Fact Sheet for NPDES Permit WA0030597

Skagit County Sewer District No. 2 (Big Lake Wastewater Treatment Plant)

Effective Date: March 1, 2021

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for the Big Lake Wastewater Treatment Plant (WWTP).

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for the Big Lake, NPDES permit WA0030597, are available for public review and comment from June 10, 2020 until July 24, 2020. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

The Permittee reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, wastewater discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

Summary

Skagit County Sewer District No. 2 owns a Membrane Bioreactor (MBR) wastewater treatment plant that discharges treated effluent into the Skagit River just upstream of the split between the North Fork and South Fork. The Big Lake WWTP treats wastewater from predominately single-family residences, along with a small number of commercial users. The new permit retains the same effluent limits as the previous permit however it also includes a new outfall inspection requirement, expanded nutrient monitoring requirements, a cap on total nitrogen, new E. coli monitoring in 2023, and new nutrient reduction optimization requirements.

Table of Contents

I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to domestic wastewater NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for groundwaters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any treatment facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix A - Public** Involvement Information for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E.**

II. Background Information

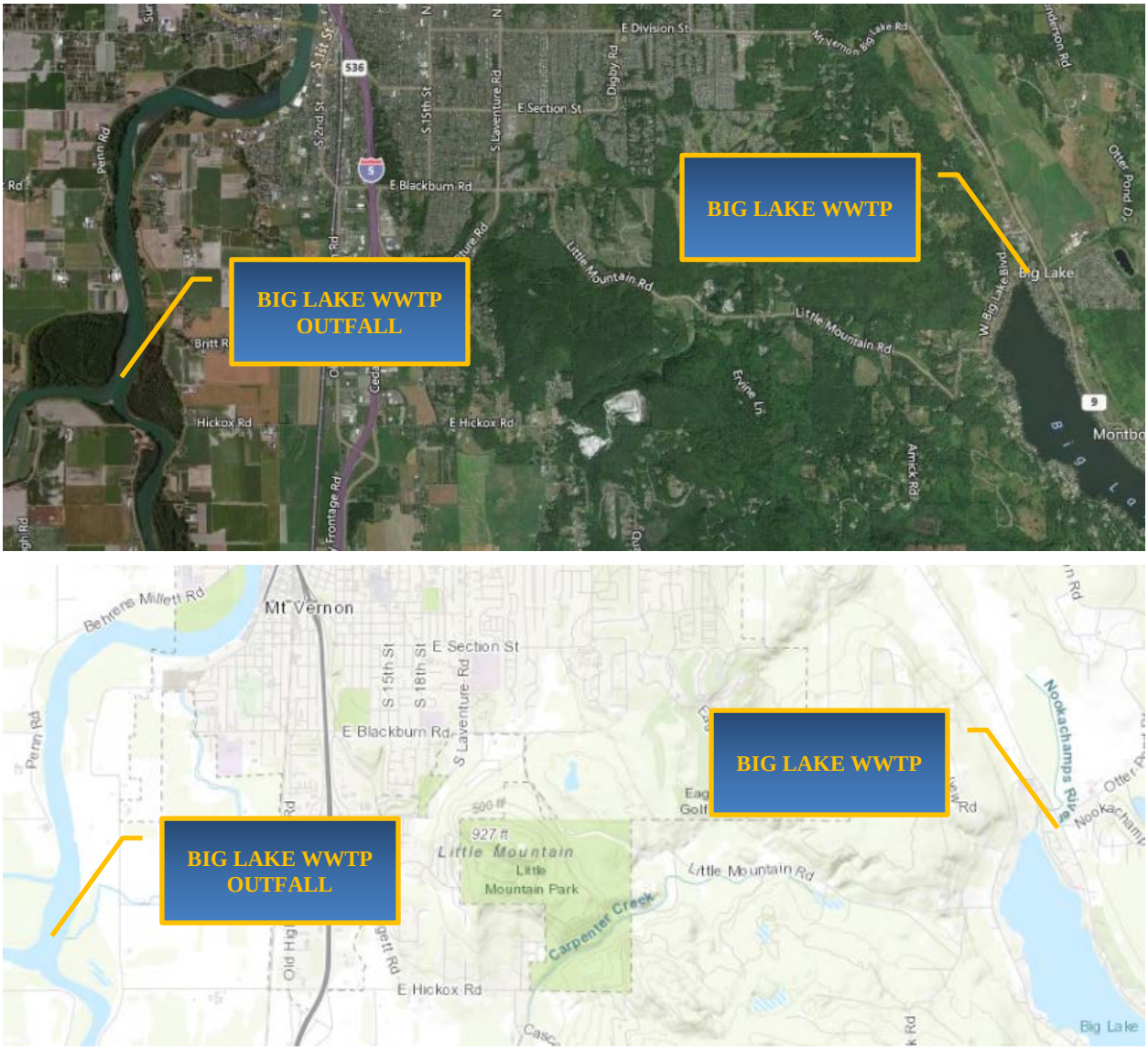
Table 1: General Facility Information

Facility Information	
Applicant	Skagit County Sewer District No. 2
Facility Name and Address	Big Lake Wastewater Treatment Plant 17079 SR 9, Mount Vernon, WA 98274
Contact at Facility	Gareth Moore, Operator (360) 661-7224
Responsible Official	Kelly Wynn, District Manager 17079 SR 9, Mount Vernon, WA 98274 (360) 466-4443
Type of Treatment	MBR
Facility Location (NAD83/WGS84 reference datum)	Latitude: 48.39771 Longitude: -122.23587
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Skagit River Latitude: 48.3900 Longitude: -122.3647

Permit Status	
Effective Date of Previous Permit	June 1, 2014
Date Application Submitted (Due)	December 3, 2018 (December 2, 2018)
Application Submitted Complete	March 28, 2019

Inspection Status	
Date of Last Inspection	September 8, 2017

Figure 1: Facility Location Map



A. Facility description

History

Skagit County Sewer District No. 2 (the District) serves a mostly residential community around Big Lake. The District formed when septic tank failures contributed to water quality standards violations in the lake. The District constructed a sewage collection and treatment system to help resolve water quality problems in the lake.

Construction of much of the new facility and collection system was completed between 1978 and 1980, including a rotating biological contactor (RBC) treatment plant near the north end of the lake. Treated effluent was piped approximately six miles away for final discharge into the Skagit River.

In 2005 the District authorized the preparation of an engineering report to evaluate capacity at the RBC treatment plant and the need for an upgrade of aging equipment. The resulting August 2007 Skagit County Sewer District No. 2 WWTP Engineering Report underwent a number of revisions culminating in a June 2010 update called the Revision for Peak Flow MBR Handling Evaluation. Ultimately the District determined the Big Lake WWTP should be upgraded from an RBC to an MBR system. The new MBR facility began operations in 2014. The MBR facility is capable of removing nitrogen, which may be of benefit as new nutrient restrictions are issued in the region. With an MBR system, the District may eventually be able to convert the WWTP into a water reclamation facility (WRF) once feasible beneficial uses for the reclaimed water have been identified and any water rights issues have been addressed. As part of a preliminary evaluation of potential beneficial uses, the District obtained Department of Ecology funding for a Feasibility Study to study a proposed instream flow mitigation project in the Nookachamps Creek Basin. The resulting Feasibility Report (dated June 2011) concluded that using reclaimed water for instream flow augmentation in the Nookachamps Basin was not feasible. The current treatment plant hydraulic profile is included in Appendix D.

The Big Lake WWTP is classified as a Class II WWTP under state regulation. The permit requires that a treatment plant operator certified to operate a Class II WWTP be in responsible charge of operations. If the facility begins to produce Class A reclaimed water, it will become a Class III WWTP. A Class III operator will then need to be in responsible charge of operations.

Collection system status

The District owns, operates, and maintains a domestic wastewater collection system consisting of eleven lift stations; 8-inch, 10-inch, and 12-inch diameter gravity and force mains; and pressure and gravity sewer pipes that serve a population of approximately 1,700 system users (per the permit application). The District also owns and maintains a pipeline to and an outfall in the Skagit River approximately 6 miles from the treatment plant. The District's service area includes residential property surrounding Big Lake. Individual residences connect to the sewer mains by a gravity side sewer where possible, however because of topography and sewer main and building locations, some residences connect to a District force main or pressure sewer system making use of individual grinder pumps. Per the most recent inspection report, dated September 8, 2017, the District is now maintaining approximately 71 grinder pumps. No significant industrial users discharge into the District's sewer system.

Description of treatment process

The design capacity of the treatment plant is 0.35 MGD (max month). Text in the following subsections is drawn from the Skagit County Sewer District No. 2 Engineering Report for Wastewater Treatment Plant Improvements (Revised June 2010 for Peak Flow MBR Handling Evaluation). Ecology approved this engineering report on August 20, 2010.

Headworks. Influent flow entering the influent channel can be routed to either or both of two parallel channels, each with a 2mm in-channel fine screen. Each of the two channels has the capacity to convey the peak hour flow. Downstream of the influent channels, flow is measured by Parshall flume. Screened influent is sampled with a refrigerated, flow-paced sampler. Grit removal is expected to occur via the 2mm openings in the in-channel fine screens and any remaining fine grit is to be periodically removed from the anoxic basins.

Anoxic Basins. Flow from the headworks was designed to enter two anoxic basins in series so that denitrification can occur. The influent flow is joined with return mixed liquor suspended solids (MLSS). The MLSS is recirculated from the membrane basin overflows to the mixed liquor recirculation (MLR) pump station, to a point upstream of the first anoxic basin. The first anoxic basin is just downstream of the headworks. The MLR is pumped back to the anoxic basins at three to four times the average influent flow to bring nitrified wastewater and facultative microorganisms back to be mixed with influent sewage for denitrification. Two anoxic basins are available for use so that oxygen reduction can be optimized in the first basin and true “anoxic” conditions can be created in the second basin.

Aeration Basin Flow D Box. Flow from the anoxic basin(s) goes to a distribution box where it is split close to equally (throughout the flow range) between two downstream aeration basins operating in parallel.

Aeration Basins. A designated blower and submersible mixer are allocated to each basin. A dissolved oxygen control system maintains DO concentrations in each basin by alternating blowers and mixers to keep DO levels at desired set points.

Membrane Bio-Reactor (MBR) Basins and Equipment. Flow from the two aeration basins is recombined in a single header and discharged into each of two MBR Basins. Permeate from the membranes is then pumped to UV channels for disinfection.

The existing treatment plant process flow diagram is included in Appendix D.

Solid wastes/Residual Solids

The WWTP removes solids during the treatment of wastewater at the headworks and at primary and secondary clarifiers, in addition to incidental solids removed as part of the routine maintenance of the equipment.

Grit, rags, and screenings are disposed of as solid waste at the local landfill. Solids from the digester are trucked to the La Conner WWTP for dewatering, composting, and subsequent land application under a permit from the Skagit County Department of Public Health and the Department of Ecology.

Discharge outfall

Treated and disinfected effluent is piped about 6 miles to an outfall in the Skagit River. The outfall diffuser is located just upstream of the South Fork of the Skagit River. The outfall is an 8-inch ductile iron pipe with an 18-foot long diffuser with four 3-inch diameter ports located 6 feet apart. The outfall terminus is approximately 195 feet from the shore.

Contract operations

Skagit County Sewer District No. 2 contracts the operation and maintenance of the Big Lake wastewater treatment plant with Water and Wastewater Services, LLC by the terms and conditions contained in a mutually agreed upon service agreement.

It is the Water Quality Program's standard procedure to identify contract operators as co-permittees on individual municipal NPDES permits, to address both state and federal requirements for permittees. However, it is not required in every case. Ecology may consider issuing the permit only to the owner; Ecology staff and managers should:

1. Consider the extent of the operator's control over the treatment system, as described in the service agreement.
2. Consider the experience and record of the operator at other facilities.
3. Consider the performance and enforcement provisions in the service agreement between the owner and the operator.
4. Review the recommendations or comments from the Attorney General's office.
5. Make a reasoned decision based on the facts, Ecology guidance, and the manner in which the entities' service agreement defines the responsibilities each will have.

Consistent with the previous permit, Ecology is again including the contract operator as a co-permittee. When a domestic wastewater facility with co-permittees does not comply with permit conditions, Ecology will consider the roles identified in the service agreement between the owner and operator when it develops both formal and informal enforcement actions.

B. Description of the receiving water

The Big Lake WWTP discharges to the Skagit River just upstream of the bifurcation of the Skagit River (RM 7.8). Other nearby point source outfalls above the District's outfall include the Mount Vernon WWTP (RM 10.7), the City of Anacortes Water Treatment Plant (RM 13), City of Burlington Wastewater Treatment Plant (RM 18.1), and the City of Sedro-Woolley Wastewater Treatment Plant (RM 22.8). Significant nearby non-point sources of pollutants include separate stormwater runoff from the cities of Mount Vernon, Burlington and Sedro-Woolley as well as runoff from agricultural fields. Mount Vernon also has two combined sewer overflows (CSO) outfalls located 3 to 4 miles upstream. Section IIE of this fact sheet describes any receiving waterbody impairments.

Only ambient data that was denoted in Ecology's Environmental Information Management System (EIM) database with a QA Assessment Level of 5, meaning that the data was verified *and* assessed for usability in a peer-reviewed study report, was used in the preparation of this factsheet. Specifically, QA Level 5 data associated with Study ID AMS001 was used. This data is from Ecology's long-term Water Quality Monitoring Station #03A060, which is located approximately eight river miles above the Big Lake WWTP discharge. The data is available on Ecology's Environmental Information Management database at https://ecology.wa.gov/Research-Data/Data-resources/Environmental-Information-Management-database.

Table 2: Ambient Background Data

Parameter	Value Used
Temperature (max month)	16.5 °C
pH (average)	7.3 standard units
Dissolved Oxygen (10th percentile)	10 mg/L
Fecal Coliform (90th percentile)	25 cfu/100 mL
Turbidity (90th percentile)	30.5 NTU
Alkalinity (90th percentile)	25.2 mg/L as CaCO3
Ammonia (90th percentile)	0.01 mg/L as N
Nitrate-Nitrite (90th percentile)	0.16 mg/L as N
Hardness[1]	16.7 mg/L as CaCO3
NOTES:	

[1] Per ECY Permit Writer's Manual, the hardness value should be the lowest value from the critical period if the data set is less than 20 or the 10th percentile value if the data set is 20 or greater. As more recent QA Level 5 data ambient hardness data was not available, hardness data from upstream Skagit River monitoring station 03A060 for the years 2007-2008 was used in Table 2 above (as consistent with previous permit).

C. Wastewater influent characterization

The Permittee reported the concentration of influent pollutants in discharge monitoring reports. The influent wastewater for data collected from June 2014 - March 2019 is characterized as follows:

Table 3: Wastewater Influent Characterization

Parameter	Solids (Residue) (Total	Solids (Residue) (Total	Solids (Residue) (Total	Solids (Residue) (Total
Units	Lbs/Day	Lbs/Day	Milligrams/L (mg/L)	Milligrams/L (mg/L)
Statistical Base	Average	Maximum	Average	Maximum
Limits	- / -	- / -	- / -	- / -
Design Limit				
Date	Value	Value	Value	Value
Min	184	221	124	150
Max	342	575	301	497
Average	236	343	206	282
Median	233	331	205	277
95th Percentile	289	498	277	392

Parameter	Total BOD5	Total BOD5	Total BOD5	Total BOD5
Units	Lbs/Day	Lbs/Day	Milligrams/L (mg/L)	Milligrams/L (mg/L)
Statistical Base	Average	Maximum	Average	Maximum
Limits	- / -	- / -	- / -	- / -
Design Limit	800			
Date	Value	Value	Value	Value
Min	193	222	129	165
Max	355	757	327	560
Average	254	355	224	305
Median	254	338	217	306
95th Percentile	297	476	301	457

D. Wastewater effluent characterization

The Permittee reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the quality of the wastewater effluent discharged from June 2014 - March 2019.

The wastewater effluent is characterized as follows:

Table 4: Wastewater Effluent Characterization

Parameter	Ammonia (Total)	Nitrate + Nitrite (Total)	TKN	Phosphorus (Soluble Reactive)	Total Phosphorus	Temperature (Measured)
Units	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Degrees C
Statistical Base	Average	Average	Average	Average	Average	Maximum
Limits	- / -	- / -	- / -	- / -	- / -	- / -
Design Limit						
Date	Value	Value	Value	Value	Value	Value
Min	0.0	2.7	0.7	0.0	0.0	16
Max	0.1	7.4	12.4	5.4	5.7	19
Average	0.0	4.6	1.7	3.2	3.3	18
Median	0.0	4.1	1.0	3.1	3.4	18
95th Percentile	0.1	6.8	3.3	5.1	5.6	19

Parameter	Fecal Coliform	Fecal Coliform	Flow	Flow	pH	pH
Units	#/100ml	#/100ml	Million Gallons/Day (MGD)	Million Gallons/Day (MGD)	Standard Units	Standard Units
Statistical Base	Monthly geometric mean	Weekly Geometric Mean	Average	Maximum	Maximum	Minimum
Limits	- / 100	- / 200	- / -	- / -	- / 9	6 / -
Design Limit			0.35			
Date	Value	Value	Value	Value	Value	Value
Min	0	0	0.11	0.12	6.9	6.5
Max	1	1	0.23	0.52	7.6	7.2
Average	0	0	0.15	0.23	7.3	6.8
Median	0	0	0.14	0.21	7.3	6.8
95th Percentile	1	1	0.22	0.39	7.5	7.1

Parameter	Solids (Residue) (Total suspended (TSS))	Solids (Residue) (Total suspended (TSS))	Solids (Residue) (Total suspended (TSS))	Solids (Residue) (Total suspended (TSS))	Solids (Residue) (Total suspended (TSS))
Units	Lbs/Day	Lbs/Day	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Percent
Statistical Base	Average	Weekly Average	Average	Weekly Average	Average
Limits	- / 88	- / 131	- / 30	- / 45	85 / -
Design Limit					
Date	Value	Value	Value	Value	Value
Min	0	0	0	0	99
Max	1	3	1	4	1002
Average	0	1	0	1	116
Median	0	0	0	0	100
95th Percentile	1	2	0	2	100

Parameter	Total BOD5	Total BOD5	Total BOD5	Total BOD5	Total BOD5
Units	Lbs/Day	Lbs/Day	Milligrams/L (mg/L)	Milligrams/L (mg/L)	Percent
Statistical Base	Average	Weekly Average	Average	Weekly Average	Average
Limits	- / 88	- / 131	- / 30	- / 45	85 / -
Design Limit					
Date	Value	Value	Value	Value	Value
Min	1	1	1	1	99
Max	23	5	3	5	100
Average	2	2	1	2	99
Median	2	2	1	2	99
95th Percentile	3	4	2	4	100

Parameter	UV Light Intensity	UV Light Intensity
Units	MilliWatts/Cm2 (mW/Cm2)	MilliWatts/Cm2 (mW/Cm2)
Statistical Base	Average	Maximum
Limits	- / -	- / -
Design Limit		
Date	Value	Value
Min	3	3
Max	47	803
Average	6	21
Median	6	7
95th Percentile	9	10

Parameter	Dissolved Oxygen	Oil & Grease	Total Dissolved Solids	Hardness as CaCO3
Units	mg/L	mg/L	mg/L	mg/L
Limits	- / -	- / -	- / -	- / -
Max	8.64	1.4	202	74.4
Average	8.18	0.8	184	68.7

E. Summary of compliance with previous permit issued

The previous permit placed effluent limits on BOD5, TSS, fecal coliform, total residual chlorine, and pH.

The Big Lake WWTP has complied with the effluent limits and permit conditions throughout the duration of the permit issued on May 1, 2014. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and on inspections.

Table 5: Violations

Violation Date	Violation	Violation Source Type
2/1/2015	Late Submittal of DMRs	DMR
4/1/2015	Late Submittal of DMRs	DMR
4/1/2018	Late Submittal of DMRs	DMR

F. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the Engineering Report for Wastewater Treatment Plant Improvements (June 2010 Revision for Peak Flow MBR Handling Evaluation) prepared by CHS Engineers and H.R. Esvelt Engineering.

The table below includes design criteria from the referenced report.

Table 6: Design Criteria for the Big Lake WWTP

Parameter	Design Quantity
Maximum Monthly Average Design Flow	0.35 MGD
Annual Average Design Flow	0.25 MGD
Peak Hour	0.83 MGD
BOD_5 Loading for Maximum Month	800 lbs/day
TSS Loading for Maximum Month	800 lbs/day

B. Technology-based effluent limits

Federal and state regulations define technology-based effluent limits for domestic wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for domestic wastewater.

The table below identifies technology-based limits for pH, fecal coliform, BOD5, and TSS, as listed in chapter 173-221 WAC. Section III.F of this fact sheet describes the potential for water quality-based limits.

Table 7: Technology-based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
BOD_5 (concentration)	30 mg/L	45 mg/L
BOD_5 (concentration)	In addition, the BOD_5 effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS (concentration)	30 mg/L	45 mg/L
TSS (concentration)	In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
Chlorine	0.5 mg/L	0.75 mg/L

Parameter	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	200 organisms/100 mL	400 organisms/100 mL

Parameter	Daily Minimum	Daily Maximum
pH	6.0 standard units	9.0 standard units

Ecology derived the technology-based monthly average limit for chlorine from standard operating practices. The Water Pollution Control Federation's **Chlorination of Wastewater** (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, **Wastewater Engineering, Treatment, Disposal and Reuse**, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/L chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/L.

Technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD_5 and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

where:

CL = Technology-based concentration limits listed in the above table

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 8: Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Monthly Average	30	88
BOD_5 Weekly Average	45	131
TSS Monthly Average	30	88
TSS Weekly Average	45	131

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit.

When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

Effective numeric water quality criteria for the protection of human health are promulgated in Chapter 173-201A WAC and 40 CFR 131.45. These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2016) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2016) and of all marine waters (WAC 173-201A-210, 2016) in the state of Washington.

Antidegradation

Description - The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2016) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements - This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.

Ecology’s analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones, the pollutant concentrations may exceed water quality numeric standards, so long as the discharge does not interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.). The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART).

Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(i-iii) or WAC 173-201A-400(7)(b)(i-ii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see **Ecology's Permit Writer's Manual**). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary.

The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Most aquatic life **acute** criteria are based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Most aquatic life **chronic** criteria are based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions.

These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. **Ecology must specify both the allowed size and location in a permit.**

   The proposed permit specifies the size and location of the allowed mixing zone (as specified below).

2. **The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.**

   Ecology has determined that the treatment provided at the Big Lake WWTP meets the requirements of AKART (see "Technology-based Limits").

3. **Ecology must consider critical discharge conditions.**

   Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology's Permit Writer's Manual describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at https://apps.ecology.wa.gov/publications/documents/92109.pdf.

Table 9: Critical Conditions Used to Model the Discharge

Critical Condition	Value
The seven-day-average low river flow with a recurrence interval of ten years (7Q10)	1,690 cfs
River depth at the 7Q10 period	5 feet
River velocity	1.35 ft per second
Manning roughness coefficient	0.029
Channel width	250 feet
Maximum average monthly effluent flow for chronic and human health non-carcinogen	0.35 MGD
Maximum daily flow for acute mixing zone	0.70 MGD
7-DAD MAX Effluent temperature	18 degrees C

Additional input data, assumptions, and ambient information used to model the discharge is detailed in the February 2009 Mixing Zone Study Report prepared by the Cosmopolitan Engineering Group. After an evaluation of several models, Cosmopolitan determined that 3D Advection-Dispersion Equations resulted in the most accurate chronic dilution factor and that, at the acute mixing zone boundary, volumetric calculations were the most limiting.

4. **Supporting information must clearly indicate the mixing zone would not:**
    - Have a reasonable potential to cause the loss of sensitive or important habitat.
    - Substantially interfere with the existing or characteristic uses.
    - Result in damage to the ecosystem.
    - Adversely affect public health.

    Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

    EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

    The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

    Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

    Because this is a domestic wastewater discharge, the effluent contains fecal coliform bacteria. Ecology developed the water quality criteria for fecal coliforms (discussed below) to assure that people swimming (primary contact recreation) in water meeting the criteria would not develop gastro enteric illnesses. Ecology has authorized a mixing zone for this discharge; however, the discharge is subject to a performance-based effluent limit of 100 colony forming units/100mL. This means the effluent meets the water quality criteria at the point of discharge and doesn't need dilution to meet the water quality criteria.

    Starting on January 1, 2021, the recreational water quality criteria for bacteria will change to E. coli for freshwater. In addition, all waterbodies will become designated for primary contact recreation. No change to the indicator will occur during this permit cycle as a site-specific correlation between fecal coliform and the E.coli needs developing. The next permit cycle will require the District to meet the primary contact E. coli standard of 100 colonies/100 mL at the point of discharge.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

5. **The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.**

   Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

6. **The size of the mixing zone and the concentrations of the pollutants must be minimized.**

   At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

   Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

   Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. **Maximum size of mixing zone.**

   The authorized mixing zone does not exceed the maximum size restriction.

8. **Acute mixing zone.**

   - **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

Cosmopolitan Engineering determined the acute criteria will be met at 10% of the volume fraction of the chronic mixing zone at 7Q10.

- **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

  As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**

  The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

9. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The tables included below summarize the criteria applicable to the receiving water's designated uses.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species.

  The **Aquatic Life Uses** for this receiving water are identified below.

Freshwater Aquatic Life Uses and Associated Criteria

Table 10: Core Summer Salmonid Habitat

Criteria	Limit
Temperature Criteria – Highest 7-DAD MAX	16°C (60.8°F)
Dissolved Oxygen Criteria	9.5 mg/L

Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.

- The **recreational uses** for this receiving water are identified below.

Table 11: Recreational Uses and Associated Criteria

Recreational Use	Criteria
Primary Contact Recreation (expires 12/31/2020)	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.
Primary Contact Recreation (effective 1/1/2021)	*E. coli* organism levels must not exceed a geometric mean value of 100 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained within the averaging period exceeding 320 CFU or MPN per100 mL.

- The **water supply uses** are domestic, agricultural, industrial, and stock watering.
- The **miscellaneous freshwater uses** are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

In July 1997, Ecology published the Lower Skagit River Total Maximum Daily Load and Water Quality Study (Pickett, 1997). The goal of the lower Skagit River TMDL study was to assure compliance with state standards for dissolved oxygen and fecal coliform bacteria levels in the river and Skagit Bay. The study covered the lower 25 miles of the river, from river mile (RM) 24.6 near Skagit County Sewer District No. 2's outfall to the mouths of the North and South Forks at Skagit Bay. Ecology collected data on ambient water quality and treated wastewater discharges in the river in 1994 and 1995.

Ecology modeled the effects of the discharges on ambient water quality for worst case river conditions under current and future discharge scenarios. Based on the modeling, the proposed TMDL set waste load allocations (WLAs) for BOD and ammonia discharged from point sources. To restore compliance with standards for fecal coliform bacteria, the TMDL set WLAs for point sources and priorities for reducing or eliminating other sources of bacteria discharge to the Skagit and its tributaries.

In May 2000, Ecology published The Lower Skagit River Dissolved Oxygen Total Maximum Daily Load Submittal Report (Department of Ecology Publication No. 00-10-031) to assess the health of the river with respect to dissolved oxygen. Although the river was not listed on the 303(d) list for violations of the dissolved oxygen water quality standards, Ecology drafted the report to examine the potential for future water quality violations based on anticipated growth of the four communities that discharge treated wastewater to the river. The report concluded that the lower Skagit River met the standard for dissolved oxygen.

However, the report also recommended that waste load allocations for BOD and ammonia be placed on the four wastewater treatment plants within the basin as a measure to prevent future degradation. The report recommended waste load allocations for the Big Lake facility be set at the technology-based limit for BOD (45 mg/L, equating to 75 lbs/day) and recommended an ammonia limit of 10 mg/L (equating to 16.7 lbs/day).

The last permit did not include an ammonia limit, opting instead for seasonal monitoring. Based on ammonia data obtained during the previous permit cycle, there is not a reasonable potential to exceed the water quality criteria for ammonia. Also, ambient dissolved oxygen levels continue to meet water quality standards (the 10th percentile value was 10 mg/L dissolved oxygen, higher than the applicable standard of 9.5 mg/L dissolved oxygen). Since ambient data shows continued compliance with water quality standards and the facility routinely demonstrates an ability to produce high quality effluent, Ecology has determined that the recommended waste load allocations are not required for this new permit cycle. Ecology will continue to monitor the health of the Lower Skagit River and may implement waste load allocations at a future date if ambient conditions show signs of degradation.

The 1997 TMDL study also concluded that fecal coliform bacteria levels exceed standards in many tributaries of the lower Skagit River, upstream of Sedro-Woolley, and in the marine waters at the mouths of the North and South Forks. The TMDL identifies areas and sources as high priority for reducing discharge of bacteria and concludes that the reduction of bacteria discharged from area sewage treatment plants does not provide any significant reduction to the total bacteria counts during those periods when bacteria loading from nonpoint pollution sources discharge into the river.

However, the permit includes a performance-based effluent limit of 100 colony forming units per 100mL for the new MBR facility on account of the receiving water being used for primary contact recreation and the importance of protecting that beneficial use during seasons when nonpoint fecal coliform loading is minimal (see Section III.C.4. for more information).

F. Evaluation of surface water quality-based effluent limits for narrative criteria

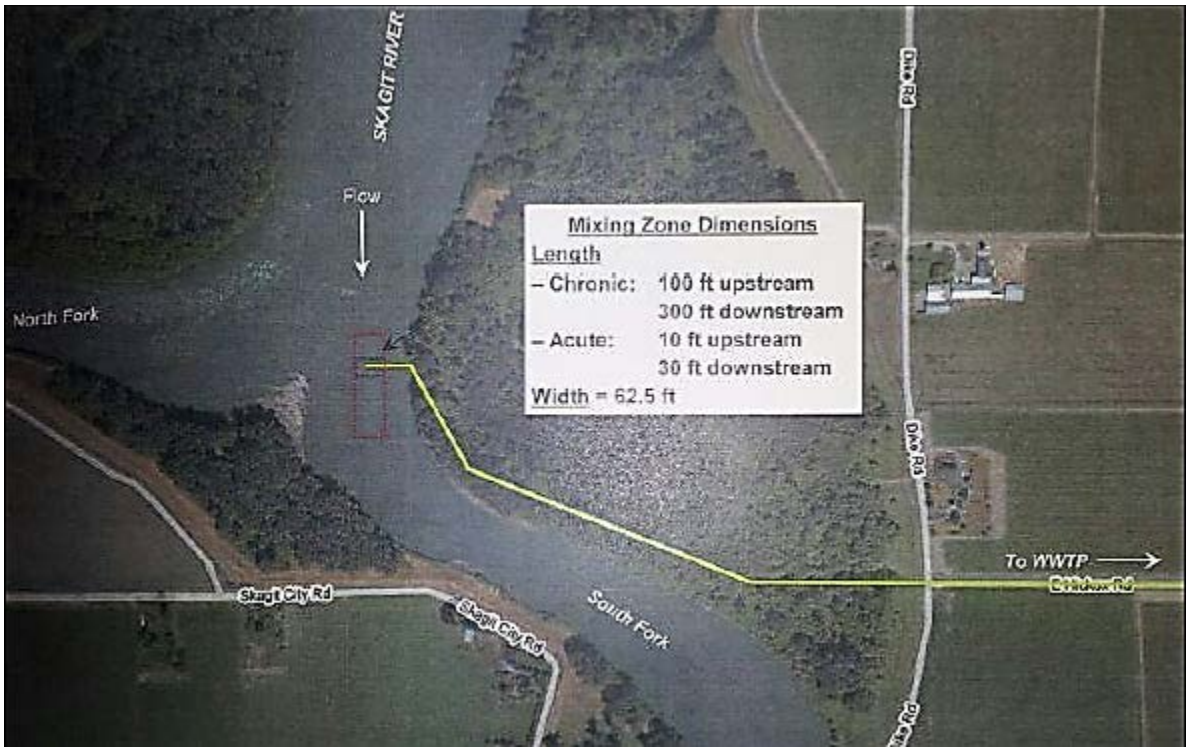
Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

G. Evaluation of surface water quality-based effluent limits for numeric criteria

Figure 2: Big Lake WWTP Mixing Zone (Feb 2009 Mixing Zone Study by Cosmopolitan Engineering)



Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD_5) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred.

Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

The diffuser at Outfall 001 is 18 feet long with a diameter of 8 inches. The diffuser has four evenly-spaced 3-inch diameter ports. The distance between ports is 6 feet. The diffuser depth is assumed to be 5 feet below the surface at critical conditions.

Ecology obtained this information from the February 2009 Mixing Zone Study Report prepared for Skagit County Sewer District No. 2 by the Cosmopolitan Engineering Group and submitted as Appendix E of the CHS Engineering Report for Wastewater Treatment Plant Improvements by CHS Engineers submitted on April 10, 2009.

Chronic Mixing Zone - WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body.

Modeling cited by the previous permit assumed a critical water depth at the outfall of five feet, however instead of setting the chronic mixing zone distance at 305 feet downstream the permit set the maximum allowable mixing zone extent at 300 feet downstream for the chronic zone. This same size limit was used in the February 2009 Mixing Zone Study Report. The mixing zone extends from the top of the discharge ports to the water surface.

Acute Mixing Zone - WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body.

The flow volume restriction resulted in a smaller acute dilution factor than the distance downstream. The dilution factor below results from the volume restriction.

The dilution factors listed below were obtained from the February 2009 Mixing Zone Study Report.

Table 12: Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	40	462
Human Health, Carcinogen		462
Human Health, Non-carcinogen		462

Ecology determined the impacts of dissolved oxygen deficiency, nutrients, pH, fecal coliform, ammonia, and temperature as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Nutrients - The Salish Sea Model (Ahmed et al, 2019) has shown that the nutrients discharged from wastewater treatment plants contribute to low dissolved oxygen (D.O.) levels, below state water quality criteria, in Puget Sound. Nitrogen is the limiting nutrient in Puget Sound waters (Howarth and Marino, 2006; Newton and Van Voorhis, 2002). More specifically, total inorganic nitrogen (TIN), the sum of nitrate-nitrite and total ammonia, is the form of nitrogen more available for algal growth that drives eutrophication and the dissolved oxygen impairment.

Early model runs ("Bounding Scenarios") also confirmed that circulation within the inner basins of Puget Sound distributes a portion of pollutants throughout the waters of the Sound. Discharges in one basin can affect the water quality in other basins. Thus, all wastewater discharges to Puget Sound containing inorganic nitrogen contribute to the D.O. impairment.

The Permittee's discharge contains inorganic nitrogen. Therefore, this permit must require the Permittee to control nutrients consistent with the Clean Water Act and Washington's Water Pollution Control Act. Water quality based effluent limits (WQBELs) are required for wastewater treatment plants discharging to surface waters when the discharge has reasonable potential to cause or contribute to an in-stream excursion above a narrative or numeric State water quality criteria (40 CFR 122.44(d)(1)(iii)).

Ecology continues to work on refining inputs and outputs of the Salish Sea Model to determine water quality impacts from both discrete point sources and watersheds entering Puget Sound. Because of the broad, far-field impacts TIN has on Puget Sound, spreadsheet tools designed for toxic pollutants (such as "Permit Calc") cannot be used for the development of a numeric inorganic nitrogen WQBEL.

Washington State has numeric criteria for D.O. but not for nitrogen which further limits use of existing limit development spreadsheet tools. Ecology uses inorganic nitrogen as an indicator parameter for D.O., as allowed in 40 CFR 122.44(d)(vi)(C). Use of this indicator parameter requires modeling to demonstrate water quality impacts from a discharge.

Even without use of an indicator parameter, nutrients have a longer averaging period than toxics and drive both near-field and far-field effects. Modeling is necessary to quantify these far-field impacts and to derive applicable numeric WQBELs. In a receiving water as complex as Puget Sound, the modeling work necessary to develop numeric WQBELs for each discharge is comprehensive and requires extensive internal and external review.

The inorganic nitrogen in the Permittee's discharge has reasonable potential to contribute to far-field water quality impacts. For this permit cycle, implementing a numeric WQBEL for nitrogen is infeasible.

This is due to the additional modeling scenarios necessary to quantify both the Permittee's far-field water quality effect and the corresponding effluent limit necessary to prevent an exceedance of the D.O. standard.

Federal rule at 40 CFR 122.44 (d)(vi)(C) requires permits that use indicator parameters to: identify the pollutants intended to be controlled, require appropriate monitoring, and include a reopener clause. This permit meets those requirements. The rule also requires documentation here in the fact sheet on how limiting the indicator parameter will result in control of the pollutant of concern sufficiently to attain and maintain water quality standards.

The Puget Sound Nutrient Source Reduction Project, is the process for developing nutrient load allocations for human sources that are contributing to the depletion of dissolved oxygen beyond what is allowable in the state water quality standard (WAC 173-201A-210-(1)(d)). The Salish Sea Model, along with representative monitoring data, is used to evaluate the improvement from reductions of these sources as described in Ahmed, et al (2019).

As of 2020, the project is in the second year of modeling. Model runs are used to understand the significance of the far- and near-field effects of wastewater discharges to marine waters along with the anthropogenic nutrient loads from Puget Sound watersheds. With the completed model results and other best-available science and monitoring data, Ecology will establish a loading capacity for nutrients that will meet D.O. criteria in the marine waters of Puget Sound. Then Ecology will allocate the overall nutrient loading capacity amongst the wastewater discharges and watersheds.

Ecology will continue to engage stakeholders on the framework for establishing nutrient load and wasteload allocations at the Puget Sound Nutrient Forum. Permittees may also participate in the process focused on WQBEL development from the nutrient wasteload allocations. Ecology currently plans on running a third year of modeling in 2021. The need for any additional computer modeling to support the development of WQBELs beyond the current project timeline will be evaluated in 2020-2021. Ecology anticipates finalizing numeric point source nutrient load reductions that will support WQBELs by the end of 2024.

While Ecology actively pursues modeling to make the development of numeric WQBELs feasible, design criteria from Skagit County Sewer District No. 2 Big Lake WWTP Upgrade approved engineering documents prepared by H.R. Esvelt Engineering will be used to form the basis of the nutrient effluent limit in the proposed permit per WAC 173-220-130. Ecology will reevaluate this limit during development of the next permit cycle, or sooner using the reopener clause if appropriate.

Optimization of treatment performance is an adaptive management strategy the Permittee can use to stay below the annual cap in the proposed permit. The proposed permit requires the permittee to evaluate the existing treatment process for nutrient reduction opportunities and to implement where appropriate any operational adjustments that would enhance nitrification and denitrification. This optimization exercise may result in minor retrofits such as the utilization of anoxic zones, side-stream management opportunities, and minor upgrades. The optimization evaluation should include a description of nutrient-related changes already made at the facility, changes that are not possible without a significant capital investment, and estimates in nutrient load reductions related to any process changes being seriously considered. The results of the optimization evaluation are to be submitted in the form of a Nutrient Optimization Plan. Any significant process optimization that results must be reflected in an update to the standard operating procedures in the Permittee's Operation and Maintenance manual per proposed permit Section S5.G. A formal engineering evaluation meeting the requirements in WAC 173-240 may also be needed once Ecology develops numeric WQBELs for treatment plants in the region.

The proposed permit includes expanded effluent monitoring requirements for nitrogen species. The additional monthly data is intended to determine compliance with a new cap on total nitrogen which is also included in the proposed permit. Total nitrogen is an appropriate alternative parameter to monitor as it includes inorganic nitrogen within it and is a design parameter for the current Big Lake WWTP.

Dissolved Oxygen--BOD_5 and Ammonia Effects - Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone.

The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

With technology-based limits, this discharge results in a small amount of biochemical oxygen demand (BOD_5) relative to the large amount of dilution in the receiving water at critical conditions. Compliance with technology-based limits and with the new nitrogen cap will reduce the burden on dissolved oxygen in the receiving water.

pH - Ecology modeled the impact of the effluent pH on the receiving water using the calculations from EPA, 1988, and the chronic dilution factor tabulated above. Appendix D includes the model results. Ecology predicts no violation of the pH criteria under critical conditions. Therefore, the proposed permit includes technology-based effluent limits for pH.

Fecal Coliform - Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 mL and a dilution factor of 462.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. In this situation, Ecology generally imposes the technology-based effluent limit for fecal coliform bacteria. The Big Lake WWTP has demonstrated it can reliably meet the water quality standard for fecal coliforms for primary contact recreation in the discharge. Therefore, the proposed permit includes the primary contact recreation standard for fecal coliform as a performance-based (technology-based) effluent limit for fecal coliform bacteria. During this permit term, the water quality fecal coliform bacteria criterion will change from fecal coliform to E. coli. Technology based effluent limits listed in WAC 173-221 were not modified with the recreational water quality standards update. This permit was in the final stages of development before the fecal coliform criterion sunset date, and model results showed no violations of fecal coliform recreational standards at the time. Because modeling under critical conditions showed no violation of water quality criteria and the transition is a change in bacterial indicator not more or less stringent than the current standards, the effluent limits will remain unchanged throughout the duration of the permit term. Dual indicator monitoring will be a part of this permit so that a site-specific correlation can be developed during the permit cycle. Ecology will use this data to assess the reasonable potential to exceed the applicable water quality criterion in the next iteration of this permit.

Turbidity - Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent and turbidity of the receiving water. Ecology expects no violations of the turbidity criteria outside the designated mixing zone provided the facility meets its technology-based total suspended solids permit limits.

Toxic Pollutants - Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge: ammonia. Ecology conducted a reasonable potential analysis (See Appendix D) on these parameters to determine whether it would require effluent limits in this permit.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient station #03A060 and Ecology spreadsheet tools.

Valid ambient background data were available for ammonia. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

Ecology determined that ammonia poses no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (**Appendix D**) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Temperature - The State temperature standards [WAC 173-201A-200-210 and 600-612] include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria

  Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), 210(1)(c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

  Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

  The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

- Incremental warming criteria

  The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

  At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment.

These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

  Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

  General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

  Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

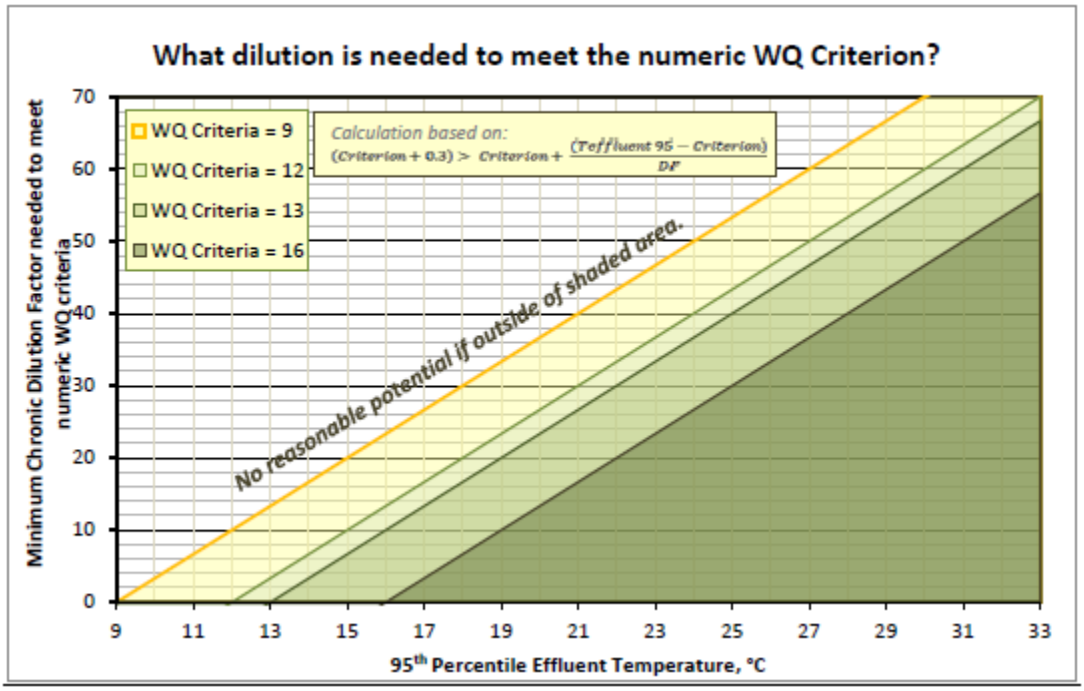
Reasonable Potential Analysis

Annual summer maximum and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum, and the incremental warming criteria at the edge of the chronic mixing zone during critical conditions. No reasonable potential exists to exceed the temperature criterion where:

(Criterion + 0.3) > [Criterion + (Teffluent95 – Criterion)/DF].

The figure below graphically portrays the above equation and shows the conditions when a permit limit will apply.

Figure 3: Dilution Necessary to Meet Criteria at Edge of Mixing Zone



(16 + 0.3) > (16 + (18.8 – 16)/462)

(16.3) > (16.0) == True

Therefore, the proposed permit does not include a temperature limit. The permit requires continued monitoring of effluent temperature. Ecology will reevaluate the reasonable potential during the next permit renewal.

H. Human health

Washington's water quality standards include numeric human health-based criteria for priority pollutants that Ecology must consider when writing NPDES permits.

Ecology determined the effluent may contain chemicals of concern for human health, based on data or information indicating the discharge contains regulated chemicals (e.g. some nutrients).

Ecology evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the **Technical Support Document for Water Quality-Based Toxics Control** (EPA/505/2-90-001) and Ecology's **Permit Writer's Manual** to make a reasonable potential determination. The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards, and an effluent limit is not needed.

I. Sediment quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website at https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups.

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards.

J. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Using the screening criteria in chapter 173-205-040 WAC, Ecology determined that toxic effects caused by unidentified pollutants in the effluent are unlikely. Therefore, this permit does not require WET testing. Ecology may require WET testing in the future if it receives information indicating that toxicity may be present in this effluent.

K. Groundwater quality limits

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100). The Big Lake WWTP does not currently discharge wastewater to the ground. No permit limits are required to protect groundwater.

L. Comparison of effluent limits with the previous permit

Table 13: Comparison of Previous and Proposed Effluent Limits

		Previous Effluent Limits: Outfall #001		Proposed Effluent Limits: Outfall #001	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day)	Technology	30 mg/L; 88 lbs/day	45 mg/L 131 lbs/day	30 mg/L; 88 lbs/day	45 mg/L; 131 lbs/day

		Previous Effluent Limits: Outfall #001		Proposed Effluent Limits: Outfall #001	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Total Suspended Solids	Technology	30 mg/L; 88 lbs/day	45 mg/L; 131 lbs/day	30 mg/L; 88 lbs/day	45 mg/L; 131 lbs/day

Parameter	**Basis of Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	Technology	100/100mL	200/100mL	100/100mL	200/100mL

Parameter	**Basis of Limit**	**Limit**	**Limit**
pH	Technology	Must be within the range of 6.0 to 9.0 standard units	Must be within the range of 6.0 to 9.0 standard units

Parameter	**Basis of Limit**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Chlorine	Technology	0.5 mg/L	0.75 mg/L	0.5 mg/L	0.75 mg/L

Effluent Cap on Total Nitrogen			
Parameter	**Basis of Limit**	**Previous Cap**	**Proposed Cap**
Total Nitrogen	Design	NA	10,658 lbs/yr (annual total)

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit.

The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's **Permit Writer's Manual** (Publication Number 92-109) for activated sludge plants less than 2 MGD (average design flow).

Ecology has included some additional monitoring of nutrients in the proposed permit to establish a baseline for this discharger. It will use this data in the future as it develops TMDLs for dissolved oxygen and establishes WLAs for nutrients. The proposed permit will require monthly monitoring of Ammonia and Nitrate+Nitrite Nitrogen.

Ecology updated the water contact recreation bacteria criteria in January 2019. This change eliminated all recreational uses except for primary contact criteria in both fresh and marine waters. Primary contact criteria changed to E. coli for freshwater and to enterococci for marine water. Ecology is initially requiring monitoring of both fecal coliform and E. coli or enterococci in new permits. This dual monitoring will improve understanding of the correlation between the two indicators. The new permit for the Big Lake WWTP proposes dual monitoring requirements for the permittee consisting of a continuation of the fecal coliform monitoring requirements as they were formulated in the previous permit and the addition of E. coli monitoring in the final year of the new permit term.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters).

Ecology accredited the laboratory at this facility for:

Table 14: Accredited Parameters

Matrix Description	Category	Method Name	Method Code	Analyte Name
Non-Potable Water	General Chemistry	SM 2540 D-2011	20051212	Solids, Total Suspended
Non-Potable Water	General Chemistry	SM 4500-H+ B-2011	20105220	pH
Non-Potable Water	General Chemistry	SM 4500-O G-2011	20121668	Dissolved Oxygen
Non-Potable Water	General Chemistry	SM 5210 B-2011	20135266	Biochemical Oxygen Demand (BOD)
Non-Potable Water	Microbiology	SM 9222 D (mFC)-06	20210019	Fecal coliform-count

V. Other Permit Conditions

A. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Big Lake WWTP to:

- Take the actions detailed in proposed permit Special Condition S4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S4 restricts the amount of flow.

C. Operation and maintenance

The proposed permit contains Special Condition S5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that the Big Lake WWTP takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

D. Pretreatment

Duty to enforce discharge prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes "pass-through" or "interference". This general prohibition is from 40 CFR §403.5(a). **Appendix C** of this fact sheet defines these terms.
- The second section reinforces a number of specific state and federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:
  a. Are prohibited due to dangerous waste rules.
  b. Are explosive or flammable.
  c. Have too high or low of a pH (too corrosive, acidic or basic).
  d. May cause a blockage such as grease, sand, rocks, or viscous materials.
  e. Are hot enough to cause a problem.
  f. Are of sufficient strength or volume to interfere with treatment.
  g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.
  h. Create noxious or toxic gases at any point.

  40 CFR Part 403 contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on WAC 173-216-060.
- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology.

  These discharges include:

  a. Cooling water in significant volumes.

b. Stormwater and other direct inflow sources.

c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Federal and state pretreatment program requirements

Ecology administers the Pretreatment Program under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986) and 40 CFR, part 403. Under this delegation of authority, Ecology issues wastewater discharge permits for significant industrial users (SIUs) discharging to POTWs which have not been delegated authority to issue wastewater discharge permits. Ecology must approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8 (f)(1)(i) and(iii)].

Industrial dischargers must obtain a permit from Ecology before discharging waste to the Big Lake WWTP [WAC 173-216-110(5)]. Industries discharging wastewater that is similar in character to domestic wastewater do not require a permit.

Routine identification and reporting of industrial users

The permit requires non-delegated POTWs to take "continuous, routine measures to identify all existing, new, and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs)" discharging to their sewer system. Examples of such routine measures include regular review of water and sewer billing records, business license and building permit applications, advertisements, and personal reconnaissance. System maintenance personnel should be trained on what to look for so they can identify and report new industrial dischargers in the course of performing their jobs. The POTW may not allow SIUs to discharge prior to receiving a permit, and must notify all industrial dischargers (significant or not) in writing of their responsibility to apply for a State Waste Discharge Permit. The POTW must send a copy of this notification to Ecology.

Industrial user survey update

This provision requires the POTW to submit an updated list of existing and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs). This provides Ecology with notice of any new or proposed industrial users in the POTW's service area without a more rigorous "complete" industrial user survey. This level of effort is often sufficient for small municipalities which have not seen any adverse effects potentially attributable to industries, have loadings commensurate with domestic flows, and have a small proportion of industrial flow.

E. Solid wastes

To prevent water quality problems, the facility is required in permit Special Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the Skagit County Health Department.

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under 40 CFR 503, to develop or update local limits.

F. Outfall evaluation

The proposed permit requires the Big Lake WWTP to conduct an outfall inspection and submit a report detailing the findings of that inspection. The inspection must evaluate the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

G. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual domestic wastewater NPDES permits issued by Ecology.

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, based on new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit issuance

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of five years.

VII. References for Text and Appendices

CHS Engineers.

2010. *Skagit County Sewer District No.2 Engineering Report for Wastewater Treatment Plant Improvements (Revised June 2010 for Peak Flow MBR Handling Evaluation)*.

Cosmopolitan Engineering Group.

February 2009. *Mixing Zone Study Report prepared for Skagit County Sewer District No.2*.

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

Howarth, R. and R. Marino, 2006.

Nitrogen as the Limiting Nutrient for Eutrophication in Coastal Marine Ecosystems: Evolving Views Over Three Decades. Limnology and Oceanography 51(1, part 2): 364-376.

Newton, J. and K. Van Voorhis, 2002.

Seasonal Patterns and Controlling Factors of Primary Production in Puget Sound's Central Basin and Possession Sound. Washington State Department of Ecology, Olympia, Washington. Publication No. 02-03-059 available at https://apps.ecology.wa.gov/publications/documents/0203059.pdf.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

January 2019. *Puget Sound Nutrient Source Reduction Project. Volume 1: Model Updates and Bounding Scenarios.* Publication No. 19-03-001 available at https://apps.ecology.wa.gov/publications/documents/1903001.pdf.

July 2018. *Permit Writer's Manual.* Publication Number 92-109 available at https://apps.ecology.wa.gov/publications/documents/92109.pdf.

September 2011. *Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation*. Publication Number 11-10-073 available at https://apps.ecology.wa.gov/publications/documents/1110073.pdf.

October 2010 (revised). *Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits*. Publication Number 06-10-100 available at https://apps.ecology.wa.gov/publications/documents/0610100.pdf.

Laws and Regulations available at http://leg.wa.gov/LawsAndAgencyRules/Pages/default.aspx.

Permit and Wastewater Related Information available at https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance.

Water Pollution Control Federation.
1976. *Chlorination of Wastewater*.

Wright, R.M., and A.J. McDonnell.
1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A - Public Involvement Information

Ecology proposes to reissue a permit to the Skagit County Sewer District No.2 (Big Lake WWTP). The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Draft on June 10, 2020 in The Skagit Valley Herald to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the comment period.
- Tells how to request a public hearing about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled Frequently Asked Questions about Effective Public Commenting, which is available on our website at https://apps.ecology.wa.gov/publications/documents/0307023.pdf.

You may obtain further information from Ecology by telephone, (425) 649-7201, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

The primary author of this permit and fact sheet is Tonya Lane.

Appendix B - Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. “Date of receipt” is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

- File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

Table 15: Address and Location Information

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C - Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity -- The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit -- The average of the measured values obtained over a calendar months time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

In addition, it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process.

This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations

appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Detection Limit.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) --A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes). Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).

ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons

or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sample Maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5, 3, or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and

construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria -- A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids -- That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) -- A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

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

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D - Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance.

Table D1: Reasonable Potential Calculation

Reasonable Potential Calculation

Facility	Big Lake
Water Body Type	Freshwater
Rec. Water Hardness	16.7 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	40.0	462.0
Human Health Carcinogenic		462.0
Human Health Non-Carcinogenic		462.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	NITRATE/NITRITE (N)									
Effluent Data	# of Samples (n)		17	18									
	Coeff of Variation (Cv)		0.82	0.29	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		110										
	Calculated 50th percentile Effluent Conc. (when n>10)			4.09									
Receiving Water Data	90th Percentile Conc., ug/L		10										
	Geo Mean, ug/L			0.16									
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	17,506	-									
		Chronic	1,907	-									
	WQ Criteria for Protection of Human Health, ug/L		-	10000									
	Metal Criteria Translator, decimal	Acute	-	-									
		Chronic	-	-									
	Carcinogen?		N	N									

Aquatic Life Reasonable Potential

Effluent percentile value			0.950
s	$s^2=\ln(CV^2+1)$		0.717
Pn	Pn=(1-confidence level)$^{1/n}$		0.838
Multiplier			1.60
Max concentration (ug/L) at edge of…		Acute	14
		Chronic	10
Reasonable Potential? Limit Required?			**NO**

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.28417
Pn	Pn=(1-confidence level)1/n	0.847
Multiplier		0.74789
Dilution Factor		462
Max Conc. at edge of Chronic Zone, ug/L		0.16851
Reasonable Potential? Limit Required?		**NO**

Table D2: Freshwater Un-ionized Ammonia Criteria Calculation

Freshwater Un-ionized Ammonia Criteria Calculation Based on Chapter 173-201A WAC, amended November 20, 2006	
INPUT	
1. Receiving Water Temperature (deg C):	16.5
2. Receiving Water pH:	7.3
3. Is salmonid habitat an existing or designated use?	Yes
4. Are non-salmonid early life stages present or absent?	Present
OUTPUT	
Using mixed temp and pH at mixing zone boundaries?	no
Ratio	22.518
FT	1.400
FPH	1.807
pKa	9.515
Unionized Fraction	0.006
Unionized ammonia NH3 criteria (mg/L as NH_3)	
Acute:	0.129
Chronic:	0.014
RESULTS	
Total ammonia nitrogen criteria (mg/L as N):	
Acute:	17.506
Chronic:	1.907

Table D3: Calculation of Fecal Coliform at Chronic Mixing Zone

Calculation of Fecal Coliform at Chronic Mixing Zone	
INPUT	
Chronic Dilution Factor	462.0
Receiving Water Fecal Coliform, #/100 ml	25
Effluent Fecal Coliform - worst case, #/100 ml	200
Surface Water Criteria, #/100 ml	*14*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**25**
Difference between mixed and ambient, #/100 ml	0
Conclusion: At design flow, the discharge has a reasonable potential to violate water quality standards for fecal coliform.	

Table D4: Calculation of Dissolved Oxygen at Chronic Mixing Zone

Calculation of Dissolved Oxygen at Chronic Mixing Zone	
INPUT	
Chronic Dilution Factor	462.0
Receiving Water DO Concentration, mg/L	10.0
Effluent DO Concentration, mg/L	8.2
Effluent Immediate DO Demand (IDOD), mg/L	45
Surface Water Criteria, mg/L	*9.5*
OUTPUT	
DO at Mixing Zone Boundary, mg/L	**9.90**
DO decrease caused by effluent at chronic boundary, mg/L	**0.10**
Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for dissolved oxygen.	
References: EPA/600/6-85/002b and EPA/430/9-82-011	

Table D5: Calculation of pH of a Mixture of Two Flows

Calculation of pH of a Mixture of Two Flows

Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT		
	@ Chronic Boundary	**@ Chronic Boundary**
1. Dilution Factor at Mixing Zone Boundary	462.0	462.0
2. Ambient/Upstream/Background Conditions		
Temperature (deg C):	16.50	16.50
pH:	7.30	7.30
Alkalinity (mg CaCO3/L):	25.20	25.20
3. Effluent Characteristics		
Temperature (deg C):	18.90	18.90
pH:	6.00	9.00
Alkalinity (mg CaCO3/L):	130.00	130.00
4. Aquatic Life Use Designation	Char spawning & rearing and/or core summer habitat	
OUTPUT		
1. Ionization Constants		
Upstream/Background pKa:	6.41	6.41
Effluent pKa:	6.39	6.39
2. Ionization Fractions		
Upstream/Background Ionization Fraction:	0.89	0.89
Effluent Ionization Fraction:	0.29	1.00
3. Total Inorganic Carbon		
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	28	28
Effluent Total Inorganic Carbon (mg CaCO3/L):	449	130
4. Condtions at Mixing Zone Boundary		
Temperature (deg C):	16.51	16.51
Alkalinity (mg CaCO3/L):	25.43	25.43
Total Inorganic Carbon (mg CaCO3/L):	29.34	28.65
pKa:	6.41	6.41
5. Allowable pH change	NA	0.20
RESULTS		
pH at Mixing Zone Boundary:	**7.22**	**7.30**
pH change at Mixing Zone Boundary:	0.08	0.00
Is permit limit needed?	NO	NO

Table D6: Influent BOD5 Concentration

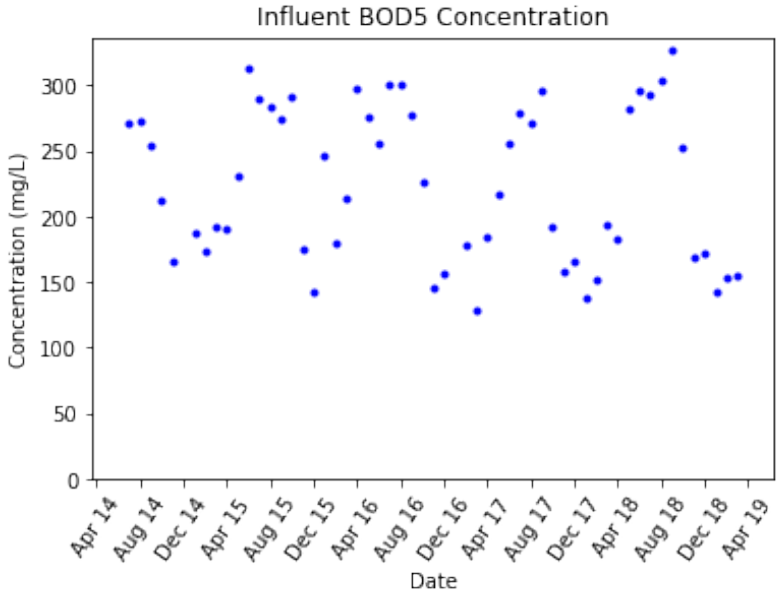


Table D7: Influent BOD5 Mass Loading

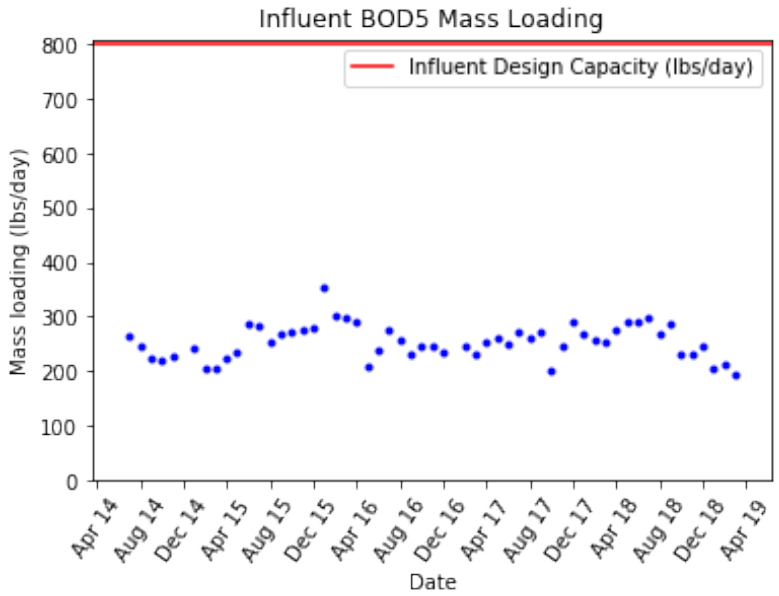


Table D8: Influent TSS Concentration

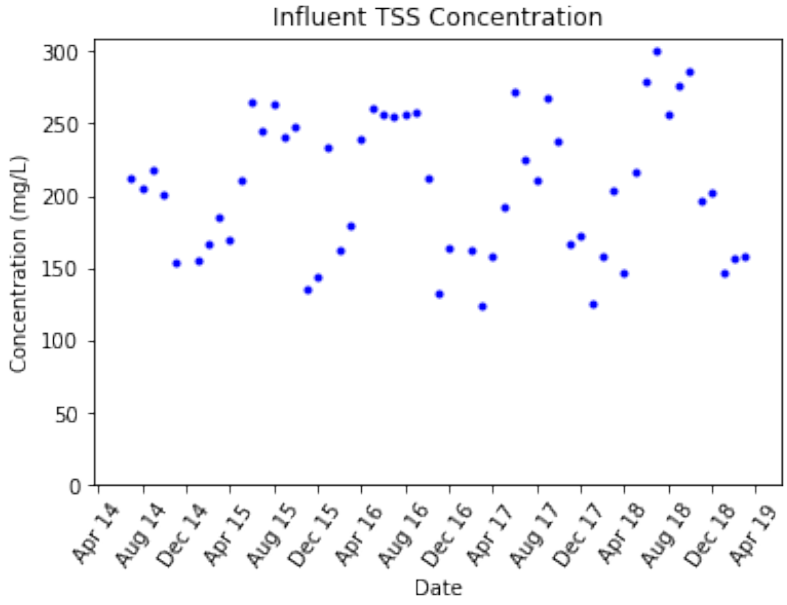


Table D9: Influent TSS Mass Loading

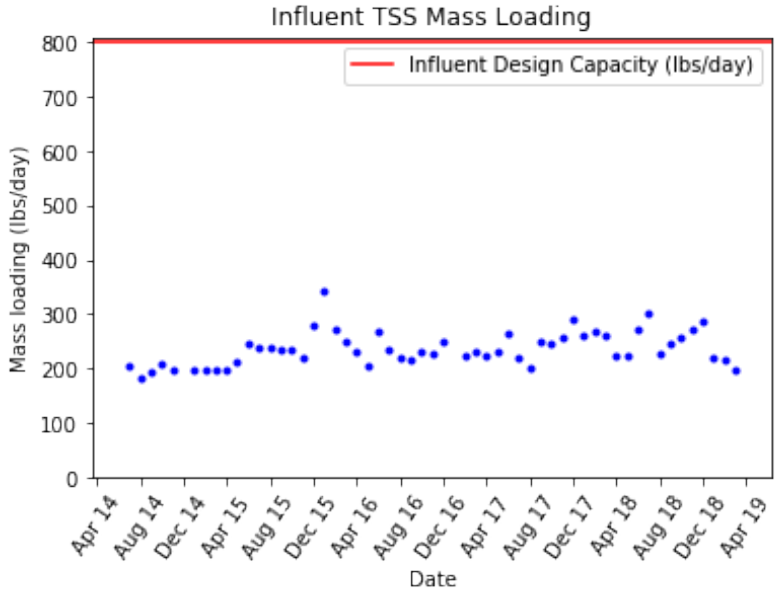


Table D10: Effluent Flow

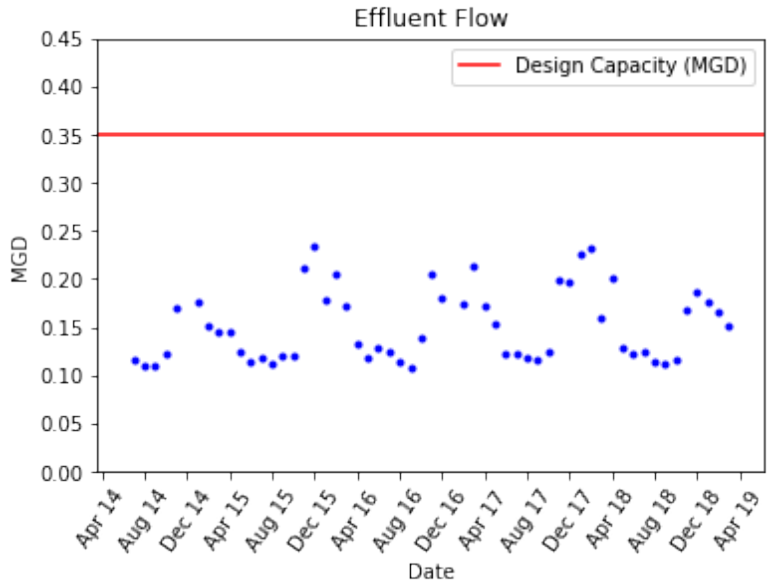


Table D11: Effluent BOD5 Concentration

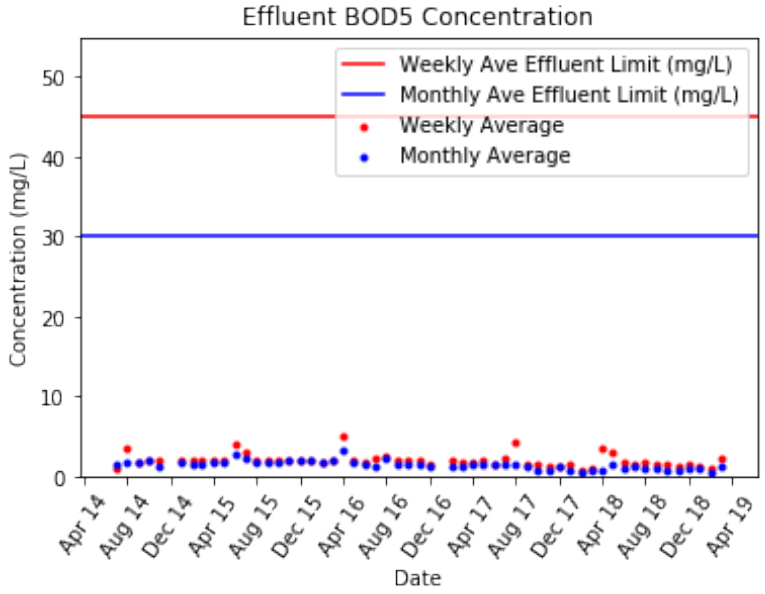


Table D12: Effluent TSS Concentration

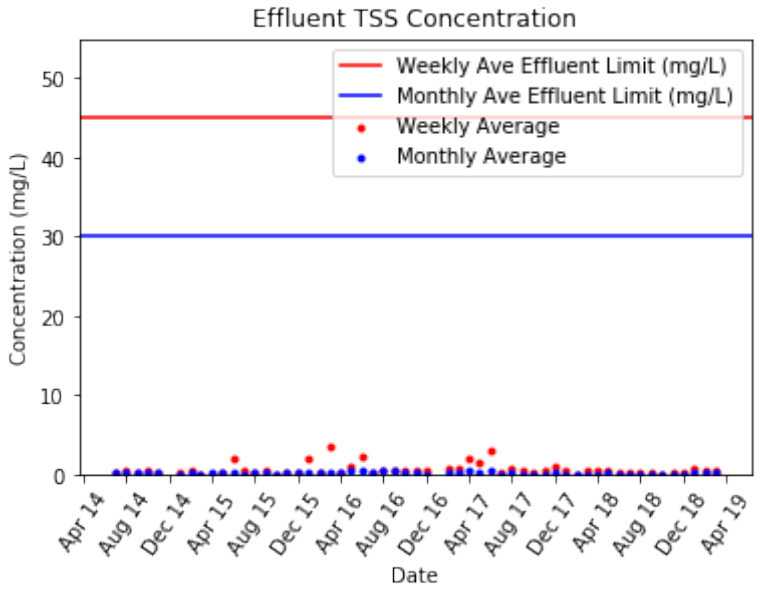


Table D13: Effluent BOD5 Mass

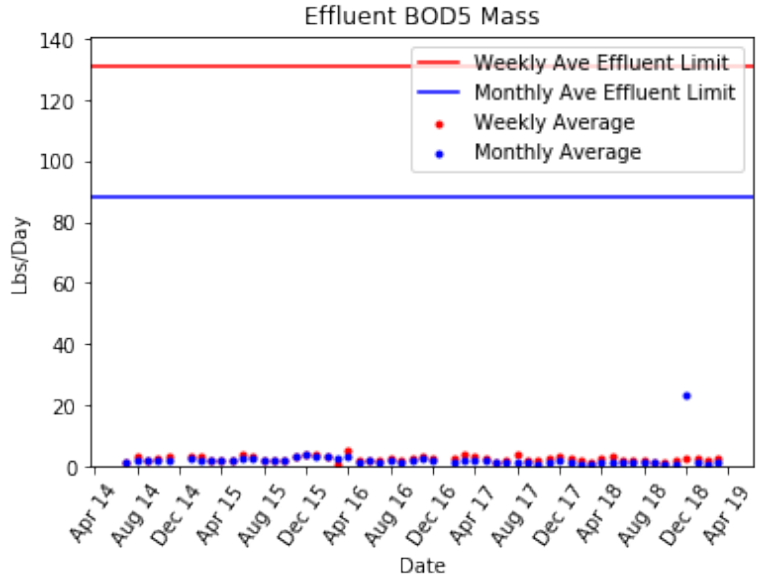


Table D14: Effluent TSS Mass

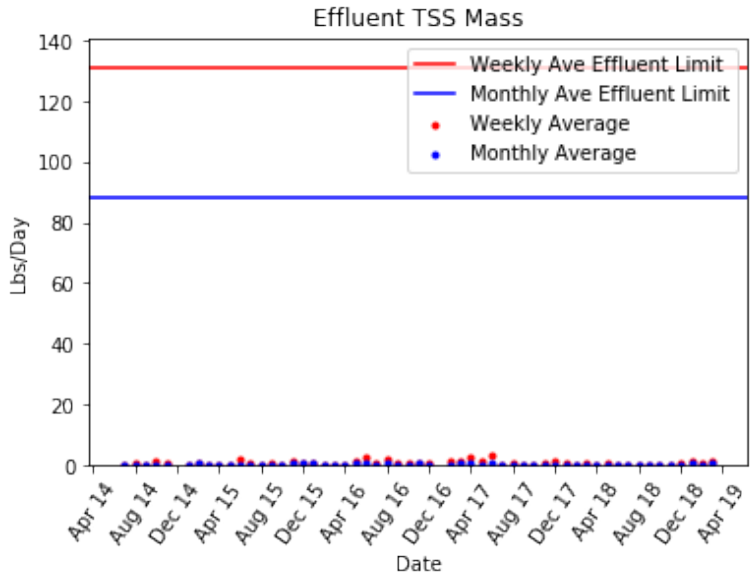


Table D15: Effluent Fecal Coliform

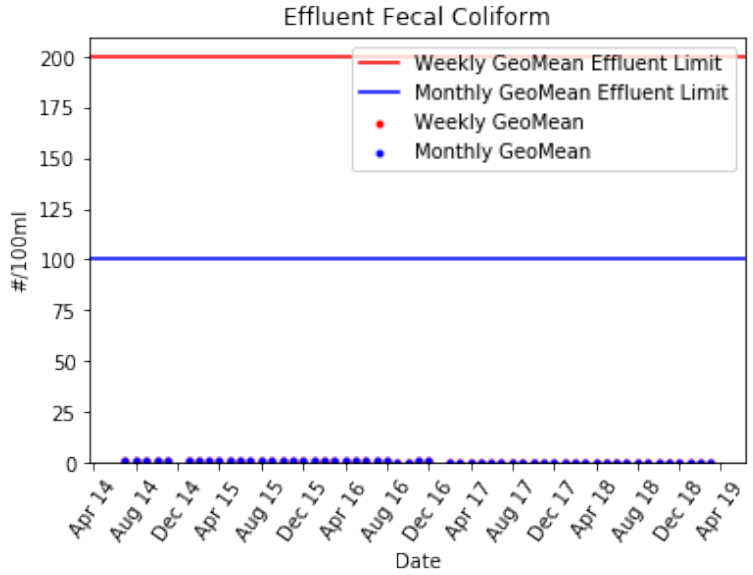


Table D16: Effluent pH

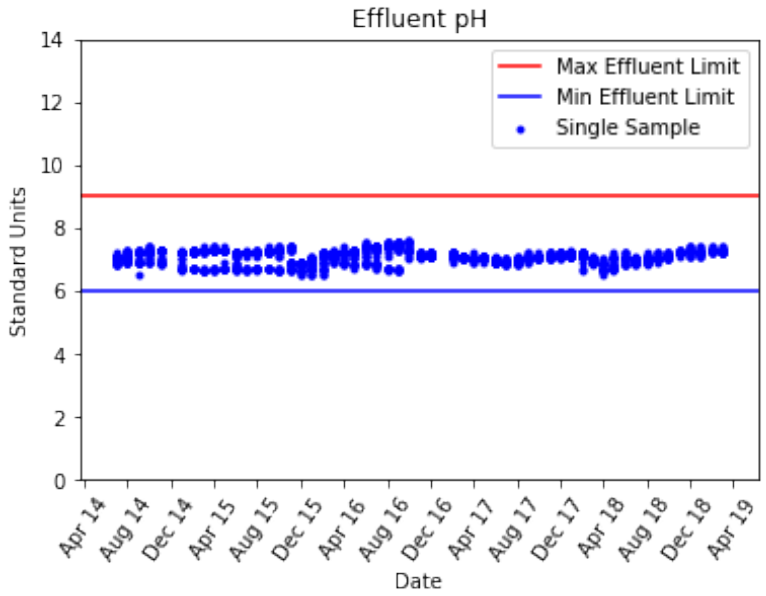


Table D17: Effluent Nutrients

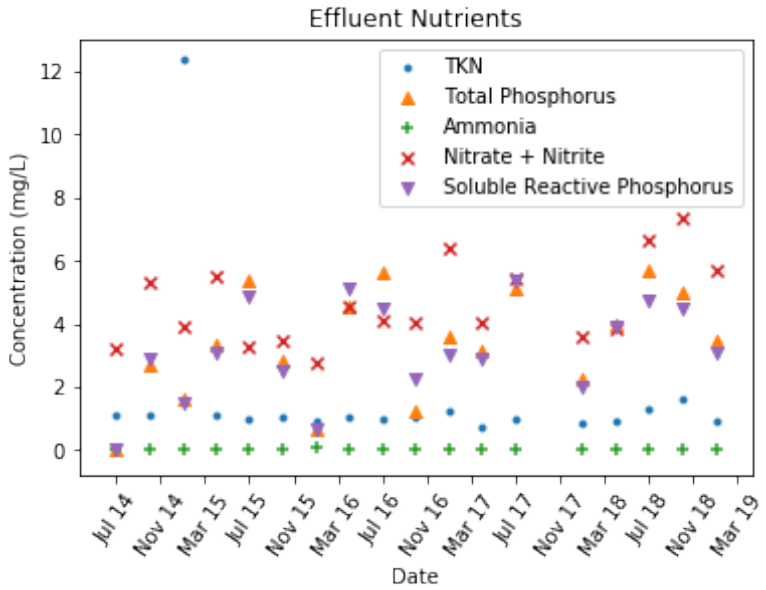
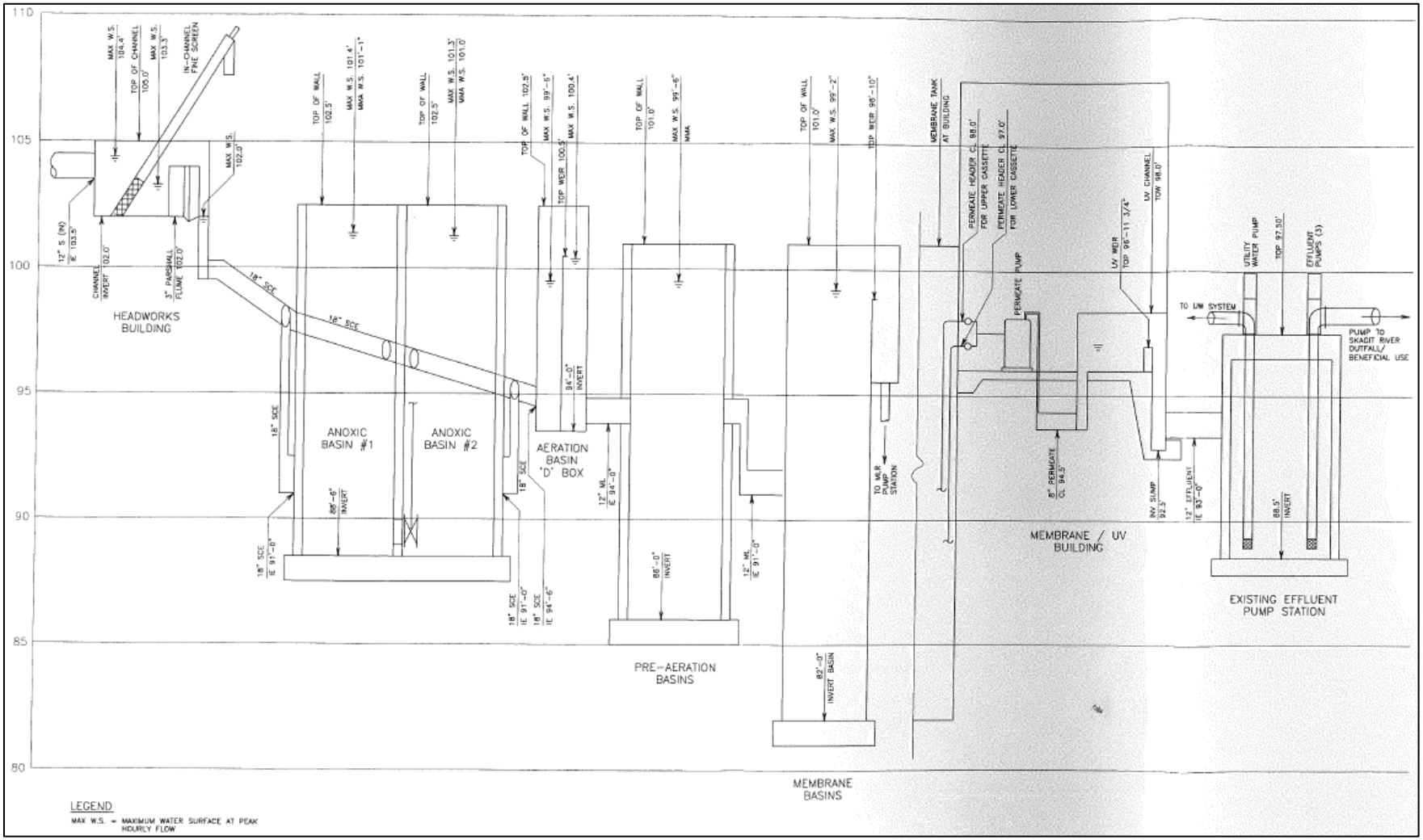


Table D18: Big Lake WWTP Hydraulic Profile



Appendix E - Response to Comments

Comments on the initial draft Big Lake permit were received during an initial public notice period (published 9/10/2019) from Northwest Environmental Advocates (NWEA). Ecology revised the draft permit as part of responding to those comments. A revised draft permit was posted for public comment on June 10, 2020. Comments on the current proposed permit were received during the public notice period from a number of individuals and organizations including King County, NWEA, the City of Tacoma, and the Washington Association of Sewer & Water Districts. Those comments are summarized below along with Ecology's responses (denoted as RTC; Response to Comment).

RESPONSES TO KING COUNTY COMMENTS RECEIVED ON BIG LAKE DRAFT PERMIT 2 (WA0030597)

KC COMMENT 1:

Comment addresses Condition S1.A of the permit.

1a) Comment recommends labeling the nitrogen caps as an "interim requirement" because the General Permit with its own cap structure is still under development, the Nutrient Management Plan and Salish Sea Modeling efforts are still underway, etc. Adding the label would make the temporary nature of the nutrient caps in individual permits more clear.

1b) Comment notes that the permits do not describe how the nutrient requirements will be coordinated with the General Permit or the Nutrient Management Plan. "The permit should reference or defer a course of compliance to ultimately be dictated by the future regulatory requirements."

KC RTC 1a:

Ecology has revised the proposed permit language. The permit now describes the TN cap as an action level. If the effluent exceeds the action level, Ecology will require actions described in the Nutrient Optimization Plan. Ecology may make revisions to the action level based on new information if it becomes available.

KC RTC 1b:

Once the general permit is in effect, the individual permit will be modified so that all nutrient requirements are located in only one permit – the general permit. In the event of an exceedance of the action level during the individual permit term, the proposed permit specifies that the permittee is to employ adaptive management in accordance with actions identified in the optimization study.

KC COMMENT 2:

Comment supports the use of an annual average statistical basis for the temporary nutrient cap, however it also recommends special measures to ensure leap day load differentials are accounted for year over year.

KC RTC 2:

The impact of a leap day in February every four years on compliance with the annual average total nitrogen action level will be minimal. The monthly load calculations are a function of 1) measured concentration for the month, 2) the average flow on the day in which the nutrient samples are collected, and 3) the number of days in the month. Leap days may be consistently handled by applying a day count of 28 days when calculating nitrogen loads for the month of February even during leap years.

RESPONSES TO MISCELLANEOUS COMMENTS RECEIVED ON BIG LAKE DRAFT PERMIT 2 (WA0030597)

MISC COMMENT 1 (Anonymous):

"On page 35 of 38, Table 1 please include other methods for BOD and Soluble BOD. Include the ability to use newer technology such as optical D.O. meters. These methods would include:

In-Situ 1003-8-2009 for BOD.

ASTM D88-09C for Dissolved Oxygen.

It is only changing a probe to a more efficient kind. It currently takes the accreditation division of Ecology way too long to approve any method changes. Please just include EPA approved alternative methods now to save time and resources moving forward with all new permits."

MISC RTC 1:

The existing Appendix A language includes an allowance for all EPA-approved methods in 40 CFR Part 136, even if they are not explicitly listed in Appendix A.

Permit Condition S2.D. states that all permit-required analyses must be conducted by a laboratory accredited for said parameters. The permittee should contact their Ecology permit manager if there are undue delays in processing laboratory accreditation for EPA-approved alternative methods.

Ecology's Laboratory Accreditation Unit (LAU) also has the ability to accredit some EPA-equivalent methods that are not explicitly listed in the CFR. Permittees are encouraged to work with their permit managers and with the LAU if they have interest in pursuing accreditation for an EPA-equivalent method.

MISC COMMENT 2 (Peter Burgoon):

Why is this a TN cap when Birch Bay is a TIN cap?

MISC RTC 2:

The Big Lake action level (cap) is based on approved engineering design criteria for the facility. The nitrogen design criterion was given as "total nitrogen", not "total inorganic nitrogen". Because inorganic nitrogen is part of total nitrogen, total nitrogen is an acceptable alternative for the interim cap on nutrients in the discharge. The set of nitrogen species monitoring required by the proposed permit will still allow for comparison of Big Lake effluent data with potential future TIN requirements in a general permit.

RESPONSES TO NWEA COMMENTS RECEIVED ON BIG LAKE DRAFT PERMIT VERSION 1 (WA0030597, dated 6/10/2020):

Responses to NWEA comments received on the first version of this permit were provided in the fact sheet that accompanied the draft published for public comment on June 10, 2020.

RESPONSES TO NWEA COMMENTS RECEIVED ON BIG LAKE DRAFT PERMIT 2 (WA0030597):

NOTE: Ecology received a second set of comments from NWEA on the revised draft Big Lake permit which was revised to include nutrient-related provisions. Comments that were addressed in the first public comment period are not repeated below. The following comments and responses are summarized.

NWEA COMMENT 1:

Comments cite January 11, 2019 letter from former Director Maia Bellon and state that the draft Big Lake permit includes none of the commitments in the letter, including that of the inclusion of a nutrient effluent limitation.

NWEA RTC 1:

The permit includes a nitrogen action level (cap) and optimization planning requirements, which are consistent with the cited letter. It is infeasible to calculate facility-specific numeric WQBELs at this time. The nutrient optimization plan to reduce loading and the nutrient cap together form a Best Management Practice (BMP) to control nitrogen as authorized by 40 CFR 122.44(k).

NWEA COMMENT 2:

Comments suggest Ecology must address nonpoint source contributions of nutrients in this individual permit.

NWEA RTC 2:

40 CFR 122.44(d)(1)(ii) requires consideration of nonpoint pollution as part of the reasonable potential analysis. The regulation does not require an NPDES permittee to address nonpoint sources of pollution. Modeling efforts to date have indicated that both point and nonpoint sources of nutrients need to be reduced to meet D.O. criteria in Puget Sound. Ecology considered nonpoint nutrient pollution when Ecology determined the discharges from the Big Lake WWTP have a reasonable potential to cause or contribute to an exceedance of the D.O. water quality criteria. The draft permit includes BMPs as authorized under 40 CFR 122.44(k), comprised of a nitrogen action level (cap) and optimization planning requirement, that are intended to limit the discharge of total nitrogen until numeric WQBELs can be developed as part of the general permitting process.

The management of nonpoint pollution and nutrients in watersheds is an area of focus in the Puget Sound Nutrient Reduction Project. Everyone is invited to participate in the Puget Sound Nutrient Reduction Project by attending and providing input at the Nutrient Forum. The issue of nonpoint pollution and nutrients in watersheds is to be a topic of discussion at future Forum meetings. The responsibility to reduce nutrient loads will not fall solely on wastewater treatment facilities.

NWEA COMMENT 3:

Comment discusses Ecology antidegradation policy and concludes that no discharger may be granted a mixing zone if it is not fully compliant with AKART. Comment goes on to state that a facility-level AKART determination, and confirmation that the current definition of AKART is still appropriate, must happen for each permit issuance.

NWEA RTC 3:

The discharge standards in WAC 173-221-040 together with the other requirements of the permit constitute AKART for the Big Lake facility. Numeric effluent limits for nitrogen are not feasible at this time, and the draft permit includes BMPs to limit the discharge of total nitrogen including a nitrogen action level (cap) and optimization planning requirements. Ecology has concluded that additional nutrient removal requirements would not be reasonable for Big Lake.

NWEA COMMENT 4:

Comment discusses definition of AKART. Claim is made that the most current state of the art or best available treatment technology must be required of each facility as the technology becomes available.

NWEA RTC 4:

The definition of AKART includes the term “reasonable”. Requiring a permittee to install and implement state of the art technology every five-year permit term would not be reasonable.

In the case of the Big Lake facility, the District and its ratepayers invested heavily to upgrade to a new MBR system which came online in 2014. The facility consistently achieves high effluent quality, and is a substantial improvement over the previous treatment technology. Properly operating and maintaining the existing MBR system, together with the other requirements in the permit, constitutes AKART for Big Lake.

NWEA COMMENT 5:

Comment states that anything other than a WQBEL upon the finding of nitrogen in a discharge potentially contributing to a far-field impairment is not acceptable. Claims that the proposed cap is not presented as a means to attain and maintain water quality standards and claims it is insufficient.

NWEA RTC 5:

The draft permit includes a cap on total nitrogen (TN action level) as well as new optimization requirements which, taken together, are best management practices (BMPs) to control nutrients in the discharge until numeric WQBELs can be developed, as authorized by 40 CFR 122.44(k).

NWEA COMMENT 6:

Comment states that the permit must "address the lack of controls on nonpoint sources such as on-site septic systems, which generally contain no nitrogen controls, on agriculture and logging, and the existing lack of controls on permitted discharges from other municipal sewage systems."

NWEA RTC 6:

Refer to NWEA RTC 2.

NWEA COMMENT 7:

Comment states that Ecology has not made the necessary examination of "how this discharge violates narrative criteria and what effluent limits are necessary to prevent that". The comment summarizes observations of algae growth, jellyfish, and aesthetic impairments that may be associated with excess nutrients.

NWEA RTC 7:

Comment refers to the narrative criteria of the Water Quality Standards, which includes a reference to "deleterious material concentrations" which must be below those which have the potential, even cumulatively, to adversely affect characteristic water uses. Ecology has determined the discharges from the Big Lake WWTP have a reasonable potential to cause or contribute to an exceedance of water quality criteria, and the proposed permit includes a

nitrogen action level and optimization planning requirements as BMPs while Ecology gathers the information necessary to develop numeric WQBELs.

NWEA COMMENT 8:

Comment states that the fact sheet does not explain how the permit is consistent with Tier I antidegradation requirements, and that Ecology does not point to any appropriate and definitive steps to bring water quality back into compliance with standards.

NWEA RTC 8:

Tier I antidegradation requires that dischargers protect existing and designated uses. The Big Lake facility meets AKART requirements and has undergone a relatively recent upgrade to further improve effluent quality – both things that are protective of existing and designated uses. At the same time, Ecology recognizes that more must be done across Puget Sound to address dissolved oxygen issues associated with both point and nonpoint nutrient loads. Ecology believes nitrogen action levels and optimization requirements in permits are appropriate BMPs that will control or abate pollution while Ecology develops the information necessary to determine numeric WQBELs.

NWEA COMMENT 9:

Comment that AKART as defined for secondary standards in the WAC is too old to still be valid and should have been updated by now.

NWEA RTC 9:

The requirements of this proposed permit, including the nutrient cap (nitrogen action level), nutrient optimization planning, and numeric effluent limits, constitute AKART.

NWEA COMMENT 10:

Comments object to permit language regarding Ecology's intent to "implement a coordinated permitting strategy" (the general permitting process), object to the use of an interim cap on nitrogen, and object to previous Ecology responses to comments including the claim that tech-based limits included in the permit are appropriate and that AKART has been appropriately defined and applied to this discharge.

NWEA RTC 10:

Ecology stands by its implementation of AKART in this permit, as well as its strategy to address nutrients in Puget Sound. Where the calculation of numeric WQBELs is infeasible, BMPs may be used as authorized by 40 CFR 122.44(k). Ecology also does not agree that the secondary treatment standards need to be redefined at this time or that Ecology cannot use the secondary treatment standards as part of the AKART determination for the Big Lake permit.

NWEA COMMENT 11:

Comment states that the cap, the monitoring plan, and the optimization planning all fail to prevent the discharge from causing or contributing to violations of water quality standards. Comment also states that there is insufficient explanation of what optimization planning will entail.

NWEA RTC 11:

The basis for the cap (action level) has been explained in the permit documents and preceding comments, and the monitoring plan is intended to track loading to the receiving water and to evaluate compliance with the cap (action level). The optimization plan is intended to help the facility evaluate changes it can make without significant additional capital investments or upgrades. While the fact sheet does include details about what the optimization plan should look like, the plan will ultimately be unique to the facility and requires some degree of flexibility. Ecology will work with Skagit Co. Sewer District 2 (Big Lake) to ensure the optimization plan is appropriate for their facility size and design, and that it can function in its intended adaptive management role. If necessary, the plan may be updated to incorporate any additional requirements specified by the general permit once that is issued.

NWEA COMMENT 12:

Comment objects to the interim cap plus optimization as a BMP that is allowed when numeric effluent limits are infeasible. Reasons given for this view include a statement that Ecology must establish a tech-based limit and then establish BMPs necessary to achieve that limit. Also states that the proposed cap is inadequate as a WQBEL or a TBEL. Requests public review and input on optimization plans.

NWEA RTC 12:

The total nitrogen concentration used for the action level calculation is a design value, and was incorporated as part of the cap on the basis of Best Professional Judgement (BPJ).

It is a technology-based value that will also serve to trigger an adaptive management response using the optimization plan as a guide for responsive actions to an exceedance of the action level. When the discharge of a pollutant is not specifically regulated by “effluent guidelines”, permit writers can use BPJ to establish technology-based limits or determine other appropriate means to control the discharge. Effluent guidelines are national regulatory standards for wastewater discharged to surface waters. The effluent guidelines for municipal publicly-owned treatment works (POTWs) are commonly referred to as the secondary treatment standards (see also WAC 173-221-040) and are a set of technology-based limits for conventional pollutants found in domestic sewage. Nutrients are at this time still considered a “nonconventional” pollutant and no current national effluent guidelines exist for wastewater treatment plants that directly address nutrients. Ecology has relied on WAC 173-221-040 to

implement secondary treatment requirements under the Clean Water Act, and has relied on BPJ to develop permit requirements that satisfy AKART under state law.

Because municipal POTWs are implicated in existing dissolved oxygen impairments in Puget Sound, nutrient control conditions are included in the permit. Ideally, a numerical, site-specific water quality-based limit would be developed. However, given the complexity of nutrient far-field effects and the longer timeframes over which nutrient loads may impact the environment, calculating a numerical WQBEL is infeasible. While Ecology pursues the necessary modeling to develop appropriate numeric WQBELs, 40 CFR 122.44(k) allows the use of best management practices (BMPs) to control or abate the discharge of pollutants. Ecology is requiring the combination of a nutrient load action level (cap), developed as described above using BPJ, and optimization planning as BMPs pursuant to 40 CFR 122.44(k). Optimization of treatment performance is an adaptive management strategy for limiting the discharge of nutrients.

Finally, as a required permit submittal, the Nutrient Optimization Plan will be a matter of public record and will be prepared with the input of operations staff and engineers who are familiar with the facility's capabilities.

NWEA COMMENT 13:

Comment suggests Ecology is failing its regulatory obligations by relying on a stakeholder process for the general permit. Comment states that the calculation of numeric effluent limits for nutrients right now is not infeasible. Comment points out that some other states have calculated nitrogen limits. Claims Ecology has declined to develop a TMDL with binding wasteload allocations.

NWEA RTC 13:

Ecology believes in the value of the stakeholder process to inform the development of the general permit, but the comment is not part of the scope of this individual permit. Ecology disagrees with the suggested calculation methods (see also NWEA RTC 15 below), and is committed to deriving appropriate loading allocations specific to Puget Sound/Salish Sea on the basis of the best available science.

NWEA COMMENT 14:

Comment claims Ecology is slow-walking the modeling process and takes issue with the modeling scenarios. Multiple comments contain detailed critiques of the Salish Sea Modeling work.

NWEA RTC 14:

Addressing criticism of the model, whether of its development speed or its design, is not within the scope of this individual permit. Such critiques should be addressed within the framework of the relevant stakeholder process: the Nutrient Forum associated with the Puget

Sound Nutrient Reduction Project. Critiques about the Salish Sea Model design can also be directed to Dustin Bilhimer (DBIL461@ECY.WA.GOV) and Cristiana Figueroa-Kaminsky (CFIG461@ECY.WA.GOV).

NWEA COMMENT 15:

Comment asks if Ecology knows how much of excess nitrogen in Puget Sound is coming from treatment plants, why we aren't doing the following:

Take aforementioned loading and "calculate a percentage of reduction needed, and apply it to all sources. It could do the same and shift percentages to different categories of sewage treatment plants. It could, based on projected population growth and climate change impacts, establish a limits-of-technology approach, setting numeric nitrogen effluent limitations at 3.0 mg/L, and include an additional enforceable compliance schedule in the permit that requires the permittee to engage, for example in water pollution trading or wastewater "polishing" through constructed wetlands, for any of its excess nitrogen discharges that cause or contribute to violations of water quality standards after use of state-of-the-art treatment technology."

NWEA RTC 15:

Application of a universal percent reduction or uniformly setting an effluent limit of 3.0 mg/L for nitrogen would be arbitrary as it is not clear at this point that these limits are necessary to meet water quality criteria.

NWEA COMMENT 16:

Comment disagrees with this language in the fact sheet: "Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria."

NWEA RTC 16:

The language cited is standard fact sheet language. The comment does not affect any condition of the proposed permit.

RESPONSES TO COMMENTS RECEIVED FROM THE CITY OF TACOMA ON BIG LAKE DRAFT PERMIT 2 (WA0030597)

TACOMA COMMENT 1:

Comment addresses Section S11 of the permit. Comment expresses concern about the 12-month timeframe for preparing the Optimization Plan. Recommends enhanced, expanded

process monitoring with QAPP before preparing the Optimization Plan. Comment continues, asking questions about language included in the Birch Bay permit, not in the Big Lake permit.

TACOMA RTC 1:

There is no S11 in the Big Lake permit. It is understood that a 12-month timeframe would not result in a highly-detailed plan. Ecology's regional office will work with Big Lake staff to ensure the optimization study is appropriate for Big Lake and can function in its intended adaptive management role. The recommendations regarding a QAPP and additional expanded monitoring are noted, however that level of detail was not envisioned for the optimization planning condition for this permittee. Big Lake staff also reviewed the draft permit prior to public notice and made no request for more monitoring. The nutrients advisory committee also agreed that smaller plants, <3 MGD, should have streamlined optimization requirements.

Big Lake is not only a small facility, but they have also already considered nutrient removal in the design of their treatment plant and already reliably produce good quality effluent. Table 7, footnote c has been revised consistent with the general permit advisory committee recommendation to calculate monthly nutrient loads by pairing measured nutrient concentrations with flows that occurred on the day in which that nutrient sampling occurred (as opposed to pairing it with the monthly average flow).

TACOMA COMMENT 2:

Comments on Pages 1, 7, 29, and 30 of the fact sheet ask why a nutrient cap is being included in the Big Lake permit when they're not part of the Salish Sea Model other than as part of the overall flow coming from the Skagit River into Puget Sound. At least one comment goes on to ask if all facilities that discharge anywhere that eventually reach Puget Sound will receive a cap. One of the comments on Page 29 of the fact sheet also refers to a "Deep Lake", which was assumed to mean "Big Lake".

TACOMA RTC 2:

Big Lake (Skagit County Sewer District 2) is included in the Salish Sea Model as a point source model input and not as part of generalized river contributions to the Sound. See for example Appendix E of the Puget Sound Dissolved Oxygen Model Nutrient Load Summary for 1999-2008 https://apps.ecology.wa.gov/publications/documents/1103057.pdf and most recently Appendix A5 of the January 2019 report called the *Puget Sound Nutrient Source Reduction Project. Volume 1: Model Updates and Bounding Scenarios* https://apps.ecology.wa.gov/publications/parts/1903001part1.pdf

The determination of nutrient caps for watershed sources (i.e. upriver point and nonpoint discharges) and decisions regarding whether and how to apportion caps or wasteload allocations to those sources are not at issue for this individual permit.

TACOMA COMMENT 3:

Comments on Page 22 and 26 of the fact sheet ask what is Ecology's authority to impose performance-based limits, in this case for fecal coliform, contrasting it with either a technology- or water quality-based limit.

TACOMA RTC 3:

Water quality criteria for fecal coliform were developed to protect "primary contact recreation", which is a designated use per WAC 173-201A-200 that has been assigned to the receiving water for this discharge. Performance-based limits can also be imposed as technology-based limits because they are limits that can be achieved with known, available and reasonable treatment methods.

The Big Lake facility has demonstrated that it does not need dilution to meet the coliform criterion at the edge of the mixing zone. In fact, the facility has long-term monitoring data demonstrating it is capable of achieving the water quality criterion of 100 cfu/100mL at the end-of-pipe. Ecology thus adopted the receiving water criteria as an end-of-pipe limit because it is more protective of human health and primary contact recreation within the fresh water mixing zone itself. This was done under the authority of WAC 173-201A-200 which identifies the fresh water designated uses that must be protected by Ecology, and WAC 173-201A-400(6) which calls on Ecology to minimize the mixing zone. As the facility's performance record attests, the limit is achievable given their reliable UV disinfection system.

TACOMA COMMENT 4:

Comment on Page 26 of the fact sheet cites text indicating no reasonable potential was found for ammonia impairment and similarly no DO impairment was found in the mixing zone, and also notes a subsequent statement that a waste load allocation may be introduced in the future if ambient conditions show signs of degradation. Comment then asks why a cap is included.

TACOMA RTC 4:

The lack of reasonable potential for ammonia discussed in the fact sheet refers to ammonia toxicity in the mixing zone, not to its potential contribution to potential DO violations in the far-field. The referenced lack of DO impairment also refers to the mixing zone and immediate surroundings, not potential far field effects of nitrogen loading on downstream receiving waters. Ecology included the nitrogen cap in the revised draft individual permit because of Big Lake's reasonable potential to contribute to D.O. water quality criteria violations in Puget Sound.

TACOMA COMMENT 5:

Comment on Page 27 of the fact sheet asks if Ecology has studied the far-field effects of BOD5 for the Big Lake discharge.

TACOMA RTC 5:

Comment relates to permitting language relating to mixing zone authorizations. Big Lake meets AKART requirements for BOD5.

TACOMA COMMENT 6:

Comment on Page 29 of the fact sheet asks how Ecology can state that 'the far-field impact TIN has on Puget Sound are why spreadsheet tools designed for toxic pollutants cannot be used for determining an appropriate WQBEL' when the model is still being refined.

TACOMA RTC 6:

The spreadsheet tools in question are used to assess the need for and to derive numeric water quality-based effluent limits in accordance with EPA's 1991 Technical Support Document for Water-Quality Based Toxics Control (TSD). These spreadsheet tools primarily address near-field impacts and rely on input values like the assigned dilution factors for a given mixing zone. Even the Streeter Phelps spreadsheet tool is too simplistic to address the complex hydrodynamic mixing and the aggregate far-field impact of numerous discharges on dissolved oxygen across Puget Sound. Ecology cannot use these spreadsheet tools for nutrients, and the Salish Sea Modeling effort has not concluded. The assessment of complex far-field effects is the purview of modeling associated with the Puget Sound Nutrient Source Reduction Project.

TACOMA COMMENT 7:

Comment is about Page 30 of the fact sheet. Comment says "Ecology has stated there is an impairment in Puget Sound; however, it has not put Puget Sound on the 303(d) listing or started a TMDL process. If Puget Sound is impaired, a cap would not attain the water quality standards that Ecology has stated are impaired."

TACOMA RTC 7:

The discussion on page 30 of the fact sheet refers to Puget Sound D.O. impairment in a general sense. The current water quality assessment was approved by EPA in 2016 and contains Puget Sound marine grids on the 303(d) list for D.O.

TACOMA COMMENT 8:

Comment on Page 30 of the fact sheet asks why the permit contains a cap when the modeling effort is incomplete.

TACOMA RTC 8:

Please refer to response in TACOMA RTC 4.

TACOMA COMMENT 9:

Comment on Page 30 of the fact sheet states view that it is preemptive to issue individual permits with conditions currently being discussed in the stakeholders group for the general permit. Comment questions Ecology's commitment to engage stakeholders since it appears the agency has already made decision regarding these requirements.

TACOMA RTC 9:

Please refer to response in TACOMA RTC 4 in regard to the reason for including nutrient-related terms in individual permits. Regarding Ecology's commitment to the stakeholder process, the stakeholder recommendations will be considered in the development of the general permit. Ecology expects to modify the individual permit after the general permit is issued to address consistency and avoid duplication.

TACOMA COMMENT 10:

Comment on Page 31 of the fact sheet asks if the total nitrogen limit used in the cap calculation is a technology-based limit.

TACOMA RTC 10:

Yes, it is. The total nitrogen concentration used for the cap calculation is a design value, and was incorporated on the basis of Best Professional Judgement (BPJ) because it is a good representation of the total nitrogen levels the treatment plant can be expected to reliably and consistently achieve. The legal authority for setting performance-based limits or case-by-case technology-based limits, as was done for total nitrogen in this case, comes from Clean Water Act Section 402(a)(1)(B). When the discharge of a pollutant is not specifically regulated by "effluent guidelines", permit writers can use BPJ to establish technology-based limits or determine other appropriate means to control the discharge. See also NWEA RTC 12 above.

TACOMA COMMENT 11:

Comment on Page 31 of the fact sheet asks if Ecology has confirmed the facility can stay below the cap with optimization and also says there should be a compliance schedule when new limits are introduced.

TACOMA RTC 11:

The cap/action level is derived from the hydraulic design capacity and the design concentration for total nitrogen. The treatment plant was designed to achieve this level of

nitrogen reduction. A compliance schedule may be used if a permittee cannot immediately comply with a water quality-based effluent limit. The Big Lake facility currently meets the cap and is designed to do so. A compliance schedule is not needed.

TACOMA COMMENT 12:

Comment on Page 31 of the fact sheet points out that WQBELs are going to be on TIN and asks if a TIN cap would be more appropriate. Comment states that TN is arbitrary.

TACOMA RTC 12:

The total nitrogen cap is the opposite of arbitrary. It is the specific nitrogen criterion included in the approved engineering design for the Big Lake facility. Also, the requirements of the permit include monitoring for ammonia, nitrate + nitrite, and TKN. This information allows for the continued tracking of both total nitrogen and TIN over time. When numeric TIN WQBELs are introduced in the future, historical data for Big Lake will therefore be readily available.

TACOMA COMMENT 13:

Comment on Page 31 of the fact sheet asks how Ecology knows compliance with limits like the new nitrogen cap will reduce the burden on DO in the receiving water. Asks if a cap is a reduction.

TACOMA RTC 13:

As flows to the treatment plant increase, continued compliance with limits on parameters that exert an oxygen demand will reduce the oxygen demand loading to the receiving water relative to what it would have been in the absence of any controls. In this sense, compliance with the cap will reduce the burden on DO in the receiving water.

TACOMA COMMENT 14:

Comment on Page 32 of the fact sheet cites the following text "… the primary contact recreation standard for fecal coliform as a performance-based (technology-based) effluent limit for fecal coliform bacteria" and indicates these terms are not the same and asks which term correctly applies.

TACOMA RTC 14:

Big Lake has a long-term record of treatment performance that demonstrates their technology-based capacity to produce effluent with lower fecal coliform than the criteria assigned to the receiving water. The proposed limit is more stringent than the secondary-treatment based standard for fecal coliform set in WAC 173-221-040, and is an appropriate technology-based effluent limit for this specific facility. It is accurate to call the limit technology-based, and also to state that it is appropriate to apply it based on Big Lake's record

of performance. An explanation for the fecal coliform limit and its legal basis is provided in TACOMA RTC 3. An explanation of performance-based limits generally and their legal basis is provided in TACOMA RTC 10.

TACOMA COMMENT 15:

Comment on Page 37 of the fact sheet asks what is the basis for incorporating a design criterion into a limit and suggests it may not be allowed if it's not a tech- or water quality-based limit. Repeats question about why total nitrogen was the parameter selected for the temporary cap, and repeats the erroneous claim that Big Lake was not specifically included in the model.

TACOMA RTC 15:

The Clean Water Act allows for BPJ adoption of limits (Clean Water Act Section 402(a)(1)(B)). The numerical cap/action level itself is technology-based. Using the design criterion for total nitrogen from the approved engineering design for the Big Lake treatment plant as the basis for a cap on nutrients is reasonable, appropriate, and achievable. Please refer to TACOMA RTC 2 for the fact check regarding Big Lake's specific inclusion in the model.

TACOMA COMMENT 16:

Comment on Page 38 of the fact sheet asks if additional monitoring will be used to inform a future TIN WLA as stated, why is the current cap in total nitrogen.

TACOMA RTC 16:

Please refer to TACOMA RTC 12. The temporary total nitrogen cap will have no effect on the data collected via the additional nutrients monitoring or on the usefulness of that data in deriving or evaluating a future total inorganic nitrogen wasteload allocation.

TACOMA COMMENT 17:

Comments on Page 57 and 59 of the fact sheet address reasonable potential calculations. First, the comment notes a calculation that determined that the ammonia concentration in the mixing zone did not exceed criteria and second, a calculation showing no dissolved oxygen impairment in the mixing zone. Comment proceeds to ask why there is a cap given these findings.

TACOMA RTC 17:

The reasonable potential calculations referenced in this comment evaluate the impacts of the discharge on the receiving water *within the mixing zone* surrounding the outfall. The reasons for including an action level (cap) in this permit are provided in previous responses to comments above (please refer to TACOMA RTC 4, NWEA RTC 12). In short, nutrient caps

address DO-related water quality standards violations in Puget Sound due to the aggregate of oxygen demand loading from numerous sources which combine in complex ways in the far-field.

TACOMA COMMENT 18:

Comment on Page 67 of the fact sheet says Big Lake does not appear to be included in Ecology's list of potential permits for inclusion in the General Permit.

TACOMA RTC 18:

Big Lake is present on the list. It is also known as Skagit County Sewer District 2. Please see TACOMA RTC 2 above.

TACOMA COMMENT 19:

Comment on Page 68 of the fact sheet asks if adding a nutrient cap requires a public rule-making process.

TACOMA RTC 19:

No, the cap can be adopted per Clean Water Act Section 402(a)(1)(B).

TACOMA COMMENT 20:

Comment on Page 68 of the fact sheet asks for the legal basis for performance-based limits.

TACOMA RTC 20:

This comment was made specifically in the context of the fecal coliform limit, the legal basis of which is provided in TACOMA RTC 3.

TACOMA COMMENT 21:

Comment on Page 69 of the fact sheet states that there is nothing in the CWA that allows for performance or design-based effluent limits.

TACOMA RTC 21:

Performance-based limits or case-by-case technology-based limits may be put in place using Best Professional Judgement (BPJ) under the authority of Clean Water Act Section 402(a)(1)(B).

TACOMA COMMENT 22:

Comment on Page 71 of the fact sheet asks what is meant by "approved design criteria".

TACOMA RTC 22:

Per WAC 173-240-060 and WAC 173-240-070, the Department of Ecology reviews and approves engineering documents submitted in accordance with the requirements of the WAC. This is what is meant by "approved." "Design criteria" refers in this case to the total nitrogen concentration used in engineering design calculations for the facility as prepared by the professional consulting engineers contracted by Skagit County Sewer District 2.

TACOMA COMMENT 23:

Comment on Page 71 of the fact sheet asks why Ecology is requiring an additional optimization report regarding how to further remove nitrogen if this evaluation had been part of the original engineering design.

TACOMA RTC 23:

The optimization study is being included because it is part of the adaptive management aspect of the BMPs to control or abate the discharge of pollutants when calculating a numerical WQBEL is infeasible (please see NWEA RTC 12). Because Big Lake already considered how to achieve low nutrient levels in its design, their optimization study may emphasize what capabilities they already have, as well as any potential further reduction in loadings they could achieve by optimizing the existing system or through making minor changes or through seasonal water reclamation if appropriate beneficial uses for the water can be found.

TACOMA COMMENT 24:

Comment on Page 6 of the Permit asks what is the enforcement plan for an exceedance of the temporary total nitrogen cap.

TACOMA RTC 24:

In the event of an exceedance of the nitrogen action level (which is based on design values for this facility) during the permit term, the proposed permit specifies that the permittee is to employ adaptive management in accordance with actions identified in the optimization study.

TACOMA COMMENT 25:

Comment on Page 8 of the Permit asks why no influent nitrogen monitoring is required.

TACOMA RTC 25:

The final permit increases effluent nutrient monitoring requirements for the facility from quarterly monitoring to a monthly monitoring frequency. Influent monitoring for nutrients is not needed for tracking nutrient loads to the receiving water, nor for evaluating compliance with the action level (cap). The permittee may determine as part of their optimization planning

that they would benefit from additional influent or process monitoring information and, if so, they would be encouraged to conduct this additional monitoring as needed.

TACOMA COMMENT 26:

Comment on Page 10 of the Permit asks if the Table 7 monitoring is influent or effluent and why the monitoring isn't weekly when the commenter believes that frequency would be necessary for adequate effluent characterization.

TACOMA RTC 26:

Nutrient monitoring in Table 7 is for effluent. The sentence under the Table 7 heading referring to influent has been corrected.

A monthly monitoring frequency is adequate for determining compliance with the annual average total nitrogen action level. That said, the monthly frequency is the minimum frequency required. If the facility conducts additional effluent monitoring of parameters that are required to be reported on the monthly discharge monitoring reports, the additional data must be reported to Ecology.

TACOMA COMMENT 27:

Comment on Page 18 Condition S4.B.b. of the Permit states that the section would be an appropriate place to put a planning requirement for nutrient control.

TACOMA RTC 27:

Comment noted.

TACOMA COMMENT 28:

Comments relating to Pages 21 and 22 of the Permit ask about standard permit language for bypasses. Specifically, 1) why does the permit section for "non-essential" bypassing require an explanation for why such a bypass is "necessary" (the terms are antonyms), and 2) why does the section relating to bypassing for "non-essential maintenance" include an evaluation of whether such bypassing occurred in order to prevent the loss of life, personal injury, or severe property damage – all things that would seem to put said bypass in a different category, one of necessary and essential action.

TACOMA RTC 28:

These permit conditions are in part adapted from the federal regulations in 40 CFR 122.41. However, the term "non-essential maintenance" does not occur in the CFR and appears to have been introduced in Ecology's standard language at some point simply to distinguish it from the

category of bypasses due to essential maintenance that wouldn't be expected to exceed permit limits and thus wouldn't need to be reported (i.e. permit condition S5.F.1).

Regarding the meaning of the permit terms: bypasses that do not qualify under S5.F.1 need to be reported and, unless approved by Ecology as an anticipated bypass under the terms in S5.F.2.a and S5.F.2.b, they may be subject to enforcement action. Generally speaking, enforcement action would not be taken if the bypass was in fact unavoidable to prevent loss of life, personal injury, or severe property damage; and/or if there were no feasible alternatives (see S5.F.2.c); and if appropriate and timely notification of the bypass was made.

TACOMA COMMENT 29:

Comments on Page 27 of the Permit relating to the optimization evaluation 1) state that "minor" should be defined, 2) ask if the optimization evaluation will need to be formally approved by Ecology, and 3) reiterate the view that 12 months isn't long enough to prepare an optimization study especially one that arguably needs more monitoring before any planning is done.

TACOMA RTC 29:

The use of the term "minor" is by necessity open-ended to allow the permittee flexibility to determine what makes sense for their facility. The facility already achieves good effluent quality as a result of their prior investment in a new treatment facility capable of achieving effluent with low oxygen demand. Big Lake has already by design considered nitrogen removal.

Ecology will review the Big Lake optimization plan for completeness. Any significant process change that is proposed and implemented will need to be written into the existing O&M manual at which point it would be formally approved as an update to the O&M manual. In the future, should Ecology formalize more specific optimization planning requirements as part of the general permit, Big Lake may need to submit an updated optimization plan.

Regarding the optimization study schedule, please see TACOMA RTC 1. Regarding further expanding monitoring requirements, please see TACOMA RTC 1 and RTC 25.

RESPONSES TO WASWD COMMENTS RECEIVED ON BIG LAKE DRAFT PERMIT 2 (WA0030597)

WASWD COMMENT 1:

Comment asks why individual permits are being issued when the general permit is still under development and questions remain regarding the potential impact of nutrient controls on growth and planning under the GMA. Suggests administrative extension until after the general permit is issued.

WASWD RTC 1:

Ecology has obligations under our delegated authority to continue to issue individual permits, even during the development of the Puget Sound Nutrients General Permit.

The Big Lake treatment plant has gone through a major upgrade in recent years, and its current MBR process was brought online in 2014. When the community invested in the new system, it did so with an expressed interest in being able to meet unknown future nutrient requirements. Consequently, the facility was engineered to achieve no more than 10 mg/L total nitrogen in the effluent. The action level (cap) in the Big Lake permit relies on criteria from the approved engineering design documents for both total nitrogen and for hydraulic capacity at the facility. Recent investments made in improving the Big Lake treatment facility are thus captured within the cap itself and no inadvertent downward pressure on growth would occur as a result of the individual permit terms for Big Lake.

WASWD COMMENT 2:

Comment points out that the timeline for the submission of an optimization study in the Big Lake permit (12 months from the permit effective date) "short circuits" the general permit optimization study discussion still under way in the stakeholder advisory process. Comment recommends extending the permit until the general permit is issued, in this case to give the permittee more certainty when contracting work for the optimization study. Comment also points out the risk of expensive change orders if the optimization study requirements are altered later via the general permit.

WASWD RTC 2:

Relevant individual permits with nutrient controls will be modified as necessary to be consistent with the general permit once the latter becomes effective.

Regarding the optimization plan specifically, basic concepts related to tracking loads, evaluating load reduction opportunities and determining what is outside the scope for low cost optimization improvements should be similar between the individual permit and what will be required of similarly-sized, small facilities by the future general permit. It is understood that a 12-month timeframe from the permit effective date would not result in a highly-detailed optimization plan. Ecology will work with Big Lake to ensure the optimization study is appropriate for their specific facility and can function in its intended adaptive management role.

WASWD COMMENT 3:

Comment suggests nutrient targets (or "action limits") instead of a nutrient cap.

WASWD RTC 3:

Ecology has revised the draft permit language. The permit now describes the cap as an action level. If the effluent exceeds the action level, it triggers additional adaptive management actions identified in the Nutrient Optimization Plan.

Appendix F - Total Nitrogen Cap

Ecology, in conjunction with the Pacific Northwest National Laboratory, developed the Salish Sea Model to understand anthropogenic nutrient sources in Puget Sound. Ecology is continuing to develop this model in order to help determine water quality-based effluent limits that can be used as part of a coordinated permitting strategy. In the interim, the proposed permit includes increased monitoring frequencies for nitrogen species and a proposed cap on total nitrogen for reasons discussed in Section III of this fact sheet. The cap takes into account the approved design criteria for nitrogen.

40 CFR 122.45(d) requires that all permit limits for POTWs be expressed as average weekly and average monthly limits, unless impracticable. EPA's Director of the Office of Wastewater Management issued a memo[1] that provided a scientific and policy rationale for developing permit limits for nutrients in a way that differs from setting limits for toxic pollutants. Ecology agrees with the arguments presented, including the following:

- The exposure period of concern for nutrients is longer than one month and can even be on the order of years.
- The average exposure rather than the maximum exposure is of concern.

For these reasons, it is impracticable to express permit effluent limits for nutrients as a daily maximum, weekly average, or monthly average. Ecology proposes to use the approved design criteria for nitrogen to calculate an annual total nitrogen cap.

The approved design criteria for total nitrogen is 10 mg/L. A load-based limit is necessary, however, so in order obtain a load-based cap from the design criteria, the approved hydraulic capacity of the facility was also used along with a unit conversion factor to obtain following loading cap:

0.35 MGD * 10 mg/L * 8.34 = 29.2 lbs/day

29.2 lbs/day * 365 days/year = **10,658 lbs/year**

[1] Environmental Protection Agency (EPA) Memorandum – Annual Permit Limits for Nitrogen and Phosphorus for Permits Designed to Protect Chesapeake Bay and its tidal tributaries from Excess Nutrient Loading under the National Pollutant Discharge Elimination System. USEPA Office of Wastewater Management website at https://www3.epa.gov/npdes/pubs/memo_chesapeakebay.pdf.