversing)	$55,000	$66,000	$13,750	$80,000
19	Two 30 CY Sludge Storage Boxes ($10k EA)	$20,000	$24,000	$5,000	$29,000
20	Sludge Box Lid with Auger Conveyor, Supports, and Lift System	$130,000	$156,000	$32,500	$189,000
	Digester Improvements:				
21	New Sludge Feed Pump (sized for new centrifuge equipment)	$35,000	$42,000	$8,750	$51,000
22	New Concrete Top Slab for Digester Sludge Pump Area	$35,000	$42,000	$8,750	$51,000
23	Decant System for Digester (Piping, Valves, pH/DO/Level Sensor)	$81,120	$97,344	$20,280	$118,000
	Total Estimated Construction Cost =				$1,560,000
	Sales Tax (8.3%) =				$129,000
	Engineering/Permits/Survey (20%) =				$338,000
	Total =				$2,027,000

Town of Friday Harbor
WWTP - Dewatering Facility Improvements
Alternative 3 - Construct New Dewatering Facility (with Centrifuge Equipment) Adjacent to Digester
November 6, 2019

Item #	Description of Work	Cost for Labor and Materials Only	Cost Including Overhead & Profit	Construction Contingency Cost	Total Estimated Construction Cost (Yr-2020)
			20%	25%	
	Dewatering Building Improvements:				
1	New Dewatering Building (HDG Steel Bldg, 32' x 35', 1120 SF, $100/SF)	$112,000	$134,400	$28,000	$162,000
2	New HVAC System for dewatering building	$20,000	$24,000	$5,000	$29,000
3	Foul Air Piping System for Bldg & Equipment	$15,000	$18,000	$3,750	$22,000
4	Concrete work (30 CY, Foundation, Supports, Equipment Pads, Curbs, Misc.)	$30,000	$36,000	$7,500	$44,000
5	Earthwork	$120,000	$144,000	$30,000	$174,000
6	Asphalt Pavement Restoration (75 tons x $400/ton)	$30,000	$36,000	$7,500	$44,000
7	New Rolling Doors (10' W x 10' T and 12' W x 12' T, 2 doors total)	$40,000	$48,000	$10,000	$58,000
8	New 5 Ton Trolley Hoist with Steel Support System	$30,000	$36,000	$7,500	$44,000
9	Yard Piping to Building	$75,000	$90,000	$18,750	$109,000
10	One Andritz D4LL Centrifuge or equal (Capacity = 100 to 150 gpm)	$312,000	$374,400	$78,000	$452,000
11	Polymer blend system	$20,000	$24,000	$5,000	$29,000
12	Polymer scale, ramp, and cradle	$15,000	$18,000	$3,750	$22,000
13	New Electrical Service, MCC, Feeders, & Instrumentation	$295,000	$354,000	$73,750	$428,000
14	Painting (misc. items)	$30,000	$36,000	$7,500	$44,000
15	Non Potable Water System (piping & valves for dewatering bldg only)	$15,000	$18,000	$3,750	$22,000
16	Misc Demo (existing piping, pavement, curb, sidewalk areas, etc.)	$35,000	$42,000	$8,750	$51,000
17	Removal and Salvage of Exist Dewatering/Drying Equip & Appurtenances	$50,000	$60,000	$12,500	$73,000
	Conveyance and Sludge Storage Improvements:				
18	Screw Conveyor System (Shaftless, Configured for Reversing)	$55,000	$66,000	$13,750	$80,000
19	Two 30 CY Sludge Storage Boxes ($10k EA)	$20,000	$24,000	$5,000	$29,000
20	Sludge Box Lid with Auger Conveyor, Supports, and Lift System	$130,000	$156,000	$32,500	$189,000
	Digester Improvements:				
21	New Sludge Feed Pump (sized for new centrifuge equipment)	$35,000	$42,000	$8,750	$51,000
22	New Concrete Top Slab for Digester Sludge Pump Area	$35,000	$42,000	$8,750	$51,000
23	Decant System for Digester (Piping, Valves, pH/DO/Level Sensor)	$81,120	$97,344	$20,280	$118,000
	Total Estimated Construction Cost =				$2,325,000
	Sales Tax (8.3%) =				$193,000
	Engineering/Permits/Survey (20%) =				$504,000
	Total =				$3,022,000

Town of Friday Harbor
WWTP - Dewatering Facility Improvements
Alternative 4 - Construct New Dewatering Facility (with Centrifuge Equipment) Adjacent to Headworks
November 6, 2019

Item #	Description of Work	Cost for Labor and Materials Only	Cost Including Overhead & Profit	Construction Contingency Cost	Total Estimated Construction Cost (Yr-2020)
			20%	25%	
	Dewatering Building Improvements:				
1	New Dewatering Building (HDG Steel Bldg, 32' x 35', 1120 SF, $100/SF)	$112,000	$134,400	$28,000	$162,000
2	New HVAC System for dewatering building	$20,000	$24,000	$5,000	$29,000
3	Foul Air Piping System for Bldg & Equipment	$15,000	$18,000	$3,750	$22,000
4	Concrete work (30 CY, Foundation, Supports, Equipment Pads, Curbs, Misc.)	$30,000	$36,000	$7,500	$44,000
5	Earthwork	$35,000	$42,000	$8,750	$51,000
6	Asphalt Pavement Restoration (100 tons x $400/ton)	$40,000	$48,000	$10,000	$58,000
7	New Rolling Doors (10' W x 10' T and 12' W x 12' T, 2 doors total)	$40,000	$48,000	$10,000	$58,000
8	New 5 Ton Trolley Hoist with Steel Support System	$30,000	$36,000	$7,500	$44,000
9	Yard Piping to Building	$150,000	$180,000	$37,500	$218,000
10	One Andritz D4LL Centrifuge or equal (Capacity = 100 to 150 gpm)	$312,000	$374,400	$78,000	$452,000
11	Polymer blend system	$20,000	$24,000	$5,000	$29,000
12	Polymer scale, ramp, and cradle	$15,000	$18,000	$3,750	$22,000
13	New Electrical Service, MCC, Feeders, & Instrumentation	$295,000	$354,000	$73,750	$428,000
14	Painting (misc. items)	$30,000	$36,000	$7,500	$44,000
15	Non Potable Water System (piping & valves for dewatering bldg only)	$15,000	$18,000	$3,750	$22,000
16	Misc Demo (existing piping, pavement, curb, sidewalk areas, etc.)	$35,000	$42,000	$8,750	$51,000
17	Removal and Salvage of Exist Dewatering/Drying Equip & Appurtenances	$50,000	$60,000	$12,500	$73,000
	Conveyance and Sludge Storage Improvements:				
18	Screw Conveyor System (Shaftless, Configured for Reversing)	$55,000	$66,000	$13,750	$80,000
19	Two 30 CY Sludge Storage Boxes ($10k EA)	$20,000	$24,000	$5,000	$29,000
20	Sludge Box Lid with Auger Conveyor, Supports, and Lift System	$130,000	$156,000	$32,500	$189,000
	Digester Improvements:				
21	New Sludge Feed Pump (sized for new centrifuge equipment)	$35,000	$42,000	$8,750	$51,000
22	New Concrete Top Slab for Digester Sludge Pump Area	$35,000	$42,000	$8,750	$51,000
23	Decant System for Digester (Piping, Valves, pH/DO/Level Sensor)	$81,120	$97,344	$20,280	$118,000
	Total Estimated Construction Cost =				$2,325,000
	Sales Tax (8.3%) =				$193,000
	Engineering/Permits/Survey (20%) =				$504,000
	Total =				$3,022,000

APPENDIX D – CENTRIFUGE EQUIPMENT PROPOSALS

Friday Harbor WWTP – Friday Harbor, WA
Budget Information – Centrifuges – D4LL Option

To: Wilson Engineering – Bellingham, WA
Attn: Jeff Christner

Ref: 3195587-1-Rev-A
Date: 5-Sep-2019

Design Criteria

Sludge Description:	Waste Activated Sludge from SBR, aerated in a digester
Sludge volume to dewatering:	95,000 gallons per week
Feed solids concentration:	0.4% TS currently
Dewatering operation:	1 duty unit, 2 days per week x 6-7 hours per day
Design hydraulic load per unit:	120-140 gpm
Design solids load per unit:	240-280 lb/hr

Equipment Selection and Expected Performance

Recommended model:	ANDRITZ D4LL
Thickened solids discharge:	16-18% TS
Solids capture efficiency:	>95% TSS
Polymer dosage:	confirm by testing

Note: Equipment performance and polymer dosage subject to a lab test on a representative sample of sludge

Scope of Supply

1. One (1) Andritz D4LL Centrifuge
2. One (1) NEMA 4X SS304L Control Panel with Allen-Bradley PLC, PF755 Series VFDs and 10" OIT
3. Startup and Training – 1 trip x 5 days on site
4. Freight to jobsite

Budget Pricing

1.	One (1) D4LL centrifuge with NEMA 4X control panel:	$260,000.00 USD
2.	One (1) D4LL skid-mounted centrifuge c/w sludge feed pump, sludge flow meter, emulsion polymer system, discharge screw conveyor, NEMA 4X control panel:	$420,000.00 USD

Prepared by:
Denis Piché
ANDRITZ
Tel: 403-650-4131
denis.piche@andritz.com

Local Representative:
APSCO LLC
Joe Buckman
Tel: 541-602-3016
jbuckman@apsco-llc.com

DECANTER D4LL

TECHNICAL DESCRIPTION

CHARACTERISTICS

Size (L x W x H)	3820 x 1100 x 1500 mm (150 x 43 x 59 in)
Empty weight with driving system	2,650 Kg (5840 lb)
Full weight with water	3,180 kg (7010 lb)
Product inlet	DN50 (2 in)
Solids outlet	Flange : 495 x 318 mm inside (19.5 x 12.5 in)

MATERIAL OF CONSTRUCTION

Bowl (Centrifugally Cast) :	2304 Duplex SS
Scroll and other wetted parts :	SS 316L
Frame	Painted carbon steel
Cover	Fiberglass

BOWL

Inner diameter	430 mm (16.9 in)
Total length	2021 mm (79.6 in)
L/D ratio	4.7
Nominal speed	3200 rpm
Maximum speed	3600 rpm
G-value at maximum speed	3115

POND DEPTH ADJUSTMENT

Type	Adjustable weir plates TurboJet nozzles optional

SCROLL

Type	Counter-current design, High Performance HP2
Total length scroll with lifting beam for removal	2580 mm (101.6 in)
Total weight scroll with lifting beam for removal	390 kg (860 lb)

WEAR PROTECTION

Inner bowl surface	Integral machined grooves
Scroll edges	Field-Replaceable tungsten carbide tiles full length
Scroll feed chamber (distributor)	Tungsten carbide
Conveyor feed ports	Field-Replaceable tungsten carbide nozzles
Solids Discharge Ports	Field-Replaceable tungsten carbide nozzles
Bowl discharge (diffuser)	SS 316L

PAINT

Frame and parts in cast iron or steel	Epoxy coating (RAL 5015), Primary (60µ) – Finish (60µ)

SEALS AND LUBRICATION

Seals	BUNA N (Nitrile), maximum temperature 80°C
Lubrication	All bearing blocks are lubricated with grease The reducer is lubricated with grease

DRIVE SYSTEM

Bowl speed + scroll speed adjustment	VFD
Main motor + frequency inverter	37 kW (50 HP)
Secondary motor + frequency inverter	7.5 kW (10 HP)
Connected load (Regenerative Drive System)	37 kW (50 HP)
Cyclo reducer (gearbox), nominal torque	5000 N-m

MOTORS

Brand	BALDOR or similar
Voltage	460V / 3 ph / 60Hz (575V for Canada)
Speed	1800 rpm
Frame	Cast iron
Rating	NEMA MG-1
Service Factor	1.15
Insulation	Class F

CONTROLS

Control/Starter Panel (CCP)	NEMA 4X SS304 Panel, CSA/UL508 Listed
PLC	Allen-Bradley Compact Logix
OIT	Allen-Bradley PanelView Plus OIT
VFD	Allen-Bradley 755 Series
Communication	Ethernet
Area Classification for Centrifuge and Panel	General/Non-Hazardous

SCROLL SPEED ADJUSTMENT

Type	Frequency inverter with secondary motor
Differential Speed Range	0 - 15 rpm
Control Modes	Automatic torque control

FACTORY ACCEPTANCE TEST VALUES

Noise Level	<85 dB(A) sound pressure in free field, measured at operational speed from 1 meter while empty (according to specific data sheet, 20µPa).
Vibration Level	<4.5 mm/s max. (registered on test bench at operational speed according ISO 10816-1)

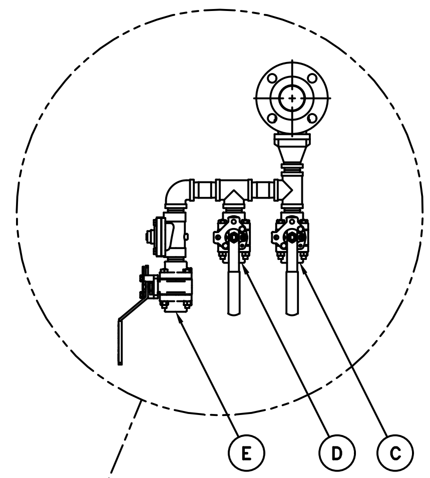
UTILITIES

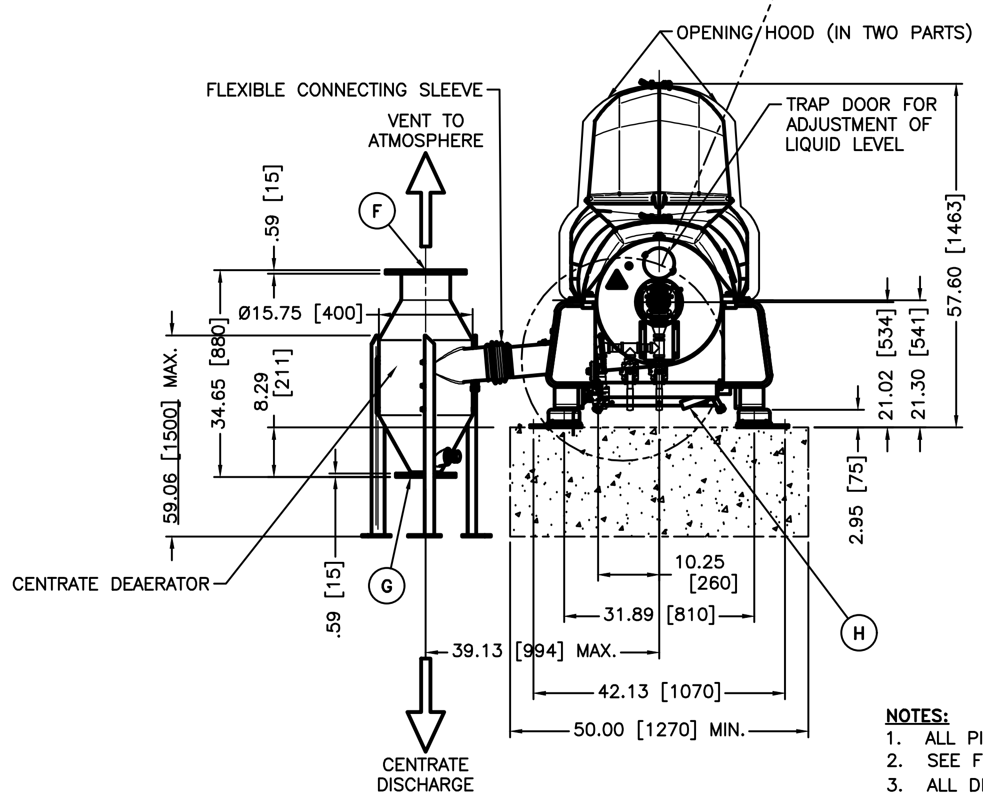
Sludge feed pressure	0.5 bar (7.5 psi) at sludge feed connection
Wash water flow rate	8 - 16 m3/hr (35-70 gpm)
Wash water quality and pressure	industrial water supply / 3-4 bars (40-50 psi)
Wash time for clean-in-place and shutdown	10 minutes for cip / 15 minutes for shut-down
Air evacuation (de-aerator supplied)	200 m3/hr (120 cfm)
Average calorific emission	3440 Kcal/hr

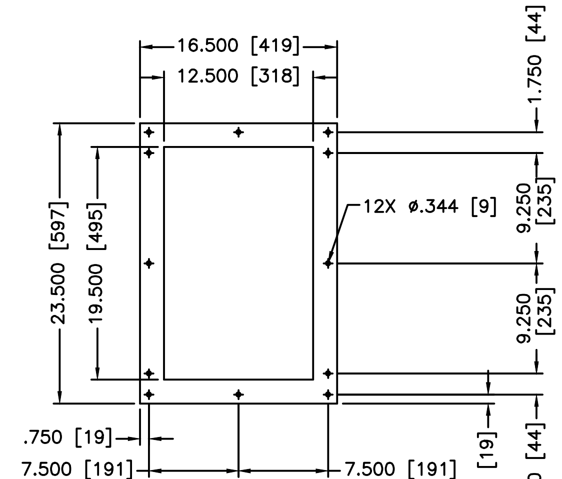
MAINTENANCE EQUIPMENT

Special Tools Supplied with Equipment	1 Scroll lifting beam 1 Scroll thrust bearing extractor 1 Pin extractor 1 Greasing set 1 set of wrenches 1 set of threaded rods 1 grease pump 1 tool box

PIPING CONNECTIONS		
PORT	SIZE	DESCRIPTION
A	2" CLASS 150 ANSI RF FLANGE	FEED INLET
B	RECTANGULAR 12-1/2" x 19-1/2"	SOLIDS DISCHARGE
C	1" FNPT	SLUDGE SAMPLE
D	1" FNPT	POLYMER CONNECTION
E	1" FNPT	WASHWATER CONNECTION
F	8" CLASS 150 ANSI FF FLANGE	VENT
G	5" CLASS 150 ANSI FF FLANGE	CENTRATE DISCHARGE
H	ø1.181"	FRAME DRAIN



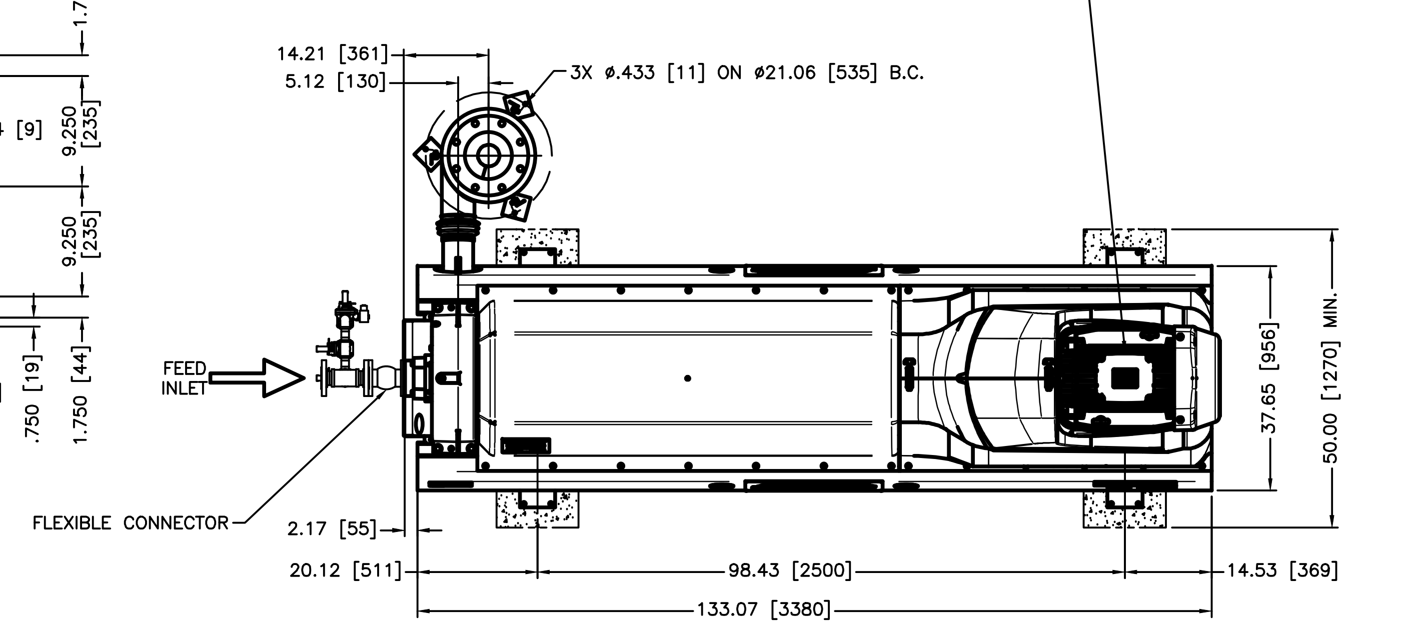


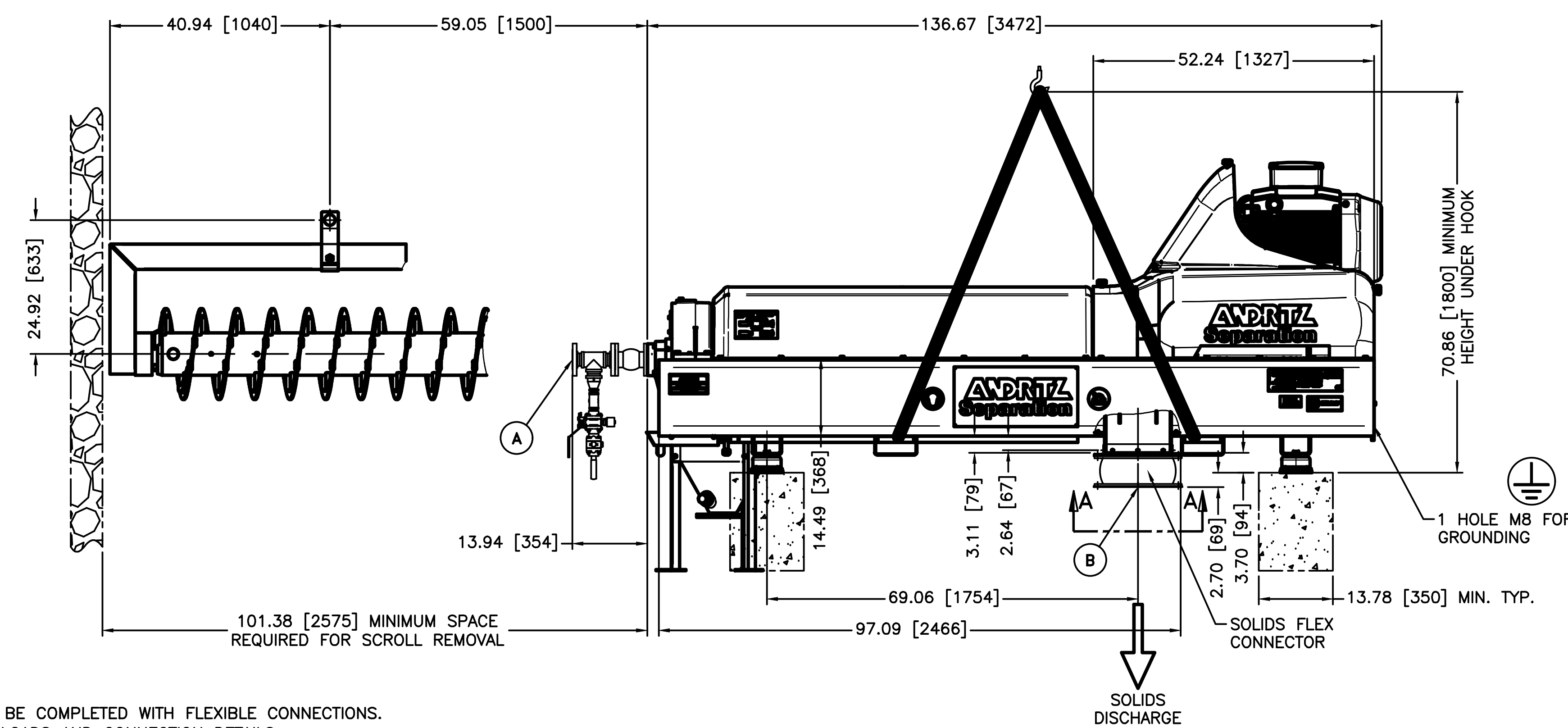


VIEW A–A

SOLIDS DISCHARGE FLANGE PATTERN
SCALE: 2X

NOTE: KEEP MOTOR CONDUITS AWAY FROM FRONT OF FIBERGLASS GUARDS. RUN MOTOR CONDUITS TOWARD REAR OF MACHINE TO ALLOW FOR COVER AND REMOVAL.





NOTES:
1. ALL PIPING TO AND FROM MACHINE TO BE COMPLETED WITH FLEXIBLE CONNECTIONS.
2. SEE FOUNDATION DETAILS FOR DESIGN LOADS AND CONNECTION DETAILS.
3. ALL DIMENSIONS ARE IN INCHES WITH mm IN [ ].
4. DRY WEIGHT OF MACHINE: 5,838 LBS [2,648 KG]
5. SCROLL+LIFTING BEAM: 862 LBS [391 KG]
6. NOISE LEVEL AT OPERATION SPEED: 82 dBA.
7. PROCESS REQUIREMENTS:
   WASHWATER: 35.2–70.4 GPM @ 43.5–58 PSI
   SHUTDOWN: 15 MIN
   CIP: 10 MIN
   AIR FLOW: 118 CFM
   MINIMUM SLUDGE INLET PRESSURE: 7.5 PSI AT CENTRIFUGE FEED FLANGE.
8. ALL CHUTES TO BE SUPPORTED BY OTHERS UNLESS NOTED OTHERWISE.
9. FRAME DRAIN TO BE CONNECTED TO CENTRATE PIPING WITH FLEXIBLE TUBUNG (SUPPLIED BY OTHERS).

FOR INFORMATION ONLY
NOT FOR CONSTRUCTION PURPOSES

SIMILAR TO DMA1643

AST No.–

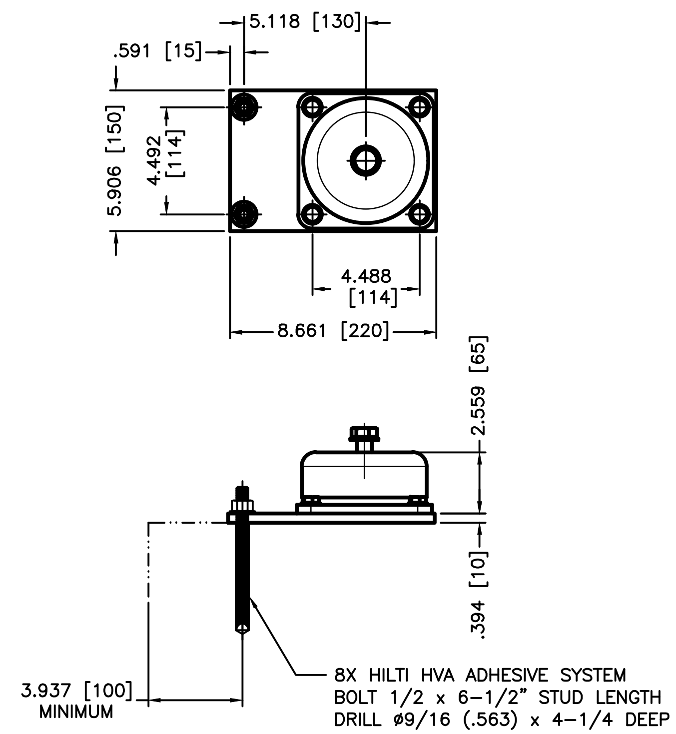
ESTIMATED WEIGHT IN LBS: –	DRAWN BY: JLK	DATE 9/26/18
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: MW	DATE 9/26/18
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE D4LL R17 CENTRIFUGE
D4LL R17 CENTRIFUGE GENERAL ARRANGEMENT

SIZE	DRAWING NUMBER	REV
D	DMA2778	0
SCALE 1/16	FILE DMA2778	SHEET 1 OF 1

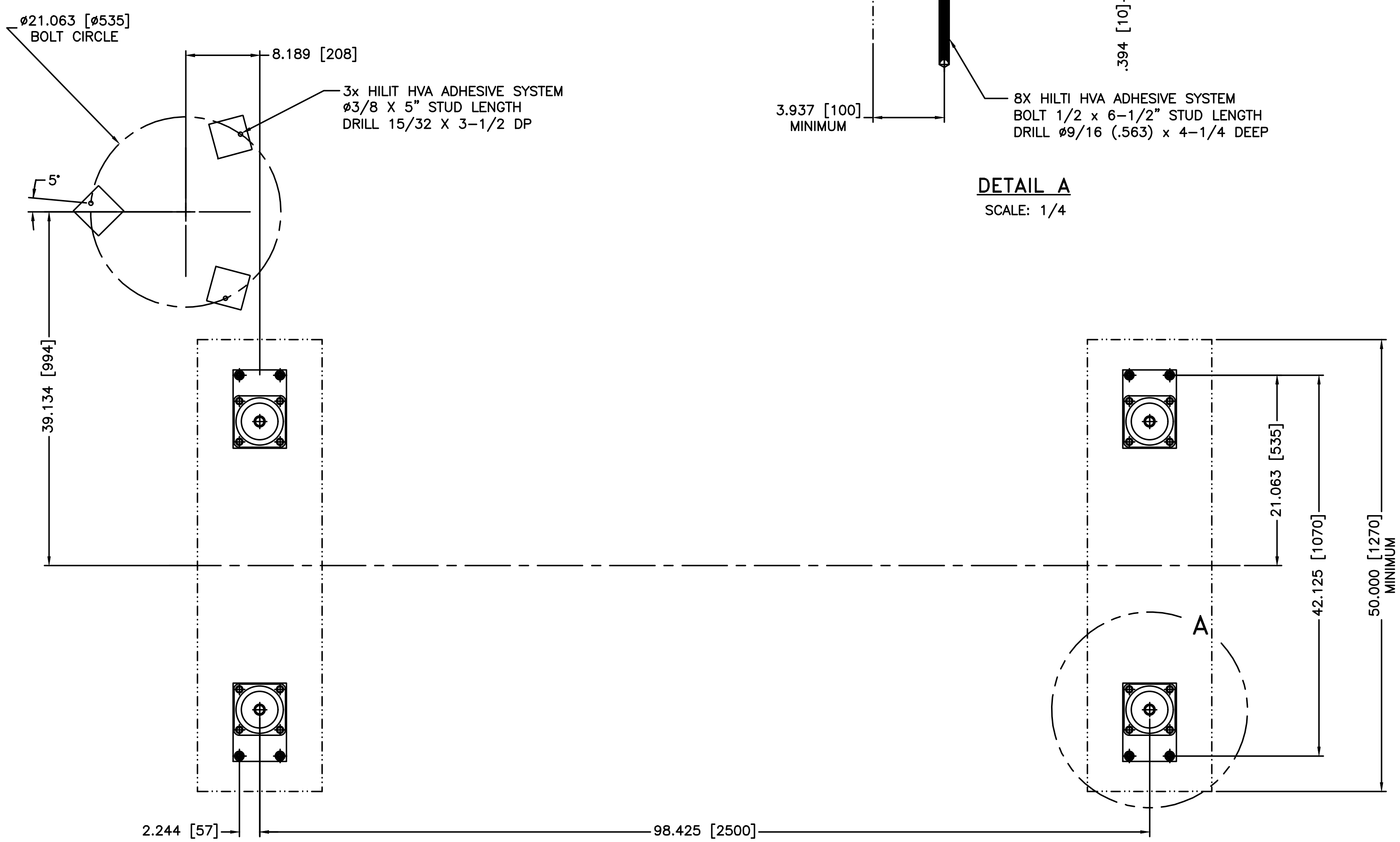


DETAIL A

SCALE: 1/4

ISOLATOR NOTE!

APPLY LOCTITE TO ALL VIBRATION ISOLATOR HARDWARE DURING INSTALLATION.



THEORETICAL TOTAL LOAD TO DISTRIBUTE AMONG THE 4 ISOLATORS (IN NORMAL OPERATION)						
STATIC LOAD		VERTICAL DYNAMIC LOAD IN LB. CYCLING FORCE EQUIVALENT TO UNBALANCE PERPENDICULAR TO THE ROTOR AXIS AND APPLIED ON THE CENTER OF GRAVITY				
WEIGHT OF EMPTY MACHINE	5,838 LBS [25,969 N]		MACHINE SPEED	EQUIPMENT FREQUENCY	BEFORE ISOLATOR	AFTER ISOLATOR
x 1.2 (WITH PRODUCT)=	7,006 LBS [31,164 N]	IN NORMAL OPERATION	2500 rpm	41.7 Hz.	663 LBS [2,950 N]	14 LBS [59 N]
			3000 rpm	50 Hz.	818 LBS [3,640 N]	16 LBS [73 N]
			3500 rpm	58.3 Hz.	922 LBS [4,100 N]	18 LBS [82 N]
		AT ISOLATORS RESONANCE	400 rpm	6.7 Hz.	86 LBS [384 N]	605 LBS [2,690 N]

THEORETICAL PRACTICAL LOAD TO CONSIDER FOR CALCULATION OF THE FOUNDATION (TO DISTRIBUTE AMONG THE 4 ISOLATORS)		
VERTICAL	STATIC=	5,838 LB x 1.2 = 7,006 LB
	+DYNAMIC*=	7,006 LB x 10% = 701 LB
	TOTAL=	7,707 LB
HORIZONTAL	DYNAMIC=	7,706 LB x 10% = 701 LB
(*) DURING SHUT DOWN OF MACHINE OR IN CASE OF ABNORMAL OR ACCIDENTAL UNBALANCE		

NOTES:

1. ALL DIMENSIONS ARE IN INCHES WITH mm IN [ ].
2. THE FOUNDATION DESIGN SHOWN INDICATES MINIMUM REQUIREMENTS FOR CLEARANCE AND DRAINAGE. ACTUAL FOUNDATION DESIGN AND CONSTRUCTION TO BE FURNISHED BY OTHERS.
3. ALL PIPING TO AND FROM THE MACHINE TO BE COMPLETED WITH FLEXIBLE CONNECTIONS.
4. ALL VIBRATION ISOLATION PADS TO BE LEVEL TO WITHIN 1/32".
5. APPROXIMATE WEIGHT:
   TOTAL MACHINE EMPTY: 5,838 lbs [2,648 kg]
   SCROLL+LIFTING BEAM: 862 lbs [391 kg]

FOR INFORMATION ONLY
NOT FOR CONSTRUCTION PURPOSES

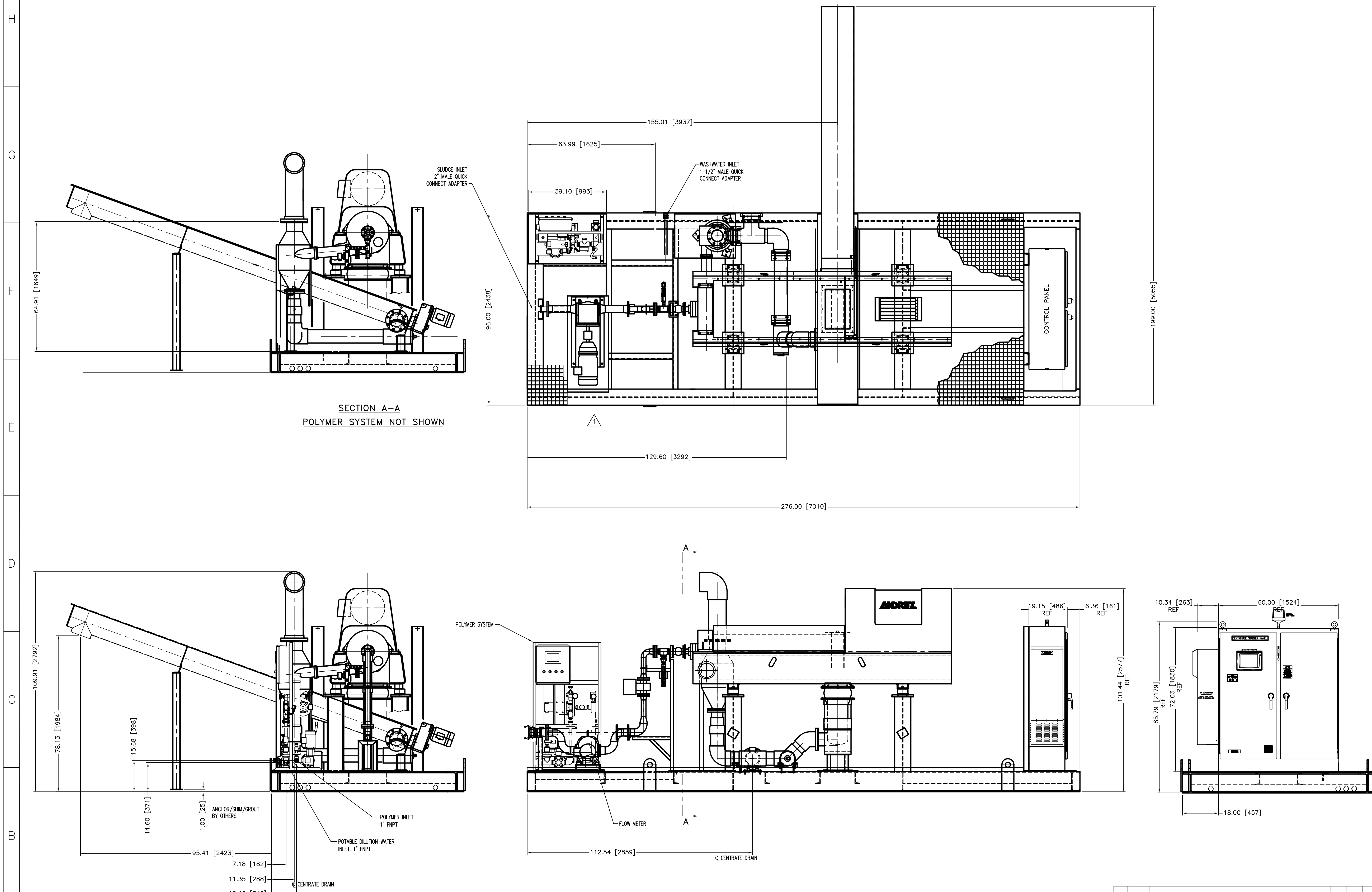
ESTIMATED WEIGHT IN LBS:	DRAWN BY: JLK	DATE 9/26/18
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: MW	DATE 9/26/18
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER	THIRD ANGLE PROJECTION	

ANDRITZ
ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE D4LL R17 CENTRIFUGE

D4LL R17 CENTRIFUGE
FOUNDATION DETAILS

SIZE	DRAWING NUMBER	REV
D	DMF1509	0
SCALE 1/8	FILE DMF1509	SHEET 1 OF 1



REV	EIR	REVISION	BY	APVD	DATE
1		REMOVE WWBP, ADD SLDG PUMP, 1-1/2 INLET QC, PIPE SUP'S	RH	RJH	7.27.10

ASAP No. –

ANDRITZ SEPARATION, Inc.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION
BY: RH DATE: 9.01.10
PROJECT No. 806341
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

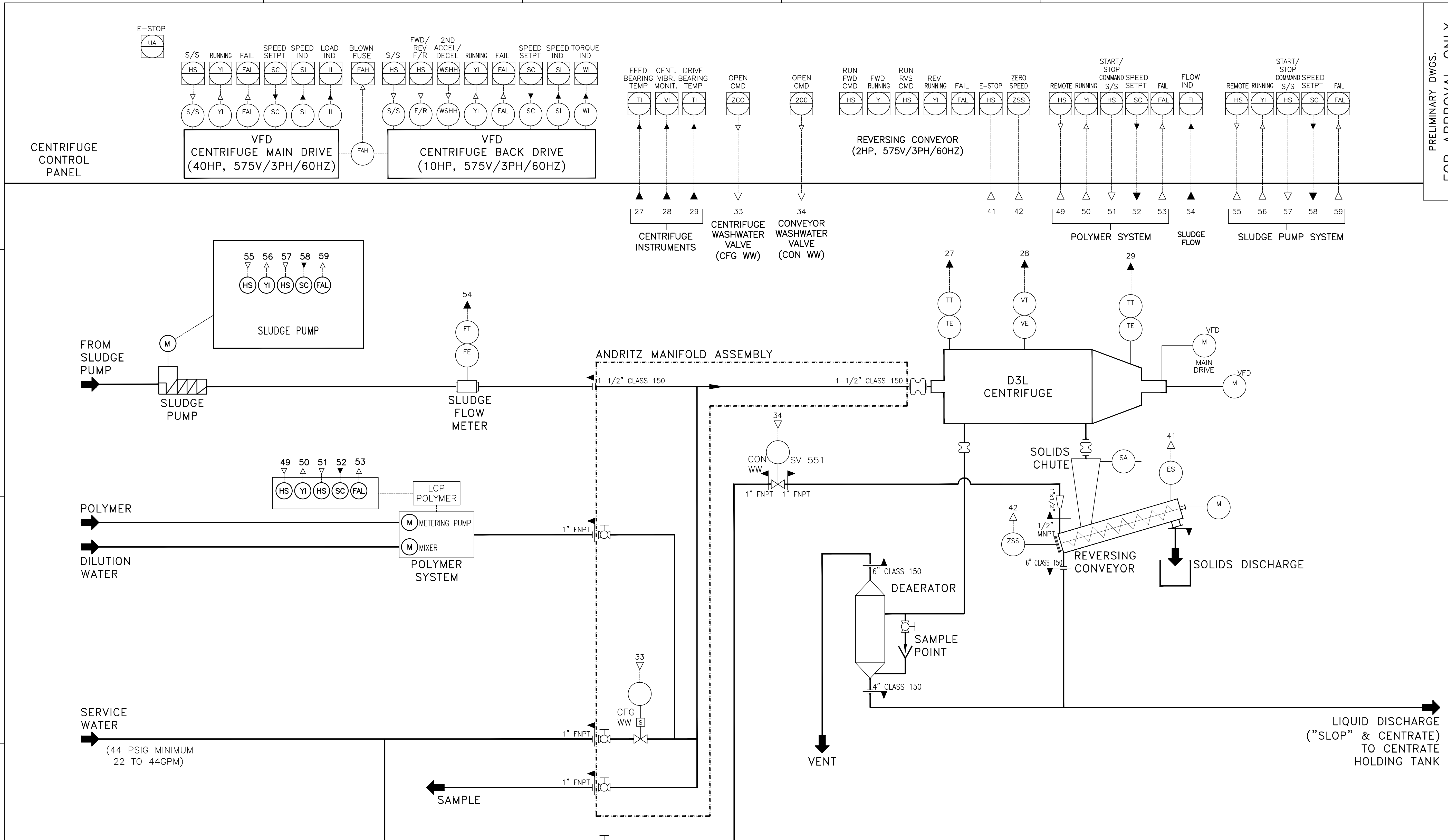
ESTIMATED WEIGHT IN LBS:
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

DRAWN BY: RJH	DATE 7.14.09
CHECKED BY:	DATE
APPROVED BY: RJH	DATE 7.14.09
THIRD ANGLE PROJECTION	

ANDRITZ
ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE
D4L CENTRIFUGE SKID
BELLE VERNON, PA
SKID ARRANGEMENT

SIZE	DRAWING NUMBER	REV
E	M806341-2	1
SCALE 1/16	FILE M806341-2	SHEET 1 OF 1



NOTE:

1. CENTRIFUGE, SOLIDS CHUTE, DEAERATOR AND SCREW CONVEYOR SHIP LOOSE FOR FIELD INSTALLATION BY OTHER THAN ANDRITZ.
2. CON WW SOLENOID SUPPLIED BY ANDRITZ, INSTALLED BY OTHERS.
3. SLUDGE PUMP, SLUDGE FLOW METER, POLYMER SYSTEM, AND ANY OTHER ITEMS NOT SPECIFICALLY MENTIONED IN ANDRITZ PROPOSAL ARE SELECTED, DESIGNED, SUPPLIED AND INSTALLED BY OTHER THAN ANDRITZ.

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE. 0 1"

PRELIMINARY DWGS. FOR APPROVAL ONLY

ANDRITZ
ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
(817) 465-5611

REV	REVISION	DATE
A	FOR APPROVAL	01/04/18

DRAWN BY: HL DATE: 01/04/18
CHECKED BY: CMP DATE: 01/04/18
APPROVED BY: DATE: 01/04/18
SCALE: NONE FILE: 825653PI101
SIZE: D3L

JOB NAME: D3L CENTRIFUGE VERMILION WWTF
TITLE: P&ID
PROJECT NUMBER
DRAWING NUMBER: PI-101 REV: A
SHEET 2 OF 2

Alfa Laval ALDEC range of decanter centrifuges

High-performance decanter for sludge thickening and dewatering

Applications

The Alfa Laval ALDEC range of decanter centrifuges are designed with a focus on cost-efficiency, reliability and easy operation. They are used for thickening and dewatering of sludge from municipal and industrial water and waste treatment plants.

ALDEC decanter centrifuges are capable of handling a wide range of flow rates. They are designed to be efficient, simple to install, easy to maintain and straightforward to operate. Installation, operating and service life costs are minimal.

Benefits

The ALDEC decanter centrifuge design provides a series of practical benefits:

- Reduces sludge volume, which cuts down on transport and disposal costs
- High capacity at small footprint: Compact, modular design saves space
- High performance combined with low energy consumption.

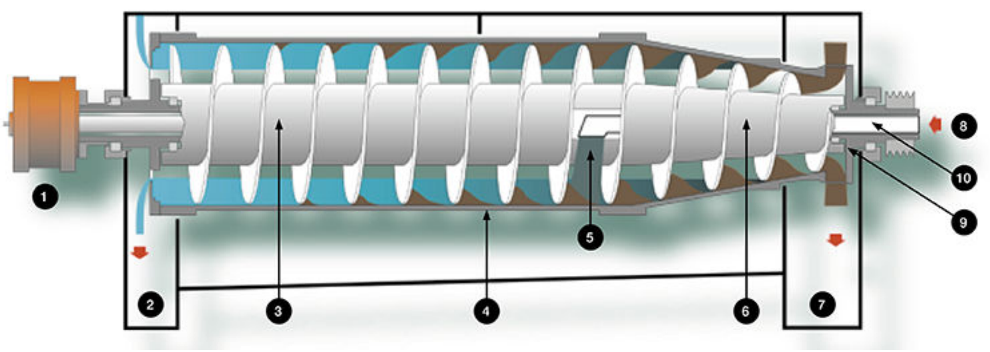
Design

The rotating part of ALDEC decanter centrifuges is mounted on a compact, in-line frame, with main bearings at both ends. Vibration dampers are placed under the frame. The rotating part is enclosed in a casing with a stainless steel cover and a bottom section with integrated outlets for both solids and the liquid being removed.

Working principle

Working principle Separation takes place in a horizontal cylindrical bowl equipped with a screw conveyor (see diagram). The feed enters the bowl through a stationary inlet tube and is accelerated smoothly by an inlet distributor. The centrifugal force that results from this rotation then causes sedimentation of the solids on the wall of the bowl.

The conveyor rotates in the same direction as the bowl, but slightly slower, thus moving the solids towards the conical end of the bowl. The cake leaves the bowl through the solids discharge openings into the casing. Separation takes place throughout the entire length of the cylindrical part of the bowl, and the clarified liquid leaves the bowl by flowing over adjustable plate dams into the casing.



1: Gearbox
2: Liquid
3: Screw conveyor
4: Wall of the bowl
5: Inlet distributor
6: Conical end
7: Solids
8: Feed inlet
9: Discharge ports
10: Feed tube

Features

- Critical parts made of wear-resistant material
- Fully open feed zone for improved separation
- 360° solids discharge to avoid blocking
- Baffle disc provides higher capacity and drier cake solids
- Steep or shallow cone configuration for optimum separation of any type of slurry
- Special conveyor designs to suit particular types of slurry
- Different kinds of wear protection for conveyor flights, to suit any particular processing requirements
- Complete, fully enclosed cleaning-in-place (CIP)
- Floater disc for light particle removal (optional)

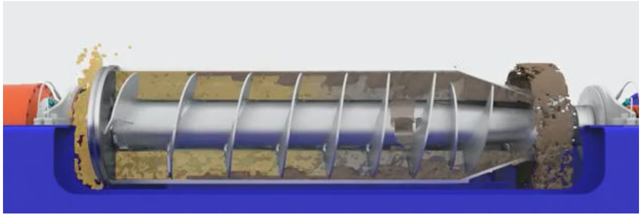


Figure 1. Steep cone configuration

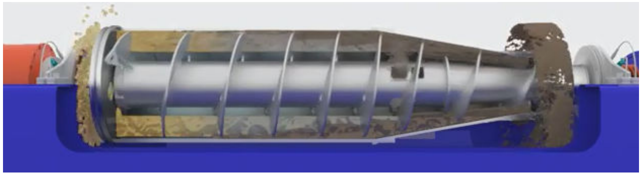


Figure 2. Shallow cone configuration

Process optimization

ALDEC decanter centrifuges can be adjusted to suit specific requirements by varying

- Bowl speed to obtain the G-force required for the most efficient separation
- Conveying speed for the most efficient balance between liquid clarity and solids dryness
- Pond depth in the bowl for the most efficient balance between liquid clarity and solids dryness

Drive system

In all ALDEC decanter centrifuges, the bowl is driven by an electric motor and a V-belt transmission drive. Power is transferred to the conveyor via a planetary or Direct Drive gearbox. For smaller ALDEC decanters, countershaft transmission is an option.

Operation can either be pre-set to a suitable set of parameters, or the difference between the speeds of the bowl and the conveyor can be controlled automatically, with no need for changing belts or pulleys.

Materials

The bowl, conveyor, inlet tube, outlets, cover and other parts in direct contact with process media are all made of stainless steel. The discharge ports, conveyor flights and feed zone are protected with materials that are highly resistant to erosion. Various types of additional optional wear protection can be added, including conveyor flights protected with flame-sprayed hard surfacing, and/or sintered tungsten carbide tiles. The frame is made of mild steel with an epoxy enamel finish. Different materials are available to meet different requirements.

Figure 3. Solids discharge, free from blocking

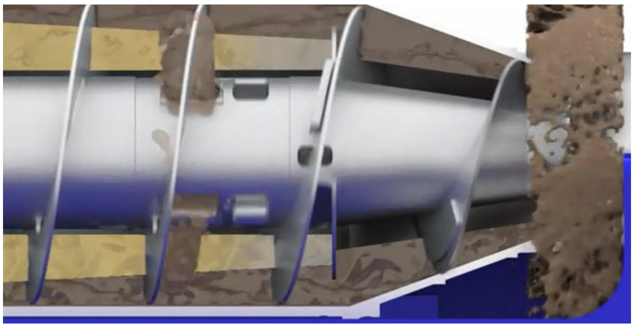


Figure 4. Baffle disc provides higher capacity and drier solids

Figure 5. Sintered tungsten carbide tiles as wear protection for conveyor flights

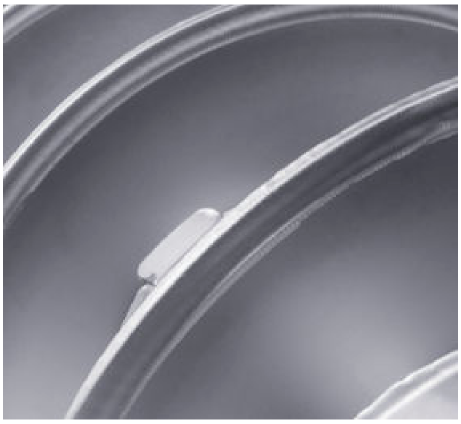


Figure 6. Flame sprayed tungsten carbide wear protection on conveyor flights

Automation

Each decanter centrifuge in the ALDEC range equipped with a variable frequency drive (VFD) is delivered with the Basic control package as standard. This package is capable of fully controlling operation of the decanter, ensuring the most efficient performance and keeping costs for installation, commissioning, operation and maintenance to a minimum. The controller is also designed to measure the temperature of the bearings, and to monitor vibration levels.

An upgrade to the Plus control package is also available as an option for ALDEC 45 models and upwards.

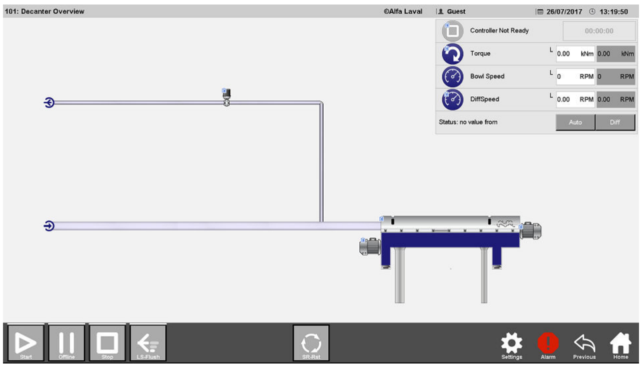
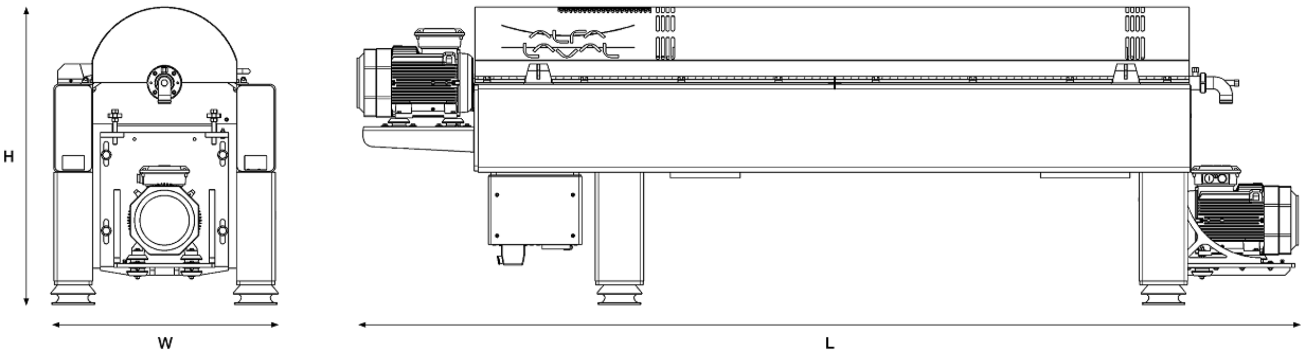


Figure 7. Decanter overview



Technical specifications

Designation	ALDEC 10	ALDEC 20	ALDEC 30	ALDEC 45	ALDEC 75
Length	2150 mm / 85 in	2936 mm / 116 in	3216 mm / 127 in	3998 mm / 168 in	4749 mm / 195 in
Width	580 mm / 23 in	780 mm / 31 in	780 mm / 31 in	990 mm / 39 in	1060 mm / 42 in
Height	762 mm / 30 in	930 mm / 37 in	930 mm / 37 in	1304 mm / 51 in	1376 mm / 54 in
Maximum weight	375 kg / 830 lbs	1125 kg / 2459 lbs	1200 kg / 2660 lbs	2300kg / 5071 lbs	3200 kg / 7050 lbs
Main drive size	4-11 kW / 5-15 hp	11-18.5 kW / 15-25 hp	11-18.5 kW / 15-25 hp	11-22 kW / 15-30 hp	11-45 kW / 50 hp
Back drive size	3 kW / 4 hp	7.5 kW / 10 hp	7.5 kW / 10 hp	5.5-11 kW / 7 hp	5.5-15 kW / 7 hp
Back drive control	CS* or VFD**	CS* or VFD**	CS* or VFD**	CS* or VFD**	CS* or VFD**
*Countershaft fixed differential speed					
**Variable frequency drive					

Designation	ALDEC 85	ALDEC 105	ALDEC 115	ALDEC 125
Length	5076 mm / 200 in	5842 mm / 230 in	6502 mm / 256 in	6901 mm / 264 in
Width	1140 mm / 45 in	1300 mm / 51 in	1450 mm / 57 in	1510 mm / 60 in
Height	2146 mm / 84 in	1696 mm / 67 in	1791 mm / 71 in	1852 mm / 73 in
Maximum weight	4900 kg / 10,800 lbs	5000 kg / 11,023 lbs	6500 kg / 14,300 lbs	8600 kg / 18,959 lbs
Main drive size	22–75kW / 30–125 hp	30-110 kW / 40-200 hp	37-160 kW / 50-200 hp	55-250 kW / 75-350 hp
Back drive size	5.5-22 kW / 7,5–40 hp	15- 30 kW / 30 hp	15-30 kW / 20-40 hp	22-37 kW / 30-50 hp
Back drive control	VFD*	VFD*	VFD*	VFD*
*Variable frequency drive				

200000334-3-EN-GB

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com

Jeff Christner

From:	Sipke Verbeek
Sent:	Wednesday, September 11, 2019 7:09 PM
To:	Jeff Christner
Cc:	Mike Reilly; John Moccero; Scott Wilson
Subject:	RE: Friday harbor WWTP
Attachments:	61244126_v6_DIMENSIONED_DRAWING.pdf

Hi Jeff,

If we use 6 hours per day of operation and 2 days a week – they need to run 132GPM to process 95.000 Gallons per week.
We can do this with one (1) 17" bowl machine, the ALDEC75. This machine will go up to 150GPM as well, with a feed concentration of 4000mg/l.

I have attached the general layout drawing for this machine.

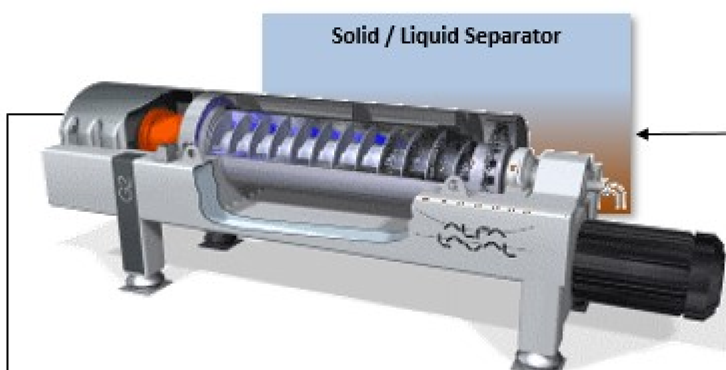
We have this machine on a trailer in case you want to run a pilot.

BR/Sipke.

Mass balance:

95.000	GPW
2,00	Days

6,0 hours/day



Product / Feed			US Units	
Flow rate	30,0	m^3 / h	131,95	GPM
	179,8	m3 / day	47.501	GPD
DS % in	0,40	% wt	0,40	% wt
	4.000	mg / l	4.000	mg / l
Density	1,0	kg / l	1,0	kg / l
Mass flow	119,9	kg / h	264,3	lbs / h
	719,2	kg / day	1.585,6	lbs / day

0,20%

Dilution Water			US Units	
Flow rate	0,00	m^3 / h	0,00	GPM

Polyelectrolite Dose			US Units	
Concentration of solution	0,40	%	0,4	%
Activity (trade product)	50,0	%	50,0	%
Active concentration	0,20	%	0,2	%
Density (trade product)	1,0	kg / l	1,0	kg / l
Dosing rate (100% active)	10,0	g / kg DS	20,0	lbs/t
Total flow rate (PE + water)	0,60	m^3 / h	2,64	GPM
Water flow rate	0,60	m^3 / h	2,63	GPM
Mass flow (trade product)	2,40	kg / h	5,3	lbs/ h
Flow rate (trade product)	2,40	l / h	0,0105	GPM
Mass flow (active polymer)	1,20	kg / h	2,6	lbs/h
Mass flow (active polymer)	80,00	ppm		

Effluent Outlet			US Units	
DS % out	0,0500	% wt	0,0500	% wt
Suspended solids conten	500,0	mg / l	500	mg / l
Flow rate	30,0	m^3 / h	131,9	GPM
	179,9	m3 / day	47.485	GPD
Recovery SS	91,9	%	91,9	%
Mass flow SS	15,0	kg / h	33,0	lbs / h
	89,9	kg / day	197,9	lbs / day

Solids Outlet			US Units	
DS % out	18,00	% wt	18,00	% wt
Flow rate	0,59	m^3 / h	2,59	GPM
	3,54	m3 / day	933,5	GPD
Mass flow	106,1	kg / h	233,4	lbs / h
	636,5	kg / day	1400,3	lbs / day

Sipke Verbeek
Business Development Manager

Business Unit Decanters

Mobile USA: 312 878 2597
Mobile NL: +31 6 29704919

Alfa Laval Inc (US)
5400 International Trade Drive - Richmond, VA 23231 - United States
Tel switchboard: 804 222 5300

Alfa Laval Copenhagen A/S
Maskinvej 5 - DK-2860 Søborg - Denmark
Tel switchboard: +45 39 53 60 00

From: Jeff Christner <jgc@wilsonengineering.com>
Sent: donderdag 12 september 2019 3:06
To: Sipke Verbeek <sipke.verbeek@alfalaval.com>
Cc: Mike Reilly <mreilly@whreilly.com>; John Moccero <john.moccero@alfalaval.com>; Scott Wilson <swilson@wilsonengineering.com>
Subject: RE: Friday harbor WWTP

Hi Sipke -

Great to meet you on Monday.
For the Friday Harbor dewatering equipment, we have the following information:

- Operator would like to be able to feed thickener with a flow of 100 gpm to 150 gpm. We may want to consider two slightly different size units.
- They average 95,000 gallons of WAS per week
- WAS concentration = 4,000 mg/L
- Operation staff currently runs a belt filter press 2 days a week at 150 gpm (5 to 6 hours per day). They are willing to adjust up to 6 or 7 hours per day, if needed.

Occasionally they will run 3 days a week when experiencing high flows + loads. Summer tourism has a big impact on the WWTP.

Jeff Christner, P.E.
Wilson Engineering, LLC
805 Dupont Street, Suite 7
Bellingham, WA 98225
Ph: (360) 733-6100 x252
www.wilsonengineering.com

Friday Harbor WWTP
Friday Harbor, Washington

Project: Friday Harbor Dewatering Improvements

Date: September 30, 2019

CRM: 30229057

GEA Mechanical Equipment US, Inc.
100 Fairway Court
Northvale, New Jersey 07647

engineering for a better world

gea.com

Table of Contents

engineering for a better world

PROJECT INFORMATION

Project Name: Friday Harbor Dewatering Improvements
CRM: 30229057

End User: Don Reitan, Superintendent
Town of Friday Harbor
Friday Harbor WWTP
375 Tucker Avenue
Friday Harbor, WA 98254

donr@fridayharbor.org
+1 (360) 378-5400

Consultant: Jeff Christner, PE
Wilson Engineering, LLC
805 Dupont Street, Suite 7
Bellingham, WA 98225

jgc@wilsonengineering.com
+1 (360) 733-6100 Ext 252

Rep Contact: Brett Kreier
JBI Water & Wastewater Equipment, Inc.
20008 83rd Avenue, East
Spanaway, WA 98387

bretkreier@jbiwater.com
+1 (206) 617-5525

GEA Contact: R. Todd Marshall
100 Fairway Court
Northvale, New Jersey 07647

Todd.Marshall@GEA.com
+1 (201) 637-9864

COVER PAGE

engineering for
a better world

GEA Mechanical Equipment US, Inc.

GEA Westfalia Separator Division
100 Fairway Court
Northvale, NJ 07647
Phone (201) 767-3900

September 30, 2019

Mr. Jeff Christner, PE
Wilson Engineering, LLC
805 Dupont Street, Suite 7
Bellingham, WA 98225

Re: Town of Friday Harbor Washington
Friday Harbor WWTP Dewatering Improvements

Dear Mr. Christner,

Please find herein our budgetary quotation for our Decanter Centrifuge.

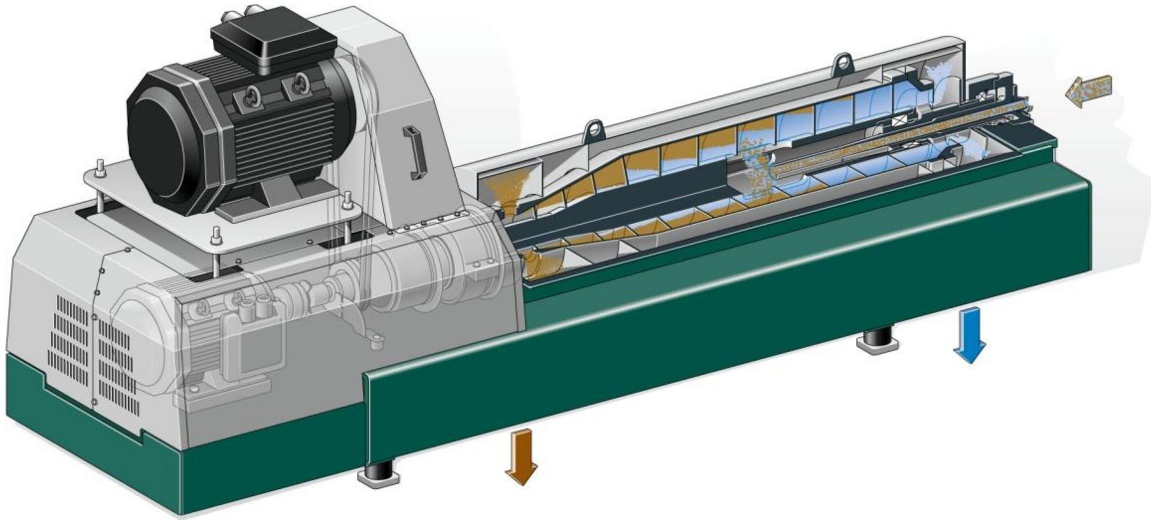
Thank you in advance for considering our equipment. We look forward to working with you.

Sincerely,

R. Todd Marshall,
Market Manager, Environment
GEA MECHANICAL EQUIPMENT US, INC.
GEA WESTFALIA SEPARATOR DIVISION

FEATURES AND BENEFITS

INNOVATIVE FEATURES/ADVANTAGES



1) Bowl Design:

A. The GEA Westfalia bowl shell is manufactured from **centrifugally cast duplex stainless steel** which offers 30% greater resistance to chloride stress corrosion and cracking than 316 stainless steel.

B. Duplex stainless provides two to three times higher yield strength and 25% higher tensile strength than 316 stainless steel.

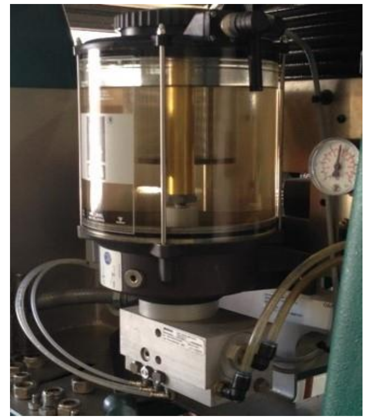
C. The GEA Bowl features two or three, depending on bowl size, inspection ports to allow endoscopic inspection and documentation. This allows owners to track wear and tear without disturbing vital parts such as bearings and seals,

D. Centrate Cone at liquid discharge end of bowl increases capture of fine floating particles by reducing the settling distance at the point of discharge.

E. Narrowed cake discharge diameter increases the natural, or neutral, height of the pond, increasing usable bowl volume and improving sedimentation performance.

F. Narrowed cake discharge diameter reduces the friction created by the cake as it exits the bowl, improving energy efficiency.

2) <u>Bearing Lubrication:</u>



A. The **Main bearings** are **grease lubricated an optional oil-mist** system is available as well for longer life. The oil-mist system utilizes food grade oil.

B. The **Conveyor Bearings** are **sealed**. This proven feature helps to reduce maintenance costs, and eliminates the possibility of under/over lubrication of the bearings causing premature failures.

3) Gearbox:

A. The GEA gearbox is oil-filled, using an expansion reservoir and non-proprietary high-performance oil. The expansion reservoir ensures thorough lubrication at start-up and full-speed operation. Any leaks will be made obvious by dropping oil levels.

B. GEA Westfalia customers benefit from our **Gearbox Exchange Program,** saving both money and time. All new components are used to re-build our gearboxes, and all Gearboxes are tested and certified before they leave the factory.

4) Scroll:

A. GEA Westfalia manufactures a solid helical conveyor of counter-current design, using no centrate tubes, , maximizing ‘time under pressure” for best capture rate.

B. The scroll conveyor hub is centrifugally cast stainless steel. The feed zone is protected from abrasion by a field-replaceable liner.

C. When the project requires tiles for abrasion protection, GEA protects the entire length of the scroll with tiles to enable field repairs. Welded-on protection, is not repairable in the field.

D. SuperTile™ provides superior protection and longer life than standard tiles. Sintered Tungsten Carbide (STC) blade is 50% more abrasion-resistant than industry standard, certified via ASTM G65 test to <2mm3 loss compared to 3mm3 in typical tiles. STC blade is attached to stainless steel backing with a silver braise which is more corrosion-resistant than the standard copper braise, in addition the braising is shielded from product contact by the overhanging lip on STC tile.

E. GEA Westfalia Separator maintains a **Scroll Conveyor Exchange Program**.

5) **Base:**
   A. GEA Westfalia manufactures a heavy, sturdy base without concrete ballast . The lower casing is solid (closed) and meets all OSHA standards.

   B. GEA's standard **Visco-Dampers** are a critical part of equipment reliability. A ViscoDamper is a steel spring within a bitumen-filled rubber sleeve. It absorbs 96-98 percent of vibration energy. This protects the decanter and the entire building from vibration far more efficiently than simple rubber pads.

   C. **Visco-Dampers** are designed for excellent functionality through the entire life of the decanter. Rubber isolators, because they dry out and get hard, must be replaced every four years, which requires lifting the entire machine at least three times in a 20-year lifecycle.

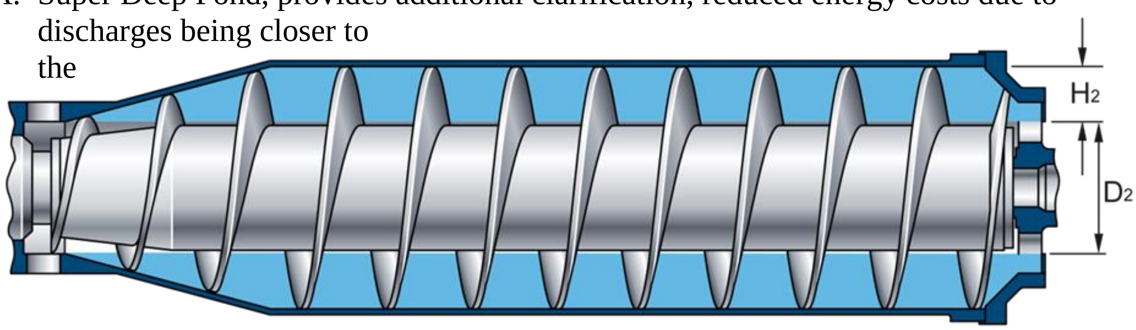
6) **Cover:**
   A. The GEA cover is made from 316 Stainless Steel to prevent corrosion.

   B. The cover is not designed to act as a Cake or Centrate casing, which reduces the cost of ownership.

7) **Discharge Casings:**
   A. The GEA discharge casings, or shrouds, arefield- replaceable and manufactured of 316 Stainless Steel for optimum durability as compared to Adiprene, ceramic, or tungsten carbide. They are independent of the cover.

   B. An independent cover enables quicker maintenance and prevents expensive damage to shrouds during normal maintenance activities.

8) **Overall Features:**
   A. Super Deep Pond, provides additional clarification, reduced energy costs due to discharges being closer to the



center of the bowl. This all translates to improved performance for dryer cake, lower polymer and higher throughputs.

SCOPE OF SUPPLY

GEA Westfalia Separator is pleased to offer the following High Solids sludge dewatering centrifuge equipment for your consideration.

- One (1) **GEA Westfalia CF 466** Decanter Centrifuge designed to meet the supplied application.
    - All process contact parts of **Duplex and 316 Stainless Steel** except O-rings, gaskets, and hard-surfacing.
    - Bowl shell shall be manufactured from **Centrifugal Castings of Duplex Stainless Steel**.
    - **≥ 3,000** x G Force at normal operating speed
    - **50 HP** AC VFD Main drive system
    - **15 HP** AC VFD Scroll drive system
    - **Stainless Steel** Cover and Belt guards.
    - Set of flexible connectors for centrate and solids discharges, feed line, and polymer piping.
    - Multi-stage Planetary Gear
- Centrifuge Control / Power Panel, NEMA 4X, 316 Stainless Steel
    - Allen–Bradley CompactLogix® and Allen-Bradley PanelView® Plus 1000 HMI.
    - ABB VFD Drives
- One (1) set of standard tools to disassemble and service centrifuges.
- One (1) set of spare parts and lubricants.
- (3) O&M Manuals and CD.
- Standard Equipment warranty for 12 months following installation or 18 months following delivery.
- Manufacturer’s Services 2 Trips / 10 Days

Items and Services Not Included

1. Unloading and uncrating of equipment upon arrival at job site.
2. Anchor Bolts
3. Installation, interconnecting wiring, piping and hangars.
4. Polymer for performance testing.
5. Sludge Pump
6. Lab testing.
7. Taxes not included.

COMMERCIAL TERMS

Freight

Freight costs to the job site are included in the quoted price. Price DDP Jobsite per Incoterms 2010.

Budget Price

One (1) GEA Westfalia CF 466 Centrifuge.................................. **$ 265,000.00 Each USD**

.... **$ 265,000.00 Total USD**

Terms and Conditions

According to GEA Mechanical Equipment US, Inc. Terms and Conditions of Sale found herein

Submittals and Delivery

Submittals will be provided 6 to 8 weeks after mutually executed Purchase Order. Based on current conditions in our manufacturing plant, shipment to site can be achieved within 24-32 weeks after receipt and clarification of all technical details.

Payment Terms

Pricing is based upon the following payment schedule at NET 30

Milestone	Percent
Mutually Agreed Purchase Order	25%
Submittal Approval	20%
Notice of Shipment Ready to Site	20%
Equipment Received on Site	30%
Equipment Startup (Not to exceed 90 days from Shipment)	5%

Centrifuge Model Recommendation

Prospective Client: **Friday Harbor WWTP**
Model: **CF 466**

Overview: Dewatering

Sludge Description:	**Aerobically Digested**
Feed Concentration:	**0.4 - 0.6 %**
Hydraulic Feed Rate:	**110 - 120 GPM**
Solids Loading Rate:	**230 - 360 #/Hr DS**

Anticipated Performance:

Dewatered Cake Solids:	**≥ 19%**
Recovery:	**97%**
Polymer Dose Rate:	**≤ 30 #/DT 100% Active**

Mechanical & Electrical:

Bowl Diameter:	**(460 mm) (18.1 in)**
Bowl Speed:	**3,500**
Operating G-Force:	**3,195**
Main Drive HP:	**50**
Scroll Drive HP:	**15**

GEA Westfalia Quick Specs:

Technical specifications	Series 6000	
length	3,664 mm (144 in)	
width	1,000 mm (39.4 in)	
height	1,345 mm (53 in)	
total weight	3,420 kg (7,541 lb)	
weight of heaviest single part, rotating assembly	1,500 kg (3,300 lb)	
Max. speed – bowl	3,500 rpm	
inner diameter – bowl	460 mm (18.1 in)	
length / diameter ratio	4	
Max. g-force	3,195 g	
Component	**Standard**	**Option**
bowl and scroll	stainless steel CrNiMo	----
liquid outlets	2-phase open	----
flight hard facing	Tungsten Carbide Tiles	Flame Spray Tungsten Carbide
solids outlet ports	Exchangeable	---
seals, inner bearings	Buna-N	P.T.F.E./Viton

SPARE PARTS WAREHOUSES AND REGIONAL FACILITIES

All GEA Westfalia Separator regional facilities and spare parts stores are directly operated by GEA Westfalia Separator. We do not sub-contract field service, training or repair work. The following is a list of GEA Westfalia Separator's North American locations:

GEA Mechanical Equipment US, Inc.
100 Fairway Court
Northvale, New Jersey 07647
(201) 767 - 3900

The North American headquarters houses all repair personnel and the necessary tools to repair all GEA Westfalia. The repair facility has 7 lathes, 5 drill presses, 4 welding tables and associated equipment, bowl and scroll balancing computers, sand blasting booths and paint booths. Hoisting capabilities include 2 – 20 Ton cranes, 3 – 10 Ton cranes and 4 – 1.5 Ton cranes. This facility also serves as the hub for North American spare parts distribution. We maintain ***$10,000,000*** in spare parts at any point in time.

GEA Mechanical Equipment US, Inc. West Office
555 Baldwin Road
Patterson, California 95363
+1 (209) 859 - 6300

The facility is capable of full service and repair work for the western part of North America. In essence, the new shop is doubling our repair capabilities for the North American market.

GEA Mechanical Equipment US, Inc. Midwest Office
1707 Randall Road, Suite 355
Elgin, Illinois 60123
+1 (630) 503-4700

GEA Canada, Inc.
5045 South Service Road, Suite 201
Burlington, Ontario L7L 5Y7
+1 (289) 288-5500

APPENDIX E – CONVEYOR EQUIPMENT PROPOSALS

CUSTOM CONVEYOR CORPORATION

20550 COMMERCE BOULEVARD
ROGERS, MN 55374
763/367-6200
Fax: 763/428-7300

File: Q29537
Date: 8/9/19

RE: Friday Harbor WWTP – Wilson Engineering
Centrifuge Screw Conveyor

Dear Kenna:

As a manufacturer of conveying systems since 1983, we are pleased to have this opportunity to provide the following budget proposal for your review and consideration. Our offering will be in general accordance with your 8/8/19 e-mailed design parameters and CEMA and industry design and construction methods and is as follows:

Qty (1) Centrifuge Screw Conveyor, 10" dia x 25'-0"± long, 25°± inclined reversing shaftless screw conveyor with a 3 hp drive pusher drive. The conveyor will be capable of conveying the specified max load rate of 50 cu ft per hour of centrifuge sludge at 18-20% solids to owner provided dumpster and will have the following component and construction features:

Motor:
3 HP, 230/460V, 3/60 Hz, TEFC, NEMA Design B, Class F ins., 1.15.S.F, 40° C, energy efficient motor.

Reducer:
AGMA, Class II, "Nord" or equal helical gear screw conveyor drive assemblies with integral AISI 1045 drive shaft and torque plate, complete with grease lubricated packing gland to provide required screw speed.

Trough:
#10 ga 304 stainless steel CEMA 300 U-troughs in maximum 12' lengths, 3/16" thk 304 stainless steel trough cross stiffeners at 4' maximum spacing with 6" dia flanged drain at low end of trough

Supports:
Fabricated from 304 st steel structural shapes and plates, min 3/16" thk, 12' max spacing.

Wear Liners:
3/8" thick UHMWP wear liner, maximum 4'-0" lengths. Held in place with stainless steel hold down clips.

Covers:
#12 gauge 304 stainless steel covers for locations outside of load areas. Covers will be manufactured in maximum 4'-0" lengths, bolted and gasketed, with (2) lift handles per cover

Spiral Flighting:
10" diameter nom, dual spiral, 2 1/2" x 3/4" outer spiral, 1 1/2" x 5/8" inner spiral HTMAS shaftless flighting, 225 brinnell, minimum 80,000 PSI with circular torque plate for drive shaft connection and nylon brush in press drain area.

Trough End Plates:
Min. 3/8” thick 304 stainless steel on drive end, ¼” thk on non-drive end

Inlet Flange:
Fabricated from #10 ga thk 304 st steel shapes and plates to match influent screen

Discharge Chute:
Fabricated from #10 ga thk 304 st steel shapes and plates with 18 oz. rubber impregnated canvas flex connections, approx. 4’ lg

Safety Stop Switch:
NEMA 4X, 120 VAC safety stop switch with orange vinyl coated aircraft cable and stainless steel eyebolt supports and cable clips.

Anchor Bolts:
½”-13 UNC x 5 ½” lg 316 SS anchor bolts

Control Panel:
By others

Assembly:
Conveyor will be shop assembled and will be shipped as assembled unit. Discharge chute will be shipped loose for field installation by Contractor. 304 stainless steel shop/field assembly bolts are included.

Finish:
Components hardware, i.e. motor and reducer will have Manufacturer’s standard finish. Spiral flighting will be shop prime painted one coat epoxy primer. Stainless steel fabrications will be shop acid passivated welds and rinsed to remove heat tint scale and provide uniform finish

General Notes:

1.) Submittal data is included in our proposal.

2.) Operation and Maintenance Manuals are included in our proposal.

3.) Start-up assistance and training are not included in our offering but are available at $2,000.00 per day plus travel expenses at cost.

4.) Spare parts are included.

5.) By Others:
- Taxes and permits
- Unloading and storage
- Installation, mechanical and electrical
- Controls and motor starters not stated herein
- Foundations and embedded steel work

6.) One (1) year warranty provided from date of start-up or 18 months from receipt of shipment, whichever occurs first.

7.) Shop no load test run of conveyors is included in this proposal.

EXCLUDED from CUSTOM’S scope of supply:

1) Off-loading and handling of CUSTOM's scope of supply at the delivery location.
2) Construction and /or installation, field measurements, or work of any kind at the jobsite.
3) Control panels or electrical components of any kind, except as specifically noted in this Proposal.
4) Interconnecting piping or electrical wiring, etc. as may be required to connect the proposed equipment to the plant system.
5) Foundations, embedded steel.
6) Calculations on existing structure or steel.
7) Travel costs for client witness of factory tests.
8) Insulation, heat tracing, or weather proofing.
9) Union labor for any field support services.
10) Videoing of training sessions.
11) Performance Bond(s), permits, sales or use taxes of any kind.
12) Anything not specifically stated in this Proposal.

Delivery:

Approval Drawings:	8 to 10 weeks after receipt of order.
Equipment:	12 to 14 weeks after receipt of approval drawings and current backload at time of release for production

Freight:
FOB- Rogers, Minn., prepaid and allowed – Friday Harbor, WA

Budget Pricing:
$42,000.00

Pricing contained herein is valid for a period of 60 days from date of proposal, after which we reserve the right to review our quote.

NOTE: Due to the current instability of the stainless and carbon steel markets, pricing and availability are subject to change without notice and shall be subject to pricing in affect at the time of raw material order placement. Any increases under these circumstances will be passed on at our cost.

Please do not hesitate to contact or our office with any questions or comments.

Sincerely,
Mitch Rontti
Mitch Rontti
Custom Conveyor Corporation

CC: Joe Buckman - APSCO

CUSTOM CONVEYOR CORPORATION

20550 Commerce Blvd.
Rogers, MN 55374
Tel: 763-367-6200
Fax: 763-428-7300

EQUIPMENT MAINTENANCE SCHEDULE

Equipment Item: 10" dia x 25' lg inclined Centrifuge Shaftless Screw Conveyors

Manufacturer: Custom Conveyor Corporation

Daily:

1. Clean-up around conveyor.
2.

Weekly:

1. Check seal on drives.
2.

Monthly:

1. Check reducer oil level.
2. Check trough liners for wear.

Quarterly:

1.
2.

Semi-Annually:

1. Flush and fill gear reducer.
2.

Bi-Annually:

1. Lubricate motors. (Every 6,000 Hours)
2.

SPIRAC®
Solid Handling Solutions

Design Data and Budget Pricing

Wilson Engineering, Bellingham WA

Date: 08/13/2019
Project name: Replacement of Serpentix Belt Conveyor--Request for Budget Estimate, email request dated 08/12/2019 from Mike McKamey.

Product: Sludge Conveyor Shown in SPIRAC Design Table 1:

The budget price for conveyor as per the attached design Table 1 including our premium two-color liner is as follows.

- **Conveyor 1** **$41,000.00**

This budget estimate includes freight and startup services but does not include the main control panel.

Delivery:

Submittals: 4 to 6 weeks

Delivery: 14 to 16 weeks

Let me know if you have any questions.

REGARDS

R*alph E. Whitesell, P.E.*
Regional Sales Manager
Office: (770) 632-9833
Mobile: (832) 655 3960
Office fax: (770) 632-9838
E-mail: ralph.whitesell@spirac.com
Web: http://www.spirac.com

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Table A – Shaftless Screw Conveyor Design
Wilson Engineering, WA

Item No.	1
Conveyor Model No.	U320-SPX/SS
Conveyor Length (ft)	22
Inclination (degrees)	27
Connects to	Truck loading area
Trough & lid Mat'l	304SS
Trough Thickness	11ga
Lid Type / Length	Bolted / 5ft max
Lid Thickness	11ga
Liner Type	Duraflo SPX
Liner Thickness	1/2 in
Inlet Qty	1
Outlet Qty	1
Material	
Conveyed Material	Sludge
Vol. Flowrate (ft3/hr)	120
Bulk Density (lb/ft3)	62.4
Fill Factor	49
Spiral	
Spiral Type	AB
Spiral Material	HTMAS
Spiral Dia/Pitch (in)	290/180 mm
X-section (mm)	60x15/35x8
RPM	19
Drive	
Drive Type	Helical Gear
Motor hp	3
Power Supply	460v/3/60
Transport Direction	Push

QUOTATION SUBMITTAL

KWS MANUFACTURING QUOTE

081919-02

August 19, 2019

Client: Wilson Engineering

Project Name: Biosolids Conveyor

Project Location: Friday Harbor, WA

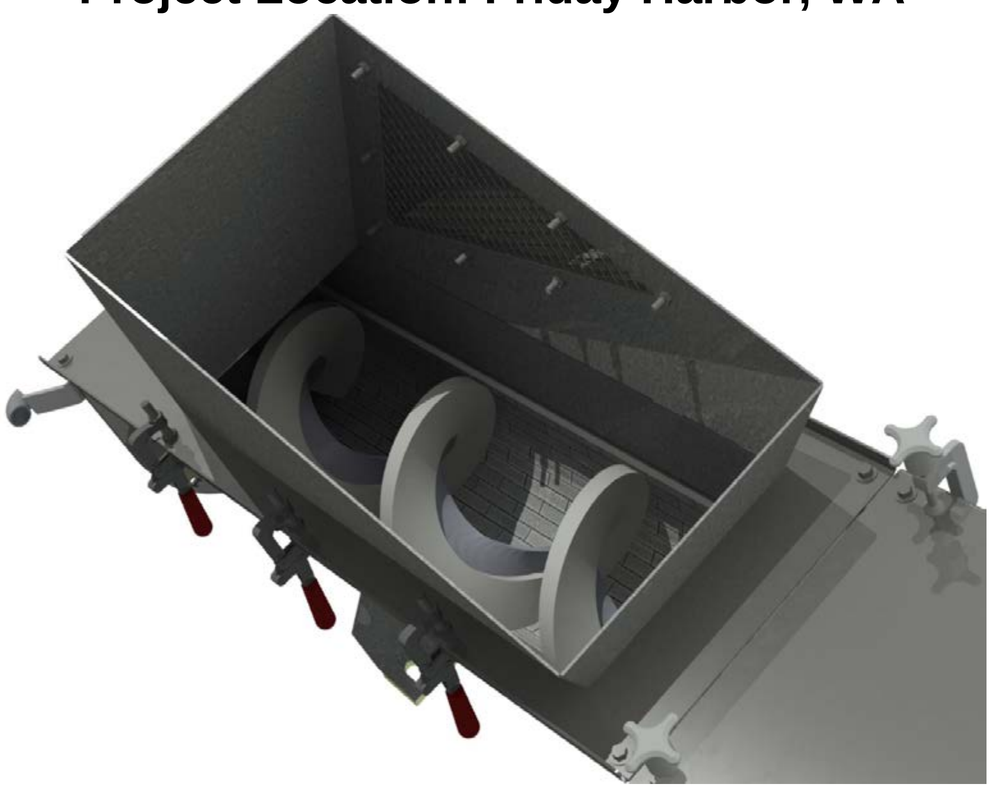


TABLE OF CONTENTS

Dear Kenna,

Thank you for the opportunity to be part of your project. We are confident you will enjoy your experience working with KWS.

KWS is the only screw conveyor manufacturer in the world that has all of the following qualifications –

- One of the Largest Screw Conveyor Manufacturers in North America
- Fully ISO 9001-2015 Certified in All Departments (not simply compliant)
- Certified to ASME Boiler and Pressure Vessel Code - "U" Stamp
- Certified to National Board of Boiler & Pressure Vessel Inspectors – "R" Stamp
- ASME and AWS Certified Welders
- AWS Certified Welding Inspector on Staff
- AWS Certified Welding Instructor on Staff
- Registered Engineering Firm in the State of Texas
- Ten Degreed Mechanical Engineers on Staff
- Three Licensed Professional Engineers on Staff
- Experienced Mechanical Designers on Staff
- Latest 3D Parametric Modeling Software
- Latest Pressure Vessel Design Software
- Latest Finite Element Analysis (FEA) Software
- Regional Factory Sales Representatives to Provide Personal Attention

KWS has over forty years of history meeting and exceeding customer expectations. As a result, KWS has grown over five hundred percent in the past ten years. At KWS, customer satisfaction is not simply an advertising phrase, it is our mission. The KWS certified quality system ensures that your equipment is designed and manufactured to rigid documented specifications and validated by exceeding performance expectations.

Thank you for the opportunity to be of service. You may contact me anytime at 1-800-543-6558, extension 258.

Sincerely,

Jimmy Dufinetz

Jimmy Dufinetz, P.E.
Manager of Environmental Sales
KWS Manufacturing Company, Ltd.
Cell: (817) 707-5749
jdufinetz@kwsmfg.com

SCOPE OF SUPPLY

Item	Qty.	Description
A1	One (1)	**KWS Shaftless Screw Conveyor System Designed to convey up to 120 CFH at 45-65 pcf of control fed dewatered biosolids** **-ONE 12" dia x Screw Conveyor approx. 20'-0" long at up to a 45 degree incline angle (7.5 HP)** Common features: • 1" thk x 3" wide 235 BHN (Microalloy C.S.) Outer Spiral Shaftless Screw • 3" dia drive shaft • 3/16" THK troughs minimum • 3/8" thk trough ends minimum • 10 GA THK min flanged bolted covers • Approx. 25 rpm shaft mount direct-drive gearmotors • 1/2" THK UHMW Liners • CCC Model RS-2 E-stop with vinyl coated aircraft pull cable • Milltronics Zero Speed Switch • Supports and Chutes Included, Up to 10' Tall • Inlet Chute from Centrifuge Diverter Gate Included
B	1 Lot	**Spare Parts**: • Spare Liners and Seal Packing Included
C	1 Lot	**Project Management, Engineering, Documentation**
D	1 Lot	**Installation Inspection, Startup, and Training (1 trip, 1 days allowed)**
E	1 Lot	**Freight Included**

NOTES:

1. Conveyors control panel not quoted. The panel pricing can vary widely depending on the type of logic, type of PLC or relays, and type of materials of construction, area classification, or front-of-panel features.

PRICING SUMMARY

Description	Qty.	Unit price, Tax not incl. $USD	Total price, Tax not incl. $USD
A1 -ONE 12" dia x Screw Conveyor approx. 20'-0" long at up to a 45 degree incline angle (7.5 HP)	1	-	$60,700
B -Spare Parts	1 lot	Included	Included
C -Project Management, Engineering, Documentation	1 lot	Included	Included
D -Installation Inspection, Startup, and Training (1 trip, 1 days allowed)	1 lot	Included	Included
E -Freight FOB – Factory (Burleson, TX), Freight Allowed To Nearest Accessible Point At Jobsite Address	1 lot	Included	Included

NOTES:

TERMS AND CONDITIONS

This proposal is based on the attached KWS Manufacturing Company, Ltd. “General Terms and Conditions”.

SPECIAL INFORMATION

- Pricing quoted is FOB – Factory (Burleson, TX), Freight Allowed To Nearest Accessible Point At Jobsite Address
- Pricing does not include any unloading and does not include any local, state or federal taxes, permits or other fees. Any taxes or fees that may apply must be added to the quoted price and paid by the buyer.
- Quotation is valid for 10 days. Pricing is only valid for 10 days from date of quotation. KWS reserves the right to evaluate pricing at time of order based on current raw material pricing.
- All prices quoted in U.S. dollars.

PAYMENT TERMS

- Proposed terms are 30% with approved submittal, 65% upon delivery, 5% retention (NOT to exceed 120 days after final shipment, all net 30) – KWS will not accept payment terms without a limitation to the payment period.

ENGINEERING / MANUFACTURING / SHIPPING

The following are the major engineering services included in the proposed sale price:

- General arrangement drawings of proposed KWS equipment
- Specific equipment drawings, complete with piping and wiring requirements
- Control panel(s), wiring drawings, and HMI screens (if applicable) of the control components included in the proposed scope of supply (IF control panels are in KWS scope)
- Load points and weights of equipment
- Stamped structural analysis of supports and/or anchor bolts (IF required)
- 2D and/or 3D CAD files of proposed KWS equipment
- Operating and maintenance manuals, including recommended spare parts lists
- Conveyors to be fully shop assembled and tested to ensure it meets the requirements
- Shop assembled conveyors are typically match marked and shipped in the longest sections for practical shipment (if conveyors are less than ~40’ long or if contractor requires sectioning due to access restrictions)
- Conveyors longer than ~20’ typically require a crane rather than a forklift. Lift equipment in a stable and secure manner as to evenly distribute the load. Lifting points / intervals not to exceed 12'-0”.

EQUIPMENT START-UP SERVICES BY ENGINEER

- Installation check-out
- Operator-Maintenance Training
- Startup Assistance

ESTIMATED SCHEDULE

Approval drawings will be furnished three to four (3 to 4) weeks after executed purchase order. Equipment can be shipped eight to ten (8-10) weeks after receipt of approved submittal package. Expedited delivery times can be quoted upon request.

SCOPE NOT INCLUDED IN KWS PRICE

(to be provided by contractor/client)

Specifically the KWS scope of supply does NOT include the following items as may be necessary for equipment installation & operation to the performance levels specified;

- Financing
- Equipment installation or building modifications
- Fees or taxes of any kind (sales, use, excise, Local, State, Federal, or Final Destination)
- Cranes or lifting devices
- Unloading and/or storage of equipment at jobsite
- Foundation design and engineering (KWS will furnish equipment drawings and data)
- Any embedments in the foundation or anchor bolts or structural design thereof
- Utilities for erection and operation (including during commissioning)
- Laboratory services, operating, electrician, installation, and maintenance personnel during equipment checkout, startup, training, and operations.
- Gauges and instrumentation not specifically identified in the above proposed scope of supply
- Any peripheral equipment (controls, electrical, pneumatic, hydraulic or otherwise) not listed in this scope letter
- Interconnecting / field wiring, conduit, piping, tubing, valves, etc., between proposed equipment and existing equipment or controls
- Civil engineering, supporting platforms, stairs, ladders
- Spare parts, lubrication, or grease of any kind.
- Any chutes which are not a part of the standard conveyor
- Bagging attachments, bagging cassettes or weather protection
- Heat tracing, motor heaters, or insulation
- Load cells, level indicators, limit switches, or any other sensors unless scoped already
- Any on site painting or touch-up painting, welding or passivation of equipment supplied.

KWS MANUFACTURING COMPANY, LTD. GENERAL TERMS AND CONDITIONS

TERMS OF PAYMENT: All invoices are due and payable in Johnson County, Texas. All credit sales are due in full within thirty (30) days from the date of invoice, unless otherwise agreed to in writing. No discount is allowed for earlier payment unless authorized by KWS in writing. Purchasers without established credit with KWS will avoid delay by furnishing satisfactory references, paying by credit card or by instructing KWS to bill in advance of shipment. Accounts past due shall accrue interest at the highest lawful rate allowed by applicable law.

GENERAL PURPOSE MACHINES: The component parts and equipment supplied by KWS are defined as general purpose machines. General purpose machines are designed for many kinds of operation and it is the responsibility of the purchaser or end user to select safety devices appropriate for their particular function.

LIMITED WARRANTY: KWS warrants all equipment manufactured by KWS to be free from defects in material and manufacture for a period of one (1) year from the date of shipment. KWS will furnish without charge, but will not install, replacements for such component parts that have been determined to be defective. Unless otherwise stated in the KWS quotation, this limited warranty is based on operation of the equipment for a period not exceeding eight hours per day. KWS MAKES NO OTHER WARRANTY OF ANY KIND AND HEREBY DISCLAIMS ALL WARRANTIES EXCEPT THE LIMITED WARRANTY HEREBY STATED, BOTH EXPRESS AND IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. All warranty claims must be submitted to KWS within ten (10) days of discovery of defects or shall be deemed waived. No representative of KWS has any authority to waive, alter, vary or add to the terms hereof without prior approval in writing.

This limited warranty applies only to equipment which is subjected to normal use and service. If the equipment exterior is painted, coated or altered in any way, or if the material conveyed is in excess of 175°F, or if change in the original intended use of the equipment is considered, the KWS Manufacturing Company, Ltd shall be consulted before modifications are made. This limited warranty shall not apply to any equipment which has been subjected to misuse, neglect or accident, or has been altered or tampered with, or if corrective work has been done thereon without KWS specific written consent, no allowances will be made for such corrective work done without such consent. Improper lubrication, deterioration by chemical action, and wear caused by the presence of abrasive materials, do not constitute defects. KWS shall not be responsible for work done, apparatus furnished, or repairs made by others. Equipment manufactured by others, and included in the KWS proposal is not warranted in any way by KWS but carries only the manufacturer's warranty, if any.

LIMITATIONS OF LIABILITY: It is expressly understood that KWS's liability is limited to the furnishing of replacement component parts. KWS SHALL NOT BE LIABLE, UPON WARRANTIES OR OTHERWISE, FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES FOR ANY DAMAGES ARISING FROM THE USE OF EQUIPMENT. Thus, KWS is not liable for any other expense, loss or damage including, but not limited to, loss of profits, production, increased cost of operation of spoilage arising in connection with the sale or use of, or inability to use the purchased equipment or products for any reason, except as herein provided.

TEXAS LAW TO APPLY, JURISDICTION AND VENUE: It is expressly understood that this sale of products or equipment was negotiated, executed, consummated and is otherwise performable in Johnson County, Texas, and shall be governed, construed and interpreted as to validity, enforcement and in all other respects in accordance with the laws of the State of Texas, and the laws of the United States of America, as applicable. KWS has its principal place of business in Johnson County, Texas, which county shall be the proper place of venue to enforce payment or performance. Purchasers irrevocably agree that any legal proceeding arising out of or in connection with this sale shall be brought in the state courts of Johnson County, Texas, or the United States District Court for the judicial district in which Johnson County is located.

CONTRACTS: All contracts are made and accepted at Burleson, Texas, and are not valid until acknowledged from the KWS main office. It is the intent and purpose of KWS to surrender title to this material when final payment is made. Possession may be given before final payment is due, and to protect KWS against default in payment or in the event of an execution or attachment is levied on the customer's property, it is hereby expressly agreed:

(A) The title and right of possession to this material shall remain with KWS until full and final payment is made;

(B) No part of this material shall be considered a fixture or incorporated into the realty by virtue of its attachment to real estate and any part may be separated from such real estate for the purpose of re-possession by KWS or by our agents in the event of a default by purchaser;

(C) KWS shall have the right to elect a claim of mechanic's lien against the property upon which this material is situated and waive our rights to re-possess under Paragraphs (A) and (B) above any time before expiration of the time fixed by law for filing a mechanic's lien;

(D) Acceptance or acknowledgement of any order, quotation or contract is with the express understanding that a "no lien agreement" has not been filed.

PROMISE OF DELIVERY: Promise of delivery represents only the best estimate of the time required to complete the work and ship the material from the KWS plant. All orders are accepted with the understanding that shipping dates are approximate and subject to change because of factory conditions, fires, strikes, material shortages, civil or military authority, mandatory priority and/or other causes beyond the knowledge or control of KWS.

SAFETY DEVICES: ***KWS will supply only such safety devices as are specified in customer furnished purchase orders. Any additional safety measures or devices which may be required by law, or which the customer wishes to add, are to be furnished by the customer or, at the customer's written request, the safety devices will be furnished by KWS at additional cost to the customer. The aforementioned safety devices include, but are not limited to; interlocks, limit switches, overflow relief switches, shear pins, emergency stop switches, emergency stop pull cables and point-of-operation switches.***

User Training: Customer agrees that it assumes sole responsibility and liability for training its employees, contractors, agents, and other end users in the safe operation of the KWS manufactured equipment. Customer agrees that it has not retained nor paid KWS to provide safety training, operational training, or best-practices advice or input regarding the operation of any KWS manufactured equipment, or the types of safety devices best suited for the Customer's usage of the purchased equipment. Customer acknowledges that it has superior information and control over the manner in which the KWS manufactured equipment will be incorporated as a component part into Customer's processes, and that the Customer is in a superior position to specify appropriate safety devices and to design safety training protocols to conform to equipment usage. Customer releases, indemnifies, and holds harmless KWS for any claims related to the safe operations of its equipment.

Indemnity: Customer agrees to defend, indemnify and hold harmless, KWS for any liability arising out of any injuries, damage, or casualty loss of any kind whatsoever experienced by Customer, its employees, contractors, or assigns arising out of or involving in any way Customer's utilization or operation of KWS manufactured equipment or any component part thereof. **Such defense and indemnity obligation includes any and all claims arising out of any allegation of KWS' own alleged negligence or any alleged manufacturing, design, or warning defect or deficiency asserted against KWS**.

Arbitration: Customer agrees that any claim or dispute of any kind whatsoever arising out of the terms of the sale and purchase of KWS' equipment, any injuries, damage, or loss associated therewith, or any claim asserted on behalf of Customer, its employees, agents, or assigns arising out of the operation or utilization thereof will be resolved solely through mandatory binding arbitration as the parties' exclusive remedy.

SAFETY WARNING LABELS: All equipment that is shop-assembled by KWS Manufacturing Company, Ltd. has warning labels affixed in many easily seen locations. Additional safety stickers are available upon request from KWS or CEMA. Please refer to CEMA Warning and Safety Reminders for Screw, Drag and Bucket Elevator Conveyors, CEMA Safety Label Placement Guide and CEMA Safety Labels documents for further information. KWS will supply standard safety warning labels as recommended by CEMA or equivalent industry standards. Customer acknowledges that it has superior information regarding the manner in which the KWS equipment will be incorporated into Customer's manufacturing processes, and the skill level and language abilities of Customer's employees who may interface with the equipment. Customer agrees that it is solely responsible for any additional safety signage, warnings, or other safety requirements particular to its employees or utilization of the KWS equipment, and Customer hereby releases, indemnifies, and holds harmless KWS for any liabilities arising out of same.

CANCELLATION: Orders entered on KWS books are not subject to cancellation and no cancellations will be accepted except upon terms that will INDEMNIFY KWS against loss. Cancellation charges will apply for all work performed prior to written notification and will be invoiced.

CLAIMS: All prices are made F.O.B. Burleson, Texas, unless otherwise indicated. KWS responsibility ceases when delivery has been made to the transportation company. If there are shortages or evidence of damage, insist on the transportation agent making notations on the shipping documents before signing receipt. Claims should be made immediately and KWS will cooperate with customers when desired in obtaining adjustments from the transportation company due to loss or damage. All equipment shall be checked for damage immediately upon arrival. Do not attempt to install damaged component parts or equipment. Claims for errors or shortages existing prior to our delivery of the equipment to the carrier will be considered only when made known to KWS immediately after receipt of shipment.

RETURNED GOODS: No material will be accepted for credit unless such return is first authorized in writing by KWS. All prices are predicated on sale of material as merchandise only. Additional charges may be assessed for any special services or markings, special boxing, cartage, transfer, overtime (when authorized by purchaser), financing, or other abnormal requirements.

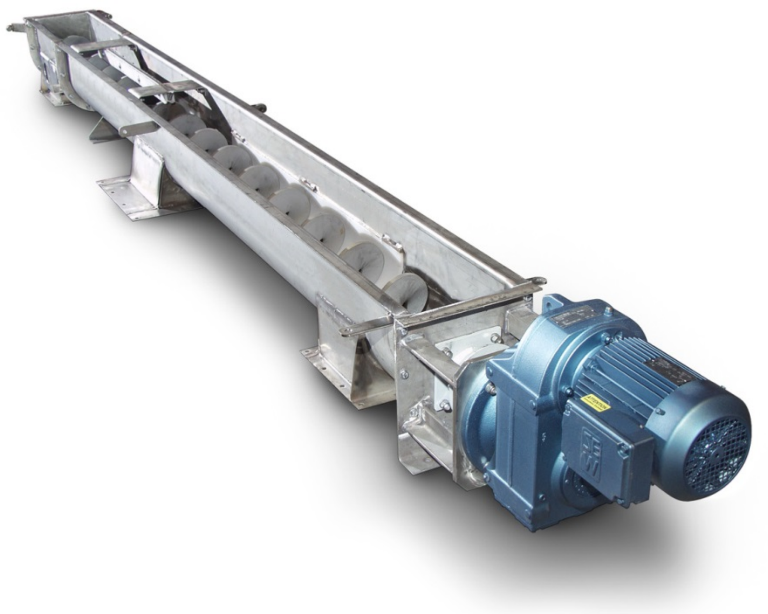
MINIMUM CHARGE: Minimum charge on any invoice will be $35.00 net plus applicable parcel post, express or freight charges.

SPECIAL TAXES: Any federal, state or city sales tax or other manufacturers' or processors' tax, if any when assessed, will be added to the invoice.

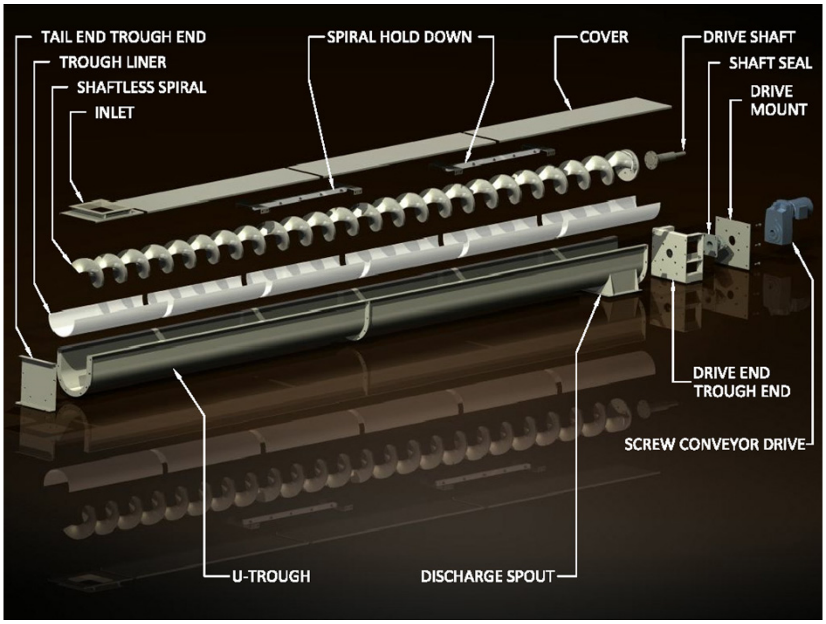
PAINTING: As a protective measure, KWS will apply before shipment one coat of KWS standard shop paint to all outside accessible unfinished surfaces, and a protective coat to all machine-finished surfaces.

GENERAL TECHNICAL SPECIFICATIONS

KWS SHAFTLESS SCREW CONVEYOR



MAIN COMPONENTS



TECHNICAL DATA SHEET

GENERAL MACHINE TECHNICAL DATA	
Model	SSC-12
Dry Weight	120 lb per ft of conv
Feed Inlet From	BFP
Discharge outlet to	Sludge Storage Area
No. Discharges	1
Discharge Type	Horizontal
Screw OD, min.	11.5 in
Spiral thickness, min	1 in
Spiral pitch (full or 2/3)	Full
Location of drive	Pulling
Drive Hp. Min.	7.5
Common Spare Parts	Spare Liners for All Conveyors, Seal Packing
Major Maintenance Requirements for 5 Years	Check Liners for Wear, Change Gearbox Oil Once, Change Seal Packing As Needed
DESIGN CRITERIA	
Type of material:	Dewatered Biosolids
Material density – range	45-65 lbs/ ft3
Solids, percent by weight:	15%
Capacity (design):	120 cubic feet per hour
Ambient temperature range	32 to 120 degree Fahrenheit
Max screw speed:	25 rpm
Hazardous Location Classification	Unclassified
Duty	24 Hours a Day, 7 Days a Week
UTILITES	
Total Connected Load	460V for motors, 120V for controls (see quote for individual motor HPs), electric actuator motors have their own motor controllers so all they need is 460V
Drain Size	3” min
MAJOR COMPONENTS MATERIALS OF CONSTRUCTION	
Troughs, covers, gates, and end plates	304L SS
Inlets/outlets, Hardware	304L SS
Supports	Galvanized Carbon Steel
Spiral	Microalloy 235 Brinnell hardness, min
Drive Shaft	C 1045 steel with zinc plating
Gaskets	Black Closed Cell Sponge Gasket PVC / Nitrile Blend With Adhesive Backing
Trough Liner	UHMW
Holddown Liner	UHMW
Seal Type	Zinc Plated Flanged Gland Seal
Seal Packing	Teflon, 3 Rings

OPERATING PRINCIPLE

KWS Shaftless Screw Conveyors are highly efficient at metering and conveying a variety of bulk materials. The fundamental concepts in screw conveyor operation as the screw helix, mounted on a central pipe or shaft, rotates within a fixed trough or tube, pushes the material along the bottom and sides, shearing the material in the radial clearance between the helix and trough and causing the material to tumble upon itself as the moving face of the helical flight tends to lift the material.

Better conveying performance is achieved through zero-clearance between the trough and spiral, improving conveying efficiency and eliminating many of the flow-impeding issues common with shafted screw conveyors. Higher trough loading allows for lower operating speeds. Lower capital cost and lower overall maintenance costs are realized from equipment designed to require fewer parts. KWS Shaftless Screw Conveyors are designed for greater flexibility and efficiency in plant layout, providing for end-to-end, side inlet/discharge and vertical configurations.

Advantages of Using Shaftless Screw Conveyors

- Ideal for handling free-flowing to sticky and sluggish bulk materials
- Improved conveying efficiency when compared to other types of conveyors
- Greater flexibility for plant layout due to multiple configurations available
- Internal bearings are eliminated

KWS Shaftless Screw Conveyors efficiently convey dry, semi-fluid or sticky bulk materials. The shaftless design provides a non-clogging conveying surface by eliminating the need for intermediate shaft bearings. The shaftless spiral rides on a liner, which serves as the support service. The spiral interfaces to the drive via a single-piece drive shaft.

Bulk materials discharged from centrifuges, filter presses or mixers can easily be metered or conveyed using a shaftless screw conveyor. The perfect solution for handling bulk materials with high moisture content is the KWS Shaftless Screw Conveyor.

DRIVE SHAFTS AND SHAFTLESS SPIRALS

KWS Shaftless Screw Conveyors are designed with a flanged connection between the spiral and drive shaft. The flanged connection is located as close to the drive endplate as possible to eliminate any restriction to the flow of bulk materials. The drive shaft is directly connected to a gear reducer and motor that provides the power to turn the shaftless spiral.

Historically, a coupling plate welded to a drive shaft was typical in the industry. KWS viewed this connection as a potential weak point and certainly a potential source of misalignment with the spiral coupling plate. Any misalignment at this connection induces a cyclical load on the coupling and causes fatigue and eventual failure. KWS has solved this problem by machining the drive shaft and coupling flange from one piece of solid bar. The result is a drive shaft coupling flange that is stronger, truly perpendicular and will not fail.

The one-piece flanged drive shaft is bolted to a coupling plate on the shaftless spiral. The spiral coupling plate is designed with a register fit to the drive shaft coupling flange allowing for easy alignment. The spiral coupling plate is welded to the coupling plate using an alignment fixture to produce a precise connection and true alignment of the drive shaft and spiral

SHAFTLESS SCREW CONVEYOR LINERS

A major benefit of shaftless screw conveyors is the elimination of intermediate hanger bearings to support the screw sections. Intermediate hanger bearings are a constant maintenance issue and can be a restriction to bulk material flow. Shaftless screw conveyors rely on trough liners to support the shaftless spiral and provide a bearing surface.

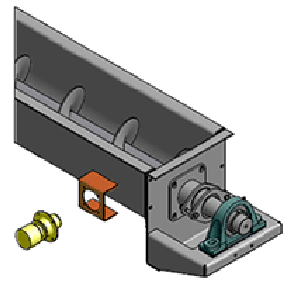
Selection of the appropriate liner material and attachment method is critical to ensuring a relatively low maintenance shaftless screw conveyor. KWS utilizes extensive experience and an application database when selecting trough liner materials for a specific application. We have developed a secure liner attachment method that simplifies installation and replacement. As we are not limited to proprietary or own-brand liners, we can review the requirements in an unbiased and commercially efficient way to ensure the best match for the job.

Variety of Liners Options:

- UHMW – Low coefficient of friction material that wears relatively slowly for most applications where the product conveyed has some liquid and little or no inorganic particulate (e.g. sand or grit)
- Oil Impregnated UHMW – UHMW infused with oil is typically used where there is little liquid in the product being conveyed or where due to the layout of the conveyor, there are sections of conveyor that may run “dry” or without product for prolonged periods of time.
- Wear-Alert UHMW – KWS uses a two-color liner to provide a visual indicator that the liner life has expired. When the top layer is worn through, a second highly contrasting color layer becomes visible and indicates that the liner must be replaced. Measuring liner thickness on equipment that is in service is difficult and this is a very useful feature for plant operators.
- Xylethon - This single color proprietary blend from the Dura Wear company is the longest lasting and costliest plastic liner option. It’s smooth and non-stick wearing surface has a tendency to polish rather than become serrated as most other industrial plastics do.
- AR400 Wear Bars – This is a lower cost spiral bearing material for use on abrasive materials with low rpsm (e.g. grit and screenings with high grit content). A number of wear bars are positions longitudinally and at intervals around the inside diameter of the trough.
- Alumina Silica Ceramic – KWS has developed the use of this material into a practical, replaceable trough liner for use where the conveyed product is extremely abrasive.

ZERO SPEED SWITCHES

Zero speed switches are used to protect equipment and processes. When the sensor or switch detects a change in speed or zero speed, a signal is sent to a control panel or an alarm to alert the operator of a malfunction. The process may be halted to prevent damage to other conveying or processing equipment.

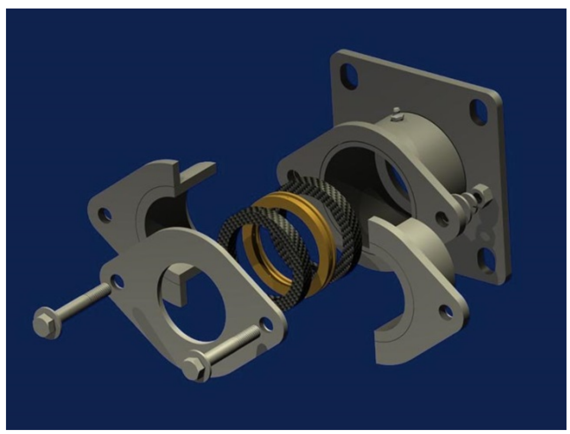


BULKHEAD TROUGH ENDS

Bulkhead trough ends are trough ends that include a removable mounting plate for the drive or bearing. Bulkhead trough ends give greater range and versatility in the selection of seals, bearings, and drives over standard trough ends. They are used for more demanding applications such as conveying water and wastewater residuals. By providing space between the trough end and the drive mounting plate, bulkhead trough ends help prevent contamination of the drive or bearing.

SPLIT FLANGED GLAND SEALS

KWS Split Flanged Gland Seals are used to prevent bulk materials from leaking from a screw conveyor or feeder. Mounted to the outside of a pedestal or bulkhead trough end, the KWS Split Flanged Gland Seal is very similar in design and function to the CEMA standard flanged gland seal. Both types of seals consist of an outer housing with multiple rings of packing compressed by an adjustable follower to create a positive seal around a rotating shaft.



KWS Split Flanged Gland Seals utilize a split follower with two halves that can be separated after retracting the follower from the seal housing allowing full access to replace the square braided rope packing without removal of the pillow block bearing.

Braided rope packing can be replaced in minutes without disturbing the adjacent pillow block bearing or drive by removing the split follower. Two adjustment bolts connecting the split follower to the outer housing are removed using common hand tools. The split follower is then retracted and the two halves separated allowing access for rope packing replacement.

SLIDE GATES

Features & Benefits

KWS Diverter Gate Located Under Centrifuge

Multi-Turn Electrically Actuated Slide Gates

KWS multi-turn electrically actuated slide gates are used to control or divert the flow of bulk materials in a wide variety of applications. Slide gates can be found on screw conveyors at intermediate discharge points, below hoppers as cut-off valves or even as emergency shut-off gates to stop material surges.

Linear actuators are typically used for low load, low cycle applications because their force/torque output is small and their actuation mechanism is light-duty. For heavier-duty applications such as truck or bin loadout conveyors, multi-turn electrical actuators are a more reliable choice. Multi-turn actuators can be used for simple open/close duty and are very precise so they can be used for modulating duty, which is where a gate or valve is opened to a desired point set through upstream control.

Multi-turn actuators can be designed for actuation parallel or perpendicular to the direction of gate stroke. Parallel actuation is known as rising stem and uses an acme screw to translate the gate blade. Acme screw threads are designed for higher loads when compared to other thread types. Perpendicular actuation is known as rotating and uses a keyed shaft with a rack and pinion mechanism to translate the gate blade.

Features

Electric Actuator – KWS multi-turn electrically actuated slide gates utilize heavy duty Acme screws or keyed shafts for long life, even in the harshest conditions. Actuator rotation speeds typically vary from 4 to 180 rpm. Actuator torque outputs typically vary from 7 ft-lbs. all the way up to 23,600 ft-lbs.

Rugged Actuator – Motor and gearbox are double-sealed in a weather-proof enclosure that provides high quality corrosion protection suitable for a wide variety of temperature ranges.

Control Box – KWS multi-turn electrically actuated slide gates come with an integrated control unit that has a motor starter, motor heater, torque and limit switches, buttons for open/close and local/stop/remote function, along with digital and programmable output.

Benefits

Low Speed, High Torque Operation – KWS multi-turn electrically actuated slide gates produce high force for shearing through bulk materials when located under a silo or hopper.

Variety of Uses – KWS multi-turn electrically actuated slide gates are versatile and custom tailored to fit almost any application or design condition. Actuators can be used in corrosive, wet and explosion-proof environments such as wastewater or chemical plants.

Design Engineering Manufacturing

KWS Manufacturing
3041 Conveyor Drive
Burleson, Texas 76028

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Phone: (817) 295-2247
Fax: (817) 447-8528

www.kwsmfg.com

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Features & Benefits


KWS Diverter Gate Located Under Centrifuge

Multi-Turn Electrically Actuated Slide Gates

Easy to Wire & Program – The actuator controls can handle a wide variety of control communication protocols and are easily configurable for a variety of input and output signals. Travel limit setting, configuration of relays, alarms and other actuator settings can be performed with an infra-red or Bluetooth remote controller.


KWS Slide Gate with Rising Stem Actuator


KWS Slide Gate with Rotating Actuator

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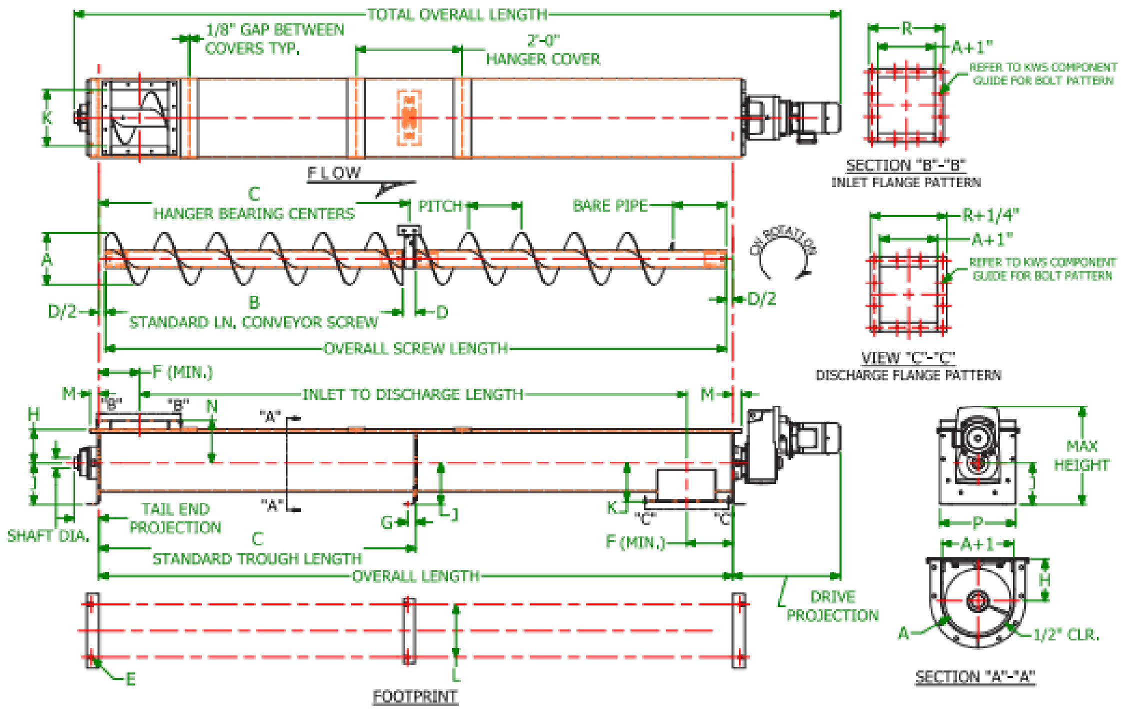
CONTROL SYSTEM

The panel pricing can vary widely depending on the type of logic, type of PLC or relays, and type of materials of construction, area classification, or front-of-panel features.

KWS SCREW CONVEYOR DIM STANDARD (GOOD FOR SHAFTLESS & SHAFTED)



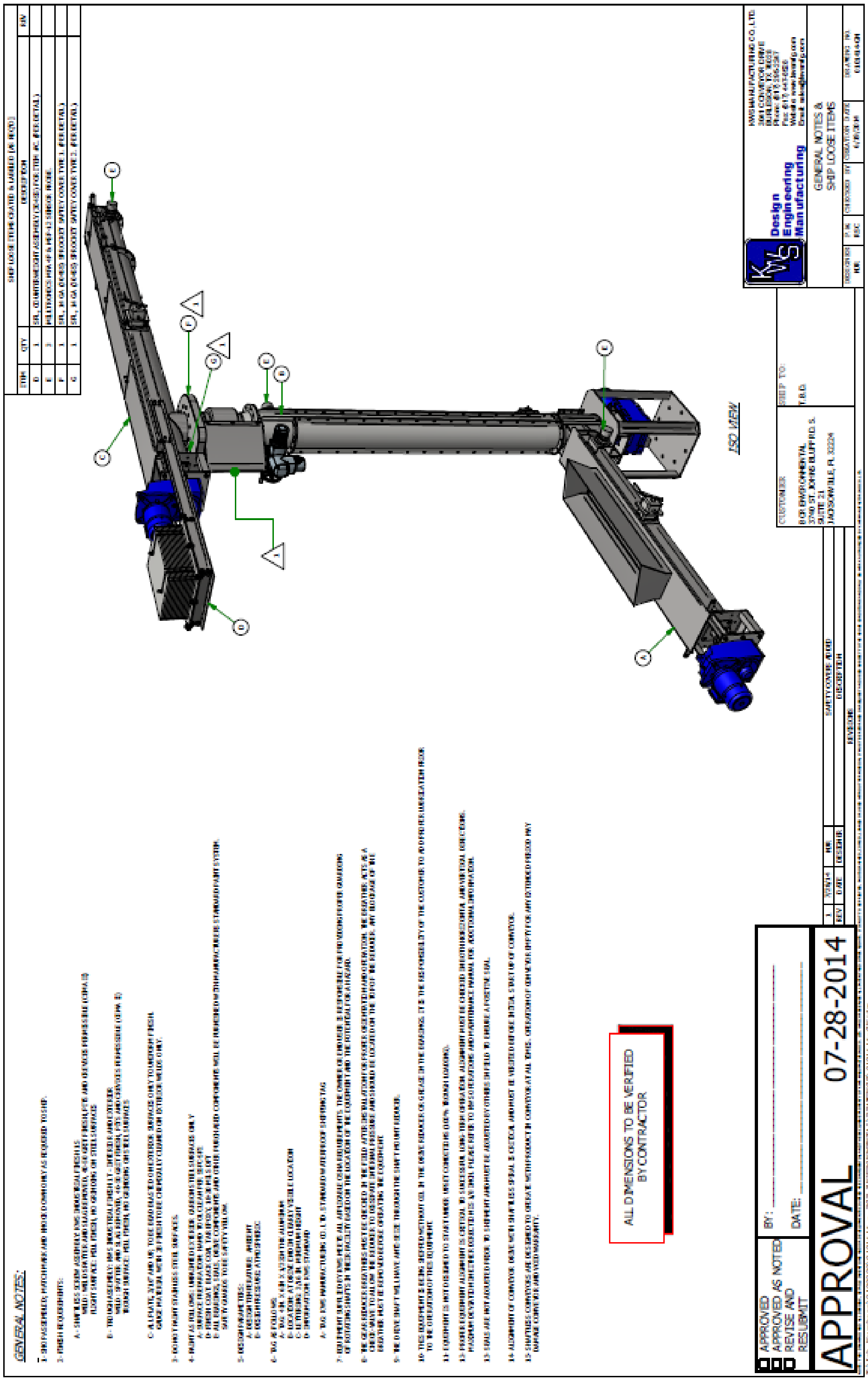
A Screw Dia.	Shaft Dia.	B	C	D	E Bolts	F (Min.)	G	H	J	K	L	M	N	P	R
4	1	9' - 10-1/2"	10	1-1/2	3/8	4-1/2	1	3-5/8	4-5/8	3-3/4	5-3/4	1-7/16	4-7/8	7-3/4	7-1/2
6	1-1/2	9' - 10"	10	2	3/8	6	1	4-1/2	5-5/8	5	8-1/8	1-1/2	6	9-3/4	10
9	1-1/2 2	9' - 10"	10	2	1/2	8	1-1/2	6-1/8	7-7/8	7-1/8	9-3/8	1-5/8	7-5/8	13-3/4	13
12	2 2-7/16 3	11' - 10" 11' - 9" 11' - 9"	12	2 3 3	5/8	10-1/2	1-5/8	7-3/4	9-5/8	8-7/8	12-1/4	2	9-3/4	17-1/4	17
14	2-7/16 3	11' - 9"	12	3	5/8	11-1/2	1-5/8	9-1/4	10-7/8	10-1/8	13-1/2	2	11-1/4	19-1/4	19
16	3	11' - 9"	12	3	5/8	13-1/2	2	10-5/8	12	11-1/8	14-7/8	2-1/2	12-5/8	21-1/1	21
18	3 3-7/16	11' - 9" 11' - 8"	12	3 4	5/8	14-1/2	2	12-1/8	13-3/8	12-3/8	16	2-1/2	14-5/8	24-1/4	24
20	3 3-7/16	11' - 9" 11' - 8"	12	3 4	3/4	15-1/2	2-1/4	13-1/2	15	13-3/8	19-1/4	2-1/2	16	26-1/4	26
24	3-7/16	11' - 8"	12	4	3/4	17-1/2	2-1/4	16-1/2	18-1/8	15-3/8	20	2-1/2	19	30-1/4	30
30	3-15/16	11' - 8"	12	4	3/4	20-1/2	2-1/2	19-1/2	21-1/2	18-3/8	30	3	22-1/2	38	36
36	4-7/16	11' - 7"	12	5	3/4	23-1/2	2-1/2	22-1/2	24	21-3/8	36	3	25-1/2	44	43

Design
Engineering
Manufacturing

Conveying Knowledge, Workmanship, Solutions

Environmental Quote Description

EXAMPLE KWS GENERAL ARRANGEMENT DRAWING AND BOM



KWS SIMILAR PROJECT CASE STUDY

KWS Problem Solvers

End User or Owner
Louisville Water Treatment Division
Louisville, CO

Consulting Engineer
Dewberry Engineers Inc.
Denver, CO

Contractor
MWH Constructors
Broomfield, CO

Plant Name and Location
Louisville Wastewater Treatment Plant
Louisville, CO

Inclined Sludge Load Out System for Louisville Wastewater Treatment Plant in Louisville, CO

General Description of the Application

The City of Louisville is a Home Rule (citizens decide the framework of the local government) Municipality in Boulder County, Colorado. The city population was 18,376 at the 2010 United States Census and the city has been ranked in the top ten of "The 100 Best Places to Live in the U.S." many times in recent years.

The Louisville Wastewater Treatment Plant (WWTP) is located in eastern Boulder County on the east side of Louisville. The facility discharges into Coal Creek, which is approximately ¼ mile east of the plant. The initial WWTP was constructed in 1952 and consisted of a settling pond followed by an aerated lagoon.

Beginning August 1, 2017, effluent released to Coal Creek must comply with new discharge limits for ammonia. To meet the new limits, the existing secondary process was replaced with new facilities capable of nitrification, denitrification, and biological phosphorus removal. The new solids handling facilities included new equipment for aerobic digestion, sludge pumping, and sludge storage.

KWS Environmental provided a new dewatered biosolids load out system to replace a belt conveyor to sludge drying bed that was inefficient, messy, and unreliable. The new system consisted of an incline shaftless screw conveyor with a single discharge to a truck. KWS also designed a new transition chute and flexible connection to mate to the existing centrifuge.

Design Parameters of Application

Product Type: Dewatered Sludge
Material Density: 75 Lbs. per Cubic Foot
Conveyor System Capacity: 110 Cubic Feet per Hour
Duty: 7 Days per Week, 24 Hours per Day

Advantages Provided by KWS

KWS Environmental engineered, manufactured, delivered and commissioned a load out system that included an inclined shaftless screw conveyor along with a transition chute and flexible connection after the centrifuge. KWS engineers used 3D Autodesk Inventor to model the system and show exact details for the new KWS inclined screw conveyor, accessory equipment, egress and the truck load out area. The KWS team assisted the consulting engineer when the scope of supply after the centrifuge was not clearly defined. KWS took the lead and designed the complete load out system including the flexible connection and transition chute so the centrifuge would be isolated and easily able to discharge into the conveyor. KWS frequently and clearly communicated with the consulting engineer and contractor throughout the project so that no dimension or feature was missed.

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Denver, CO

Contractor
MWH Constructors
Broomfield, CO

Plant Name and Location
Louisville Wastewater Treatment Plant
Louisville, CO

Inclined Sludge Load Out System for Louisville Wastewater Treatment Plant in Louisville, CO

Special Features of KWS Design

KWS Environmental provided a complete biosolids load out system including a 31-feet long inclined shaftless screw conveyor with an abrasion resistant AR-235 spiral for long screw life. The shaftless spiral is supported by ½-inch thick UHMW trough liners that are easily replaceable. A flexible rubber connection before the inlet transition chute of the shaftless screw conveyor protects the conveyor from the vibration of the centrifuge. The transition chute after the centrifuge was designed to match the centrifuge discharge and inclined screw conveyor inlet and includes an inspection port. The inclined screw conveyor was constructed from 304 stainless steel for corrosion protection. KWS Environmental designed and manufactured a special cantilevered floor support for the discharge end of the conveyor so no supports would interfere with the truck bay.

Special Features of KWS Design

"We appreciate your attention to detail and level of support on this project."

Driss Bencekroun, Project Manager - MWH Constructors

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Conveying Systems

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darren@mlmconveying.com
www.mlmconveying.com

August 20, 2019

Goble Sampson
22526 SE 64th Place, #240
Issaquah, WA. 98027

Re: Friday Harbor, WA.
Collection Conveyor System
MLM Project 1908002

We are pleased to offer you our BUDGET PROPOSAL for the supply of a MLM Conveying Systems Collection Conveying equipment system which includes one (1) inclined biosolids collection shaftless screw conveyor.

MLM Conveying Systems is a designer, manufacturer and supplier of mechanical equipment solutions for material handling and storage for all process stages in both the municipal and industrial markets with our experiences dating from the 1960's.

Applications served would include residuals from dewatering, screening and grit removal equipment, and foreign sludge receiving facilities; utilizing shafted or shaftless conveyors transitioning to truck loading, composting, biogas/biofuels, incineration or drying systems. We offer decades of experience to assist in the execution of design engineering, project management, installation and aftermarket support, service and spare parts.

Previously, our shaftless spiral products have been produced in the same factory in Sweden for over 40 years, with the largest in house inventory of spiral sizes in the world. MLM will now also be producing this equipment in our North American facility, including the manufacture of the shaftless spirals made from high tensile micro alloy bar, and other materials such as stainless steel.

MLM was one of the original manufacturers to supply spirals for shaftless screw conveyors made from high tensile micro alloy bar material, which produces an optimum hardness that has been found to be the best material for forming and welding a spiral for optimal strength and life. We cold form our spirals to the desired tolerance, diameter and pitch. This tolerance results in straighter, more robust spirals which will last longer and will prevent any "wobble" during operation, which can result in premature wear of the spiral, liner and trough.

We have one of the largest inventories of mandrels used for the forming of shaftless spirals in the world and have been an OEM supplier of spirals for many of the leading manufacturers of Shaftless Screw Conveyors, including Spaans Babcock, Asdor, US Filter, and Siemens. This inventory allows us to supply and retrofit conveyor systems built by any manufacturer.

MLM also has the ability and expertise to offer Shafted screw technology developed by Spaans BHS. This technology was acquired by ML in 2004.

Our installations using the Spaans BHS technology include the largest and most complex dewatered sludge cake applications in North America since 1978. Examples include the storage hoppers and replacement distribution screw conveyors at Annacis Island and projects in Washington D.C. Blue Plains, Columbus Southerly and Jackson Pike, Duffin Creek, Toronto Humber / Highland Creek and Ashbridges Bay, Changi Singapore, as well as numerous projects in the Phoenix area. Many of these municipal equipment installations have been successfully in service for over 30 years!

We trust the details are complete; however, should you require any further information, please contact the writer.

Thank you again for your attention in this matter.

Yours truly,
MLM Conveying Systems, Inc.

Darren Newman
mobile. 416.277.4262
darren@mlmconveying.com

Our relevant experience with similar projects cannot be matched and the following listing of our similar projects confirms our technical expertise in providing complex and complete dewatered biosolids systems solutions on time and on budget:

STORAGE and CONVEYANCE SYSTEMS

Installation	**Type storage**	**Retrieval system**	**Volume tonnes**	**Year**	**Comments**
Highland Creek Toronto	Storage silos,	Shafted classifying and transfer screw conveyors	40	2016	Centrifuge collection and transfer to storage silos.
ChangSha City China	Two (2) storage hoppers	Shaftless hopper extraction conveyors	20	2014	Hopper extraction to sludge feed pumps
Clarkson Mississauga, CA	Two (2) rectangular hoppers	Twin live bottom conveyors and slide gates Classifying Conveyors Distribution Conveyors	2 @ 250	2011	Direct truck loading and transfer conveyors Underneath centrifuges
Duffin Creek Pickering, ON	Incinerator feed	Transfer, Classifying and Silo Extraction Screw conveyors and slide gates	Various	2009	Incinerator feed
Annacis Island Vancouver, BC.	Two (2) Rectangular Hoppers	Twin live bottom conveyors and slide gates and replacement distribution conveyor	2 @ 220	2000 2015	Direct truck loading and new transfer conveyors

Installation	Type storage	Retrieval system	Volume tonnes	Year	Comments
Fiesta Island San Diego, CA	Eight (8) round silos	Three sets of twin live bottom conveyors	8 @ 204	1998	Interim storage
NEORD Southerly Cleveland, OH	Two (2) rectangular hoppers	Twin live bottom conveyors	2 @ 102	1998	Interim storage
23rd Ave. Phoenix, AZ	Two (2) rectangular hoppers	Twin live bottom conveyors and slide gates	2 @ 135	1998	Direct truck loading
91ST Ave. Phoenix, AZ	Four (4) rectangular hoppers	Twin live bottom conveyors and slide gates	4 @ 170	1996	Direct truck loading
Toronto Humber	Thirty-six shaftless grit & screenings collection conveyors	N/A		1996	Truck Loading Facility

Our manufacturing capabilities include over forty thousand (40,000) square feet of fabrication area with a lifting capacity of 165 tons - no project is too large! Within our machine shop and steel fabrication area, we regularly manufacture screw conveyors and storage systems from carbon and 300s stainless steel as well as abrasion-resistant alloys.

With our QA program MQA-100-1 (ISO9003), you are guaranteed that the equipment provided by MLM will meet the needs of your demanding environment. Conformance to API 650 Tank Manufacturing Standards provides our customers with the quality required in the municipal water and wastewater environment.

MLM's experience, installation history and support with all the necessary equipment components, from conveyors of all types, to slide gates, to dewatered biosolids truck-loading systems and headworks equipment. Our designs incorporate the heavy-duty, easy maintenance features demanded from our customers for the Municipal market environment.

We would be most pleased to welcome you to our facility at your convenience!

Scope of Supply

Bid Item	Qty.	Description	Dwg. Ref.
1	1	**Shaftless Conveyor (285mm x 20" long)** Material 304SS unless noted One (1) Inlet connection. One (1) discharge connection. 3.0HP Motor, SEW Eurodrive parallel shaft mounted helical reducer, output speed 18 rpm. 4140 alloy driveshaft, 3/16" thick U-shaped trough c/w 1/2" thick UHMW liner, 12GA bolted cover, (1) inspection hatch, (3) saddle support, (1) 3" drain connection. 3/8" drive end plate complete with flanged adapter, 2-7/16" packing seal. 3/8" Tail plate. Spiral (360x360, 70x25 and 360x178, 70x25) Controls are not included. Acid passivation finish on stainless steel. Shipping weight less spiral: 3,300 lbs.	
2	1 Lot	**Three (3) Support Legs, no more than 9'- 11" high.** Material 304SS unless noted. Acid passivation finish on stainless steel. Shipping weight: 620 lbs	MLM-SK-1
3	1 Lot	**Support Documentation**	

TOTAL LUMP SUM PRICE for ITEMS 1 to 3.. US$ 42,250.00 .

Notes and Exceptions:

- All taxes are extra
- FOB factory, delivery allowed to your site.
- Workshop testing is included.
- All electrical devices, including, safety switches, and motion detectors are shipped loose for on-site installation
- Acid passivation (brush) of all exterior weld areas is included.

Terms and Conditions

Delivery

This quotation is made:	FOB factory, freight allowed to jobsite, All Applicable Taxes Extra
Shop Drawings:	Two (2) to three (3) weeks after receipt of order.
Equipment Delivery:	Eight (8) to Ten (10) weeks, for equipment, after receipt of approved drawings.

Payment
Twenty-five (25%) percent with Purchase Order, fifteen percent (15%) upon receipt of approved shop drawings, twenty-five percent (25%) upon readiness to ship, twenty-five percent (25%) on delivery and ten percent (10%) on startup, not to exceed four (4) months after delivery to site. We reserve the right to split ship and be paid pro rata. **The terms of payment are subject to credit approval**. Interest at the rate of two (2) percent is chargeable on overdue accounts. Payment from purchaser is not subject to receipt payments from third party to purchaser.

Taxes
Our quoted pricing does not include any federal, state, provincial or local taxes, taxes or duties which will be extra, if applicable.

Validity Period
This quotation is valid for a period of ninety (90) days from the date of the written proposal from MLM Conveying Systems. Upon expiration of the validity period, MLM Conveying Systems reverses the right to escalate the price of equipment to match actual material costs.

Claims
Claims for short shipments or damaged goods must be received by MLM Conveying Systems office in writing within seven (7) calendar days of delivery.

Warranty

MLM Conveying Systems warrants the equipment to be free of defects for a period of twenty-four (24) months after start-up or thirty (30) months after delivery, whichever occurs first or on completion of manufacture if shipment is delayed by the Purchaser. MLM Conveying Systems' obligation under this warranty will be limited to repairing or at MLM Conveying Systems' discretion, replacing any product or part thereof proving defective. Warranties offered are contingent upon the equipment being stored in accordance with MLM Conveying Systems' instructions and upon the equipment being maintained and lubricated as per operating and maintenance instructions provided by MLM Conveying Systems.
THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Liabilities
MLM Conveying Systems (Seller) is not responsible for and will not be subject to or liable for consequential, incidental or contingent damages whatsoever.

Field Services
This quotation has included for field supervision as outlined in the Scope of Supply. However, if additional time and/or visits are required, then these will be chargeable at a rate of $900.00 US per eight-hour day, plus travel and living expenses at cost.

Exclusions
The installation contractor is responsible for the following:

- .1 all manpower and lifting equipment to, unload, and install the equipment,
- .2 aligning and anchoring the equipment into position,
- .3 all civil structures, foundations, supports (other than conveyor saddle supports), and concrete and grout work,
- .4 all lubricants, other than initial fill,
- .5 final touch-up and field painting as necessary,
- .6 test running and commissioning,
- .7 delivery and discharge piping and tubing beyond connection to equipment,
- .8 all electrical, electronic and control work, including devices unless otherwise note,
- .9 temporary power supply during construction, installation and start-up,
- .10 storage of delivered equipment, and;
- .11 in-place storage or maintenance of equipment, if equipment cannot be put into regular service after installation.

STANDARD TERMS OF SALE

1. Applicable Terms. These terms govern the purchase and sale of the equipment and related services, if any (collectively, "Equipment"), referred to in Seller's purchase order, quotation, proposal or acknowledgment, as the case may be ("Seller's Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms or documents.

2. Payment. Buyer shall pay Seller the full purchase price as set forth in Seller's Documentation. Unless Seller's Documentation provides otherwise, freight, storage, insurance and all taxes, duties or other governmental charges relating to the Equipment shall be paid by Buyer. If Seller is required to pay any such charges, Buyer shall immediately reimburse Seller. All payments are due within 30 days after receipt of invoice. Buyer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval.

3. Delivery. Delivery of the Equipment shall be in material compliance with the schedule in Seller's Documentation. Unless Seller's Documentation provides otherwise, Delivery terms are F.O.B. Seller's facility.

4. Ownership of Materials. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's property. Seller grants Buyer a non-exclusive, non-transferable license to use any such material solely for Buyer's use of the Equipment. Buyer shall not disclose any such material to third parties without Seller's prior written consent.

5. Changes. Seller shall not implement any changes in the scope of work described in Seller's Documentation unless Buyer and Seller agree in writing to the details of the change and any resulting price, schedule or other contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.

6. Warranty. Subject to the following sentence, Seller warrants to Buyer that the Equipment shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship. The foregoing warranty shall not apply to any Equipment that is specified or otherwise demanded by Buyer and is not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Buyer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Buyer under warranty, tort or any other legal theory. If Buyer gives Seller prompt written notice of breach of this warranty within 18 months from delivery or 1 year from acceptance, whichever occurs first (the "Warranty Period"), Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the subject parts or refund the purchase price therefore. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Equipment in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller). THE WARRANTIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES AND ARE SUBJECT TO SECTION 10 BELOW. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

7. Indemnity. Seller shall indemnify, defend and hold Buyer harmless from any claim, cause of action or liability incurred by Buyer as a result of third party claims for personal injury, death or damage to tangible property, to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defenses of and settle any indemnified claim. Seller's indemnification is conditioned on Buyer (a) promptly, within the Warranty Period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.

8. Force Majeure. Neither Seller nor Buyer shall have any liability for any breach (except for breach of payment obligations) caused by extreme weather or other act of God, strike or other labour shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, act of government or any other cause beyond such party's reasonable control.

9. Cancellation. If Buyer cancels or suspends its order for any reason other than Seller's breach, Buyer shall promptly pay Seller for work performed prior to cancellation or suspension and any other direct costs incurred by Seller as a result of such cancellation or suspension.

10. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE EQUIPMENT SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE EQUIPMENT. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.

11. Miscellaneous. If these terms are issued in connection with a government contract, they shall be deemed to include those federal acquisition regulations that are required by law to be included. These terms, together with any quotation, purchase order or acknowledgement issued or signed by the Seller, comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Buyer's documents, unless separately signed by Seller. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Buyer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Buyer may not assign or permit any other transfer of the Agreement without Seller's prior written consent. The Agreement shall be governed by the laws of the State of Delaware without regard to its conflict of laws provisions.

AUSTIN-MAC, INC.

2739 Sixth Ave South
P.O. Box 3746
Seattle, WA 98124-3746
(206) 624-7066 FAX (206) 682-4442

QUOTATION

Q 17794

PLEASE INDICATE THE
ABOVE NUMBER WHEN ORDERING

TO: Wilson Engineering
Kenna Wurden-Foster
(Friday Harbor WWTP)
(360) 733-6100 ext 246

QUOTATION DATE	SALESPERSON
11/6/2019	David Martin
INQUIRY DATE	**INQUIRY # / NAME**
11/1/2019	Kenna

EST. SHIP DATE	SHIP VIA	FOB	FREIGHT	TERMS
10-12 WEEKS	TRUCK	SEATTLE	pp&a	NET 30 w/ credit

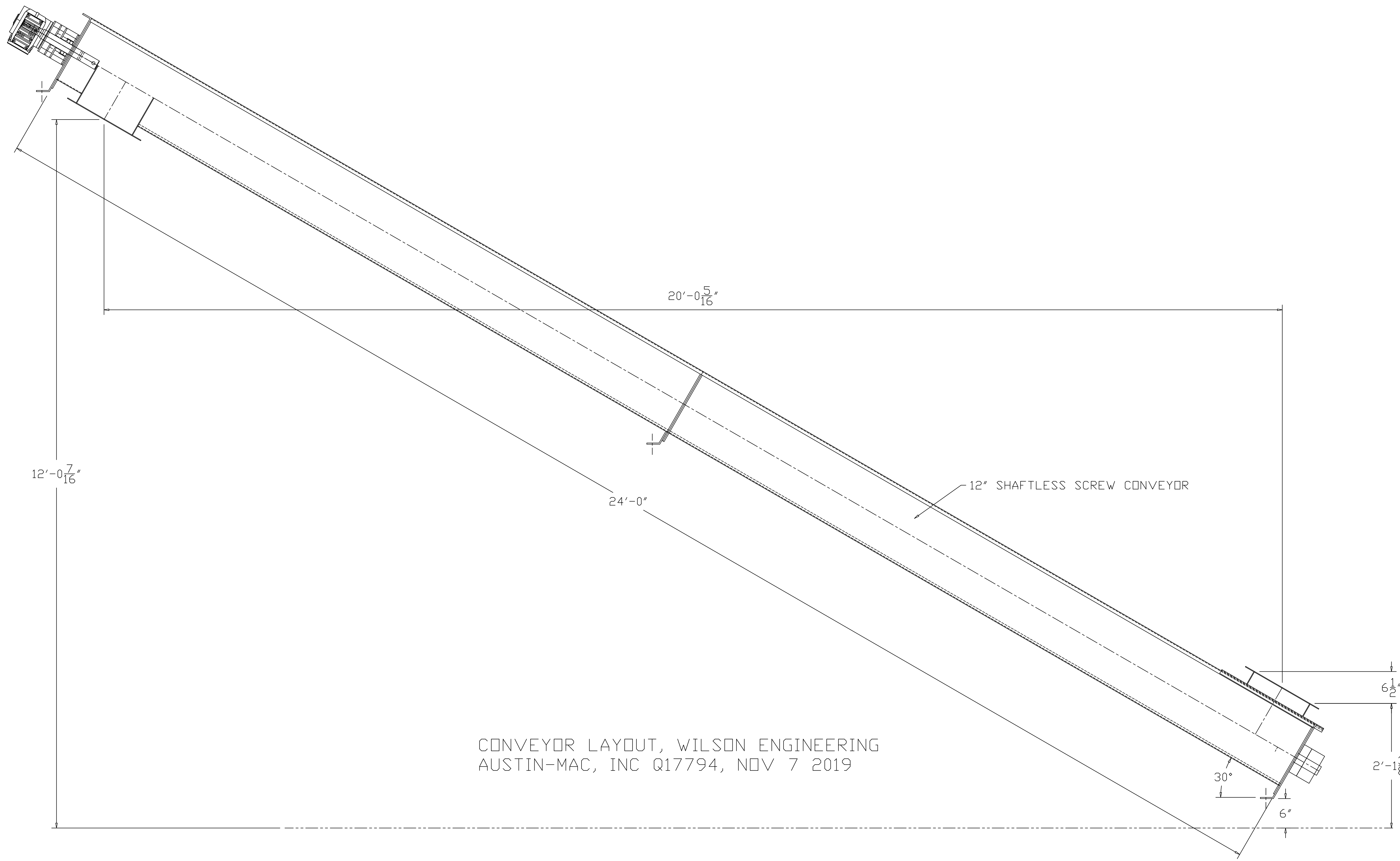
QTY	DESCRIPTION	PRICE	AMOUNT
1	**12" X 9" PITCH X 24'-0" LONG, 30 DEGREE INCLINE,** **SHAFTLESS SCREW CONVEYOR, (REVERSABLE)** ***MATERIAL: SLUDGE, 60-65 LBS/FT^3*** ***CAPACITY: 120 CFH @ 30 RPM***	**BUDGET**	**$ 29,800.00** **LOT**
1	**SHAFTLESS SCREW:** 12" DIA X 9" PITCH X 23'-9" LONG, 1" THICK X 4" WIDE SHAFTLESS, 8620 BAR, RIGHT HAND, END MOUNTED ON 3 1/2" SCH80 PIPE. SCREW BUSHED, & DRILLED FOR 3" DIA (2-BOLT).		
1	**TROUGH:** 12" SINGLE FLANGE U-TROUGH, 10 GA 304 SS. 1/4" TROUGH END PLATES, 304 SS. 1/4" END FLANGES, 304 SS. (1) INLET & (1) DISCHAGE SPOUT, 10 GA 304 SS. BOLTED & GASKETED COVERS, 10 GA 304 SS. 1/2" THICK DUAL COLOR UHMW LINERS, 4'-0" MAX LENGTH WITH SIDE HOLD DOWN. DRIVE END SEALED WITH 3" DIRECT MOUNT COMPRESSION SEAL AND SUPPORTED BY GEAR REDUCER. **BOTTOM 6" PIPE DRAIN**		
1	**MOTOR:** 3 HP, 1800 RPM, 3/60/230-460V, TEFC, C-FACE, TOSHIBA EQP GLOBAL SD		
1	**REDUCER:** SEW EURODRIVE FAZ77AM182, CLASS 2, 30 RPM, M1 MOUNT, 3" SHAFT		
1	**ZERO SPEED:** SIEMENS WM100		
1	**E-STOP ASSEMBLY:** ALLEN BRADLEY LIFELINE 3		
LOT	**SUPPORT LEGS, TRANSITIONS & CHUTES** **2-DAY ONSITE START-UP & TRAINING** **FULLY ASSEMBLED & TESTED WITH O&M MANUAL** **EXCLUDES: STRUCTURAL CALCS / STAMP**		

WE ARE PLEASED TO SUBMIT THE ABOVE QUOTATION FOR YOUR CONSIDERATION. SHOULD YOU PLACE AN ORDER, BE ASSURED IT WILL RECEIVE OUR PROMPT ATTENTION. QUOTED PRICES ARE BASED ON CURRENT RAW MATERIAL COSTS AND ARE SUBJECT TO CHANGE AT THE TIME OF ORDER PLACEMENT OR ENGINEERING APPROVAL. LATE PAYMENTS WILL BE ASSESSED 1% PER MONTH.

BY ACCEPTED DATE

SIGN AND RETURN WHEN ORDERING

THANK YOU!



CONVEYOR LAYOUT, WILSON ENGINEERING
AUSTIN-MAC, INC Q17794, NOV 7 2019

APPENDIX F – SLUDGE TESTING AND CENTRIFUGE EQUIPMENT LAB REPORT – FROM ANDRITZ

Laboratory Report

TOWN OF FRIDAY HARBOR, WA

Report No.: L-14156
Opportunity No.: 3195587
Application: 2997-0017
Product Home/Group: 527, 4418
Division: 41

Date Report Issued: October 9, 2019
Date Sample Received: September 11, 2019
Author: Ron Thomason
Copy: Hausegger, Piché

ENGINEERED SUCCESS

Friday Harbor WWTP
Don Reitan
375 Tucker Ave.
Friday Harbor, WA 98250
360-378-5400
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APSCO Inc.
Joe Buckman
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573-795-9870
jbuckman@apsco-llc.com

ANDRITZ Separation Technologies, Inc.
Denis Piché
1010 Commercial Blvd. S.
Arlington, TX 76001
403-650-4131
denis.piche@andritz.com

TABLE OF CONTENT

ANDRITZ LABORATORY REPORT

COMPANY	:	Town of Friday Harbor Friday Harbor, WA
PLANT	:	Friday Harbor WWTP
SAMPLE TYPE	:	Waste Active Sludge from SBR
DATE	:	October 9, 2019

1. Introduction:

Five (5) gallons of sample were received on September 11, 2019 in the ANDRITZ laboratory from the Friday Harbor, WA Wastewater Treatment Plant (WWTP) for dewatering tests simulating Centrifuge and Belt Filter Press (BFP) technologies. The general reason for receiving the sample was to confirm performance values included in an equipment proposal dated September 5, 2019.

2. Objectives:

The specific objectives of these laboratory tests were to:

2.1 Analyze the sample as received for physical properties.

2.2 Compare performance results of the provided plant polymer to those of alternative polymers.

2.3 Provide Centrifuge performance data.

2.4 Provide BFP performance data.

3. Sample Analysis Results and Observations

3.1 Sample Analysis Results:

Total Solids* (%TS @ 105ºC)	0.3	
Suspended Solids** (%SS @ 105ºC)	0.3	
Plug Solids (%TS, @ 1000 G's and 5 min)	3.2	
Plug Solids (%TS, @ 2000 G's and 5 min)	3.1	
Plug Solids (%TS, @ 3000 G's and 5 min)	3.8	
Plug Solids (%TS, @ 4000 G's and 5 min)	3.6	
Spin Down Volume (%, 1000 G's, 5 min)	12	
Spin Down Volume (%, 2000 G's, 5 min)	11	
Spin Down Volume (%, 3000 G's, 5 min)	9	
Spin Down Volume (%, 4000 G's, 5 min)	8	
pH @ 20°C	6.4	
Conductivity (mS/cm)	0.6	
Specific Gravity	1.0	
Solids Specific Gravity (Calculated)	1.1	
Ash Content of Total Solids*** (% of TS)	20	
Volatile Solids Content*** (% of TS)	80	
Capillary Suction Time (sec)	10	
Screened Solids:		Description
+30 Mesh Fraction (% of SS)	0.0	Fiber, Debris
30 x 50 Mesh Fraction (% of SS)	0.1	Fiber, Debris
50 x100 Mesh Fraction (% of SS)	3.4	Biomass
100 x 140 Mesh Fraction (% of SS)	6.6	Biomass
140 x 230 Mesh Fraction (% of SS)	34.2	Biomass
230 x 325 Mesh Fraction (% of SS)	17.8	Biomass
-325 Mesh Fraction (% of SS)	37.8	
Sludge Volume Index (SVI ml/g)	281	
Settled Solids (1000 ml @ 30 min)	941	
Color	Light Brown	
Odor	Musk	

Table 1

Standard Methods:

***2540B Total Solids, **2540D Total Suspended Solids, ***Fixed and Volatile Solids**

3.2 Photos

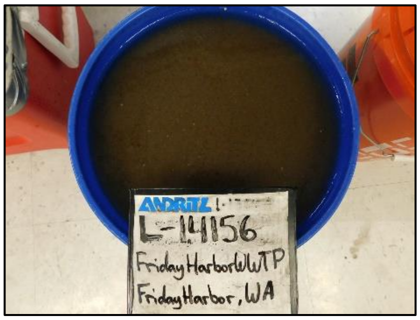


Photo 1: Sample As Received

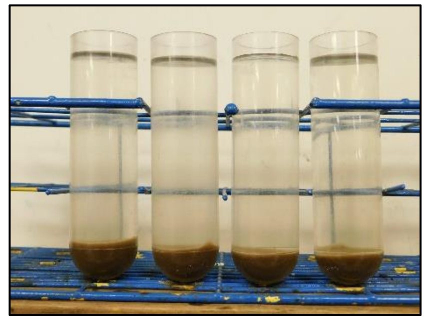


Photo 2: Spin Tube Test
L-R: 1000, 2000, 3000, 4000g's
For 5 Minutes Each Without Polymer

3.3 Analysis Observations

The sample was very dilute at 0.3%TS.

The volatile solids content was relatively high at 80%.

4. Polymer Evaluation Results and Observations

4.1 Polymer Evaluation Results

Plant Polymer Sample	7878FS40
Polydyne	7878FS40, 6287
Solenis	K279FLX

Table 2

4.2 The WAS sample flocculated well with high charge density cationic flocculants.

4.3 Though Centrifuge technology usually requires ~15% higher polymer dosage than BFP technology, the very dilute solids concentration made dosage differentiation difficult.

5. Belt Filter Press Test Results and observations

5.1 Belt Filter Press Test Results:

Lab Sample	L-14156
BFP Type	1.2m SMX®-S7
Polymer Utilized	7878FS40
Makeup Polymer Dilution (%)	0.5
Neat Polymer Dosage (lbs/ton TSS)	30
Active Polymer Dosage (lbs/ton TSS)	15
Recommended Belt Type	6093
Throughput (lb TSS/hr)	200 – 320
Throughput (GPM)	121 – 194
Anticipated Solids Capture (%SS ± 1%)	94
Belt Speed (FPM)	10
Cake Thickness (mm)	6
Cake Solids (%TS)	11.0

Table 3

5.2 Photos


Photo 3: Lab BFP Cake


Photo 4: Belt Condition

5.3 BFP Testing Observations

- At 15 Active lbs/ton polymer dosage, the sludge drained quickly in the gravity zone of the BFP.
- The sensitivity of the sludge to pressure required that ANDRITZ maintain a moderate belt tension.
- The low feed solids concentration relative to the solids that remained on the belts after cake discharge resulted in slightly lower solids capture rate at 93 % ± 1%.
- Analysis of the cake sample received from Friday Harbor resulted in a concentration of 13.4 %TS. The corresponding filtrate sample received contained 0.004 %TSS.

6. Centrifuge test results and observations

6.1 Laboratory Centrifuge Test

Spin Time (Minutes)	G Force	Type of Test	Polymer Type	Polymer Dosage Rate (active lbs/ton)	Plug Solids (%TS)	Anticipated Cake Solids (%TS)
5	3000	Glass Tube	None	None	3.8	
5	3000	Glass Tube	7878FS40	14.9	4.2	
10	3000	Screen			14.8	14.5 – 16.5
15	3000	Screen			15.9	
20	3000	Screen			16.6	
Solids Capture: 96 % ± 1 %						

Table 4

6.2 Photos

Photo 5: Left Spun Without Polymer
Right Spun With Polymer

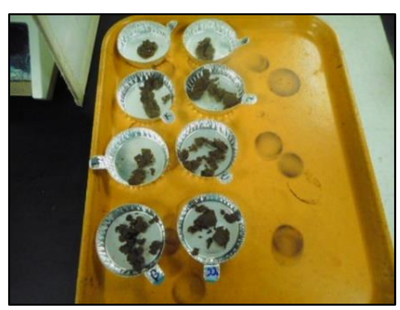


Photo 6: Spin Dewatered Cakes
5, 10, 15, 20 Minute Spins at 3000g's

6.3 Laboratory Test Centrifuge Test Observations

- With or without polymer flocculation the centrifuge effluent, centrate, was good ash shown in Photo 5.
- With a sufficient polymer dosage (Polydyne 7878FS40 at 14.9 Active lbs/ton TSS) added, the sludge dewatered well by centrifuge technology (Photo 6) to a range of 14.5 to 16.5 %TS.
- Solids capture rate was very good at over 95 %.

7. Conclusions:

Though the sample received contained low solids concentration, 0.3%TS and 0.3%TSS, centrifuge technology effectively separated the solids from the liquid to a maximum of 16.6%TS. Belt filter press technology was less effective because ANDRITZ found it necessary to lower the belt tension to minimize solids extrusion. This resulted in a cake containing 11%TS. ANDRITZ recommends centrifuge technology to produce maximum cake solids and solids capture.

Attached are photographs of the screen analysis, gravity drainage curves and lab sample data sheets for reference and comparison.

8. Sample Disposition:

The remaining untested sludge will be disposed in accordance with local regulations.

Report Prepared by : Ron Thomason
Title : Process Engineer

RT/sk

Attach.

Copies of this report have been distributed to the following:

Original +1cc/ Lab
1 cc/ Denis Piché
Sig Hausegger

9. Attachments:

9.1 Photographs

Photo #1: +30 Mesh Fraction

Photo #2: 30X50 Mesh Fraction

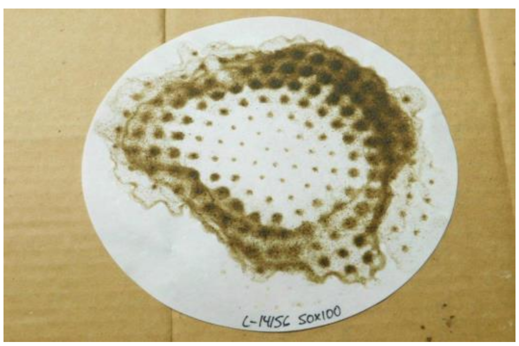


Photo #3: 50X100 Mesh Fraction

Photo #4: 100X140 Mesh Fraction

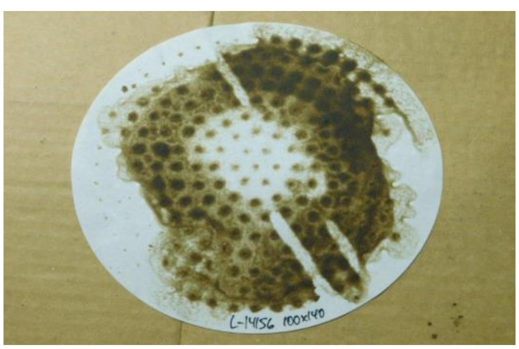
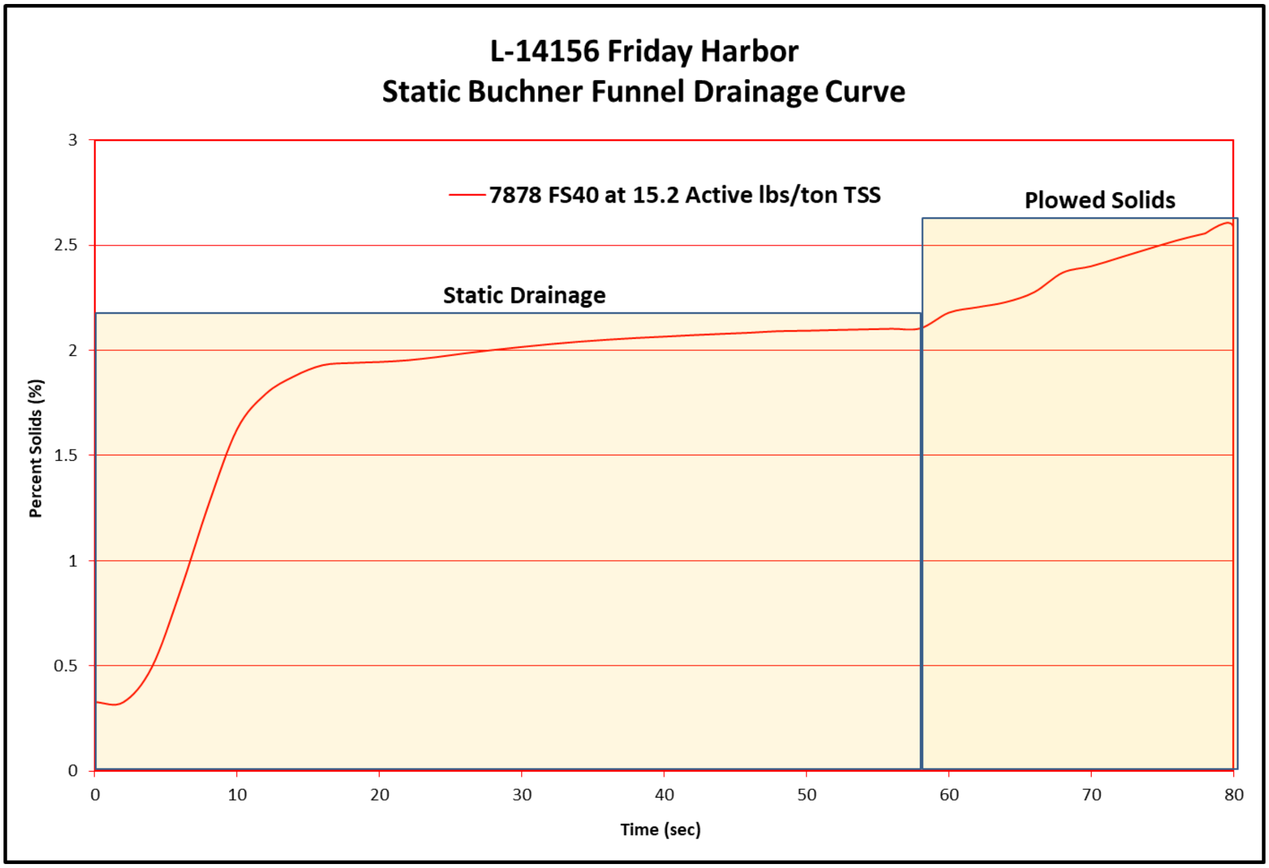


Photo #5: 140X230 Mesh Fraction

Photo #6: 230X325 Mesh Fraction

9.2 Gravity Drainage Curve



9.3 Lab Sample Data Sheets

III. HAZARDOUS MATERIALS

Hazardous waste definition and classification from the Texas Administrative Code (TAC) is as follows:

CLASS I WASTES — Any industrial solid waste or mixture of industrial solid wastes which, because of its concentration or physical or chemical characteristics, is toxic, corrosive, flammable, a strong sensitizer or irritant, or a generator of sudden pressure by decomposition, heat, or other means, and which may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, or disposed of or otherwise managed, including hazardous industrial waste.

CLASS II WASTES — Any individual solid waste or combination of industrial solid waste that cannot be described as Class I or Class III as defined in this regulation.

CLASS III WASTES — Inert and essentially insoluble industrial solid waste, usually including, but not limited to materials such as rock, brick, glass, dirt, and certain plastics and rubber, etc., that are not readily decomposable.

NOTE: Hazardous waste samples can include, but are not limited to: petroleum and petrochemical sludges; petroleum and gasoline storage tank bottoms; insecticide residues; PCB's (polychlorinated biphenol); most chlorinated hydrocarbons; heavy metal sludges (chromium, copper, zinc, lead, mercury, cadmium, nickel, barium, arsenic and antimony, to name the most common ones); radioactive materials; samples above pH 9.5 and below 5.5; paint sludge; and cyanide wastes.

IV. ANDRITZ LABORATORY WASTEWATER SAMPLE DATA SHEET

DATE: ____________ **INQUIRY #:** ____________

ANDRITZ Representative and/or Salesman:

____

____

CLIENT:

Company: Town of Friday Harbor Contact: Don Reitan

Plant/Mill Address: 375 Tucker Ave.

City: Friday Harbor State: Washington Zip: 98250

Phone: 360-378-5400 Email/Fax: donr@fridayharbor.org

Sample Characteristics: (This information is to be supplied by Customer to determine whether sample is typical of normal operation).

Date Collected: 9/10/19

Sludge or Slurry Consistency: (% Total Solids) Approximately 0.5% Liquid (Will report TSS when results are available)

(% Suspended Solids) ____________ Ash Content (% of Total Solids): ____________

pH @ Temperature (___ °F or ___ °C): ________ Specific Gravity: ____________

Capillary Suction Time (sec) ____________

1) Plant Influent

Design Flow (MGD) .69 MGD
Average Flow (MGD) .2300 presently
Industrial Influent Type Non-Industrial Flows
Industrial Influent Percentage ________

2) Headworks

☐ Coarse ☒ Fine
Screen Opening Size 3 mm
☒ Grit Removal ☐ None

3) Primary Treatment

☐ Gravity Settled
☒ Dissolved Air Flotation
☐ Lagoon
☐ Other________
☐ None
☐ Chemical Aid
Type ________
Dosage ________

4) Secondary Treatment

Type of Treatment

☐ Nitrification/Denitrification ☐ Nitrification Only
☐ Chemical Phosphorous Removal Chem. Type ________
☐ Biological Phosphorous Removal

Type of Equipment

☐ Aerated Basin ☐ Oxidation Ditch
☐ Rotating Biological Contactor ☐ Trickling Filter
☒ Sequence Batch Reactor ☐ MBR
☐ Other________

Type of Aeration

☒ Diffused Air ☐ Pure Oxygen ☐ Mechanical

5) Sludge Description

☐ 100% Primary
☒ 100% Secondary
☐ Blend ☐ by weight ☐ by volume
______% Primary
______% Secondary
☐ Co-settled Primary/ Secondary
☐ Other________

6) Sludge Treatment

☐ Anaerobic Digestion ☐ Mesophilic ☐ Thermophilic
☒ Aerobic Digestion
☐ Zimpro
☐ ATAD
☐ Lime
☐ Raw/None
☐ Other________

Volatiles Reduction ______ %
Solids Retention Time _____days

☐ Chemical Addition
Type ________
Dosage ________

7) Existing Sludge Dewatering

☒ Belt Filter Press ☐ Centrifuge ☐ Vacuum Filter
☐ Plate and Frame ☐ Drying Bed ☐ Other ________
☐ Gravity Belt Thickener ☐ None

Throughput (Dry Tons/day) 0.5 (twice weekly aprox.)
Flow Rate (Gallons per Minute) 150 - 200 GPM
Discharge Solids (%TS) 12%-16%

Polymer Type ☐ Emulsion ☐ Dry ☐ Mannich
Polymer Name Zetag 7878 FS40
Polymer Dosage (active lbs/ton) no calc performed

Chemical Addition Prior to Polymer Injection
☐ Ferric ☐ Lime ☐ Permanganate ☐ Other________ ☒ None

Purpose for Laboratory Evaluation (please check):

- ☐ Preparation for Demonstration Testing
- ☐ Performance Evaluation for Existing Installation ANDRITZ Job#____________
- ☒ Performance Evaluation for Sales Quotation
- ☒ Other Performance Evaluation for Equipment Consideration (Centrifuge)

Testing Objectives:

Equipment to be tested: ☐ Belt Filter Press ☒ Centrifuge ☐ Gravity Belt Thickener ☐ Rotary Screen Thickener

Sludge Flow Rate (GPM): 100-150 GPM

Dry Tons Per Day: 0.5 to 1.0

Discharge Solids (%TS): 20%-22%

Operating Hours Per Week: 16

Additional Objectives:____________

Hazardous Materials:

Hazardous or Non-hazardous: OSHA - EPA - DOT.

If Hazardous the following must be completed or sample will not be received:

- Prior notification to authorized ANDRITZ Laboratory Personnel 45 days before sample shipment. (Per EPA CFR 40 Regulations)
- MSDS supplied.
- List hazardous components and relative concentration and/or Chemical Analysis Data if available

I acknowledge that the information provided above is truthful and accurate to the best of my knowledge.

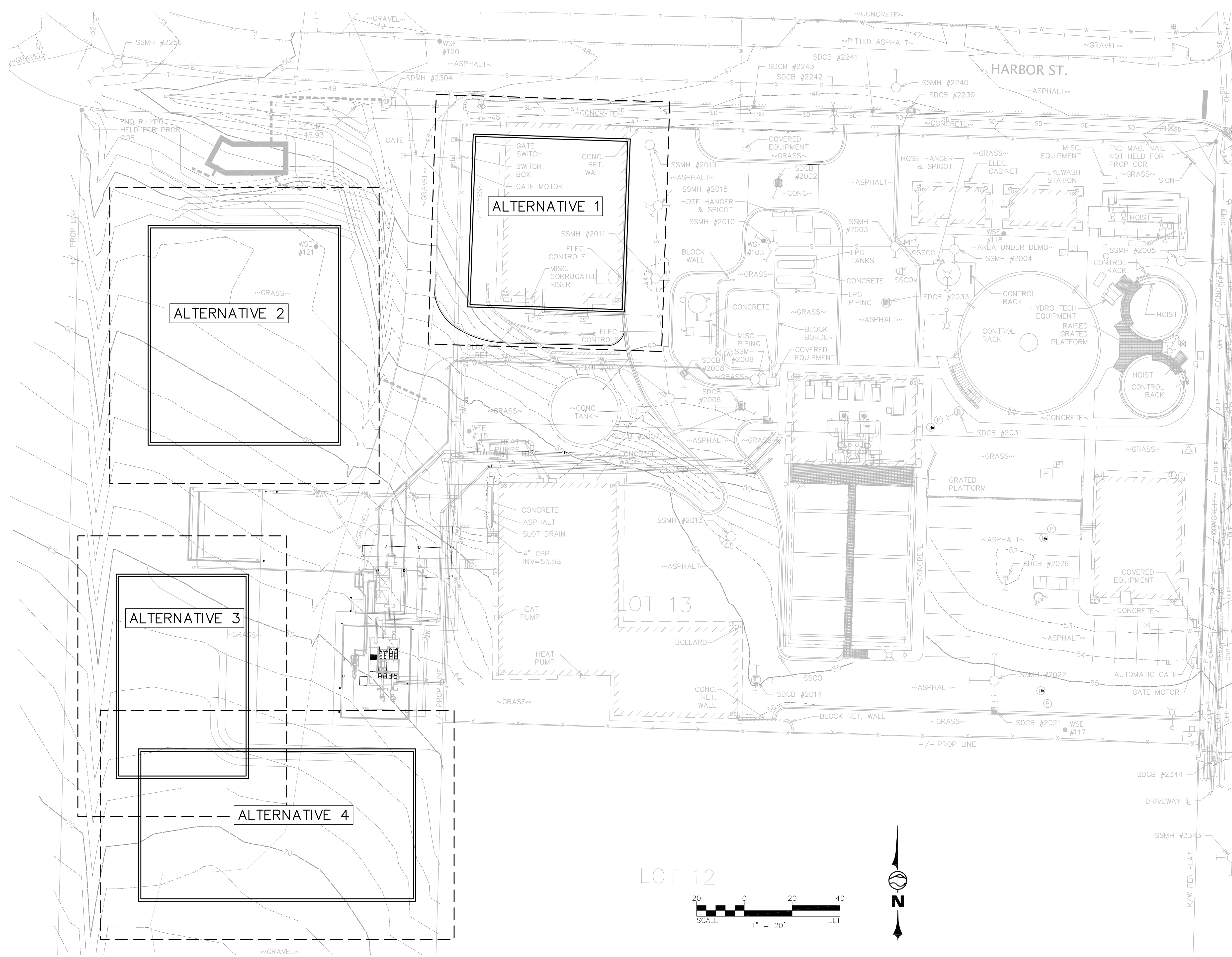
Name: Don Reitan

Title: Wastewater Superintendent

Signature: [signature]

Date: 9/10/19

APPENDIX G – EQUALIZATION BASIN ALTERNATIVE LOCATIONS



NO.	REVISIONS	BY	DATE

CIVIL
STRUCTURAL
SURVEY

WILSON ENGINEERING

WILSONENGINEERING.COM

DESIGNED BY XXX
DRAWN BY XXX
CHECKED BY

TOWN OF FRIDAY HARBOR

SAN JUAN COUNTY
WASHINGTON

BIOSOLIDS HANDLING

EQUALIZATON BASIN ALTERNATIVES

DATE 09-24-19
SCALE AS SHOWN
JOB NUMBER 2019-110

SHEET 1
PAGE -

PLOT SETTINGS: RICOH 8X11- B&W.pc3, Letter, Portrait, 1:1.0488, WE APWA_UNSCREENED.ctb
W:\2019\2019-110 TOWN OF FRIDAY HARBOR BIOSOLIDS HANDLING\DWG\2019-2019-110 - EQUALIZATION BASIN ALTERNATIVES.DWG - 11/6/2019 4:52 PM - Scott Wilson