

Fact Sheet for NPDES Permit WA0020257

Anacortes Wastewater Treatment Plant

Effective Date: December 1, 2017

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 City of Anacortes 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 City of Anacortes WWTP, NPDES permit no. WA0020257, were available for public review and comment from September 25, 2017, until October 25, 2017. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

The City of Anacortes 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 closed, Ecology summarized substantive comments and our responses to them. Ecology included the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments**, and published it when issuing the final NPDES permit. Ecology generally does not revise the rest of the fact sheet. The full document becomes part of the legal history contained in the facility's permit file.

Summary

The City of Anacortes operates an activated sludge WWTP that discharges to Guemes Channel. Ecology issued the previous permit for this facility on June 21, 2012.

The proposed permit contains the same effluent limits as for the previous permit for Carbonaceous Biological Oxygen Demand (CBOD5), Total Suspended Solids (TSS), pH, Fecal Coliform Bacteria, Acute Whole Effluent Toxicity, and more stringent Total Residual Chlorine limits of maximum daily as 403 µg/L and monthly average as 154 µg/L.

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I. Introduction

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

The following regulations apply to domestic wastewater NPDES permits:

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

The following additional regulations apply to communities operating collection systems with Combined Sewer Overflows (CSO):

- Submission of plans and reports for construction and operation of combined sewer overflow reduction facilities (chapter 173-245 WAC)
- US EPA CSO control policy (59 FR 18688)

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

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

II. Background Information

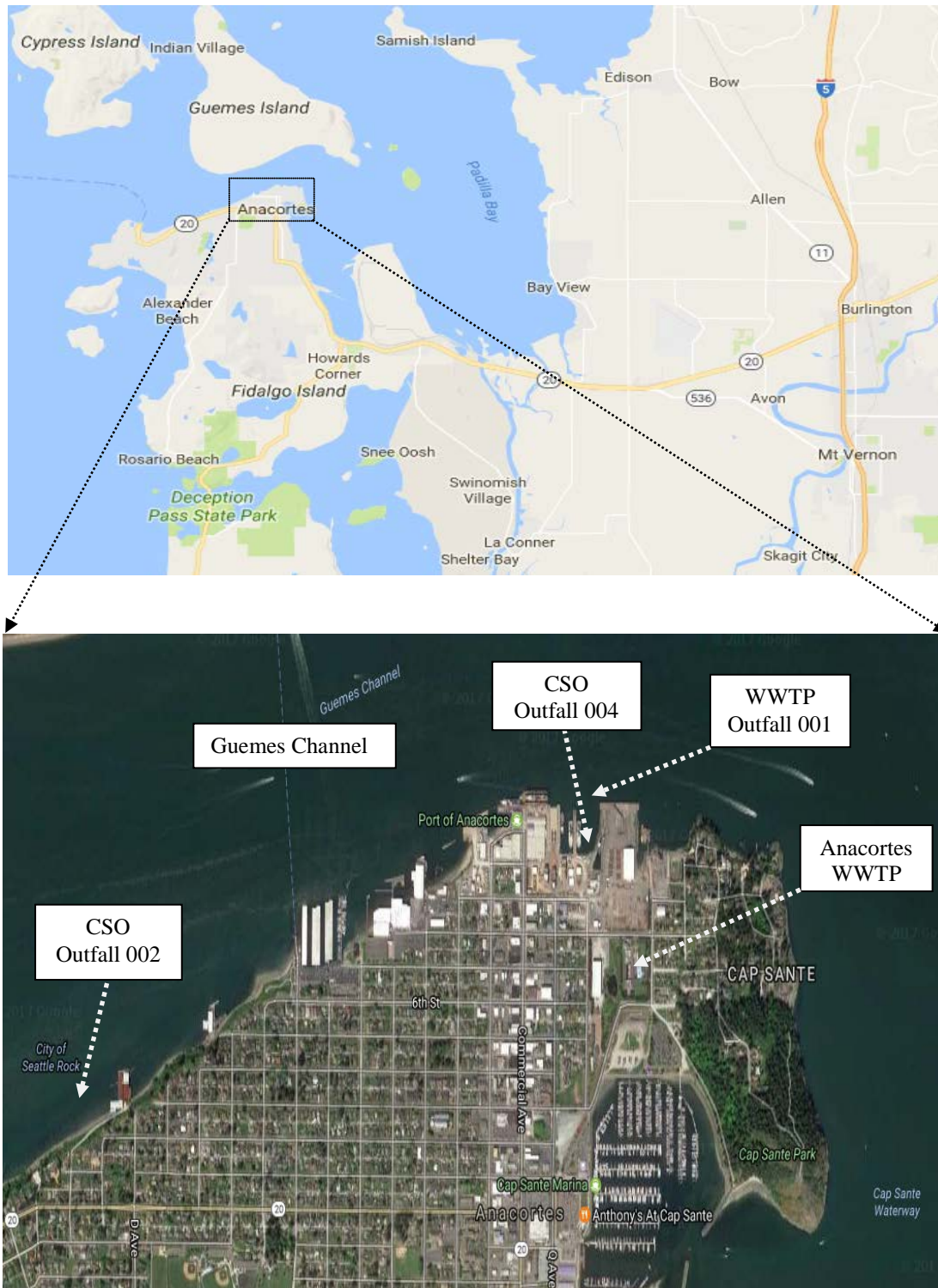
Table 1. General Facility Information

Facility Information			
Applicant	City of Anacortes		
Facility Name and Address	Anacortes Wastewater Treatment Plant 500 T Avenue Anacortes, WA 98221		
Contact at Facility	Rebecca Fox, Wastewater Plant Manager Phone: 360-299-0953		
Responsible Official	Laurie Gere, Mayor P.O. Box 547, Anacortes, WA 98221 Phone: 360-299-1950		
Type of Treatment	Activated Sludge		
Facility Location (NAD83/WGS84 reference datum)	Latitude: 48.518040 Longitude: -122.606344		
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Guemes Channel (Puget Sound)		
	Outfall	Latitude	Longitude
	Outfall 001	48.523056	-122.608611
	CSO 002	48.515278	-122.634167
	CSO 004	48.521667	-122.609444

Permit Status	
Issuance Date of Previous Permit	June 21, 2012
Application for Permit Renewal Submittal Date	December 30, 2016
Date of Ecology Acceptance of Application	January 3, 2017

Inspection Status	
Date of Last Non-sampling Inspection Date	June 28, 2017

Figure 1. Facility Location Map



(Illustration only, not to scale)

A. Facility description

History

The City of Anacortes wastewater treatment plant (WWTP) began operation in 1992. The treatment processes include preliminary, primary, and secondary treatment, disinfection, and sludge handling. The treatment plant incorporates a bypass that diverts primary treated flows greater than 7.8 million gallons per day (MGD) around the aeration basins and secondary clarifiers. In 2008, the City of Anacortes constructed facility modifications to correct excess diversions, as required by the previous NPDES permit.

Significant industrial and commercial discharges to the Anacortes WWTP include the following two seafood processors: Sugiyo USA and Trident Seafood Corporation. The Port of Anacortes discharges storm water into the sewer system, and the state ferry terminal discharges sewage pumped from its vessels.

Collection system status

The City of Anacortes' collection system dates back to the early 1900s. It includes 23 pump stations. Two combined sewer overflow (CSO) outfalls have the potential to discharge untreated sewage mixed with stormwater into Guemes Channel as a result of precipitation events. One of the CSO outfalls (004 - Q Avenue) had three discharge events during 2012-2016; the other CSO outfall (002 - B Avenue) had none during this time period. The City of Anacortes has permanently decommissioned a third CSO outfall (003 - M Avenue), which has had no discharges since 1997.

Treatment processes

The liquid treatment system includes influent pumping, bar screens, grit removal, primary clarifiers, aeration basins, secondary clarifiers, chlorine disinfection and dechlorination. Appendix D shows the treatment process schematic. The facility also includes a septage receiving station (holding tanks, grinder, and pump). During 2015 the Anacortes WWTP received an average of 5,221 gallons of septage per day.

Disinfection: The treated wastewater is disinfected in chlorine contact basins. Liquid chlorine (sodium hypochlorite) is added to the Secondary Clarifier effluent and dechlorination (sodium bisulfite) is added to the chlorine contact basin effluent. Disinfected effluent is discharging (by gravity during low tides and by pumping during high tides) through Outfall 001 to the Guemes Channel.

You can find basic information describing wastewater treatment processes included in a booklet at the Water Environment Federation website at:

<http://www.wef.org/resources/for-the-public/public-information/>

Solid wastes/Residual solids

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the primary and secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Sludge removed from the primary and secondary clarifiers is thickened by gravity thickeners and incinerated in a fluidized bed incinerator. The City of Anacortes disposes of the solid wastes and ash at a local transfer station then transported to a landfill. Appendix D shows a diagram of the solids process.

Discharge outfall

The treated and disinfected effluent flows into Guemes Channel through Outfall 001, on the west side of the Port of Anacortes Pier 2. The outfall diffuser is a pile-supported, 24-inch diameter concrete cylinder pipe, attached perpendicular to the end of the outfall pipe. The diffuser section is parallel to Guemes Channel, situated on the seabed grade at a depth of approximately 31 feet below mean lower low water (MLLW). The diffuser section is 52 feet long, with seven 6-inch ports spaced approximately 8.7 feet apart. All ports discharge laterally into the channel.

On September 26, 2016, the City conducted an outfall inspection and discovered that the pipe was leaking. In October 2017, the City completed outfall pipe repairs.

Staff

In accordance with WAC 173-230-140, this is a Class III plant. A Class III operator must be in responsible charge of the plant, and the operator in charge of each shift must be certified at a level of Class II or higher. Staff include full-time certified operators (Group IV, Group III, Group II and Group I). This facility is attended daily. On holidays and off-hours there is always someone on call.

B. Description of the receiving water

The Anacortes WWTP discharges to Guemes Channel, part of Puget Sound. The receiving water is designated as an excellent water body by the State of Washington. Other nearby point source outfalls include Dakota Creek Industries (industrial stormwater and drydock flood water) and Tesoro Refining & Marketing Company. Significant nearby non-point sources of pollutants include municipal, industrial and construction stormwater, agricultural activities and forestry.

The closest data available is from Ecology's EAP marine water monitoring location No. FID001 – Fidalgo Bay east of Anacortes (<https://fortress.wa.gov/ecy/eap/marinewq/mwdataset.asp>). Ecology monitored this station between 1993 to 1997 and lately in 2014. The ambient background data (2014 only) used for this permit is listed below.

Table 2. Ambient Background Data

Parameter	Value Used
Temperature (highest annual 1-DADMax)	13.1 °C
Temperature (90 th percentile)	13.0 °C
pH (Minimum / Maximum / 90 th percentile)	7.3 / 7.9 / 7.9 standard units
Dissolved Oxygen (10 th percentile)	6.9 mg/L
Salinity (90 th percentile)	30.2 psu

C. Wastewater influent characterization

The City of Anacortes reported the concentration of influent pollutants in discharge monitoring reports. The tabulated data represents the quality of the wastewater influent from July 2012 to June 2017. The influent wastewater is characterized as follows:

Table 3. Wastewater Influent Characterization

Parameter	Units	Monthly Average Value	Max. Day Value
BOD ₅	mg/L	218	352
BOD ₅	lbs/day	3,317	4,972
CBOD ₅	mg/L	158	356
TSS	mg/L	274	695
TSS	lbs/day	4,183	8,952

D. Wastewater effluent characterization

The City of Anacortes 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 July 2012 to June 2017. The wastewater effluent is characterized as follows:

Table 4. Wastewater Effluent Characterization

Parameter	Units	Monthly Average Value	Weekly Avg. Value
CBOD ₅	mg/L	5.4	20
CBOD ₅	lbs/day	96	340
TSS	mg/L	8.6	33.8
TSS	lbs/day	148	607

Parameter	Units	Monthly Average Value	Maximum Day Value
Total Residual Chlorine	µg/L	61	370

Parameter	Units	Maximum Monthly Geometric Mean	Maximum Weekly Geometric Mean
Fecal Coliforms	#/100 mL	95	200

Parameter	Units	Minimum Value	Maximum Value
pH	Standard units	6.6	8.6

Parameter	Units	Monthly Average Value	Maximum Day Value
Flow	MGD	2.1	9.1

Parameter	Units	Average Value	Maximum Daily Value
Temperature (Winter)	°C	13.4	14.5
Temperature (Summer)		23.1	24.5

Parameter	Units	Average Value	Maximum Daily Value
Ammonia	mg/L as N	23.2	83.6
Nitrate+Nitrite Nitrogen	mg/L as N	1.6	16.2
TKN	mg/L as N	27.3	75.1
Total Phosphorus	mg/L as P	3.3	7
Soluble Reactive Phosphorus	mg/L as P	2.5	4.4

Parameter	Units	Average Value	Maximum Daily Value
Dissolved Oxygen	mg/L	4.4	9.0
Oil and Grease	mg/L	2.6	2.9
TDS	mg/L	312	336
Total Hardness	mg/L as CaCO ₃	92.4	101

Priority pollutant testing summary

During the previous permit term, the City conducted its effluent priority pollutant testing and the summary is shown in **Appendix D**.

Whole effluent toxicity testing summary

The City tested its effluent for acute and chronic toxicity during the previous permit term. The testing summary is shown in **Appendix D**. Three of the ten acute toxicity tests available to date showed less than 65% survival in 100% effluent. The probable cause of this toxicity was ammonia. Due to this acute toxicity, the proposed permit includes a limit and required

monitoring for acute toxicity. The chronic toxicity test results showed no statistically significant difference between the control and the acute critical effluent concentration (ACEC), and thus no chronic toxicity. See Section III.J of this fact sheet for more information about toxicity testing.

E. Summary of compliance with previous permit issued June 21, 2012

The previous permit placed effluent limits on CBOD₅, TSS, pH, fecal coliform, and total residual chlorine.

The permittee has mostly complied with the effluent limits and permit conditions throughout the duration of the permit on July 21, 2012. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), DMRs, and on inspections.

The following table summarizes the violations that occurred during the permit term.

Table 5. Permit Violations

Date	Submittal Name	Due Date	Received Date	Violation
4/1/13	Wet Weather Operation Report	April 15, 2013	April 19, 2013	Late Submittal
4/1/14	Wet Weather Operation Report	April 15, 2014	May 7, 2014	Late Submittal

The permittee meets compliance with report submittal requirements over the permit term.

Table 6. Permit Submittals

Submittal Name	Due Date	Received Date
2012 CSO Annual Report	April 15, 2013	April 11, 2013
2013 CSO Annual Report	April 15, 2014	April 15, 2014
2014 CSO Annual Report	April 15, 2015	March 25, 2015
2015 CSO Annual Report	April 15, 2016	April 15, 2016
2016 CSO Annual Report	April 15, 2017	April 11, 2017
CSO Post Construction Monitoring Data Report	June 30, 2015	June 30, 2015
CSO Post Construction Monitoring Plan	December 30, 2016	December 30, 2016
Acute Toxicity Testing	October 30, 2012 April 30, 2013 October 30, 2013 April 30, 2014 October 30, 2014 April 30, 2015 October 30, 2015 April 30, 2016 October 30, 2016 April 30, 2017	September 11, 2012 March 4, 2013 October 11, 2013 April 7, 2014 August 25, 2014 March 24, 2015 October 29, 2015 April 19, 2016 September 15, 2016 April 25, 2017
Chronic Toxicity Testing	June 30, 2016 December 30, 2016	June 10, 2016 November 4, 2016
Industrial User Survey	December 30, 2016	December 30, 2016
Outfall Evaluation	December 30, 2016	December 28, 2016
Application for Permit Renewal	December 30, 2016	December 27, 2016

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, Anacortes Wastewater Treatment Plant Capacity Evaluation dated April 1998, prepared by HDR Engineering, Inc. The table below includes design criteria from the referenced report.

Table 7. Design criteria for Anacortes WWTP

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	4.5 MGD
BOD ₅ Loading for Maximum Month	6,400 lbs/day
TSS Loading for Maximum Month	6,400 lbs/day
Peak Flow to Secondary Treatment	7.8 MGD
Peak Flow to Primary Treatment	9.6 MGD

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 federal CSO Control Policy (59 FR 18688) also requires entities with Combined Sewer Overflows to implement “Nine Minimum Controls” as technology-based performance standards for CSO discharges. The Nine Minimum Controls are discussed in more detail in Section V of this fact sheet, which includes more details on CSO requirements.

The table below identifies technology-based limits for pH, fecal coliform, CBOD₅, and TSS, as listed in chapter 173-221 WAC. The technology limits apply only to discharges of treated effluent from the wastewater treatment plant. Section III.F of this fact sheet describes the potential for water quality-based limits.

Table 8. Technology-based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
CBOD ₅ (concentration)	25 mg/L	40 mg/L
CBOD ₅ (concentration)	In addition, the CBOD 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.	

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

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

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 CBOD₅ and Total Suspended Solids as follows:

$$\text{Mass Limit} = \text{CL} \times \text{DF} \times \text{CF}$$

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 9. Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
CBOD ₅ Monthly Average	25	938
CBOD ₅ Weekly Average	40	1,501
TSS Monthly Average	30	960
TSS Weekly Average	45	1,440

C. Surface water quality-based effluent limits

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

Numerical criteria for the protection of aquatic life and recreation

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

Numerical criteria for the protection of human health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

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

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description -- The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

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

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in

the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

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

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

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

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

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.

Combined sewer overflows

Chapter 173-245 WAC requires that "All CSO sites shall achieve and at least maintain the greatest reasonable reduction, and neither cause violations of applicable water quality standards, nor restrictions to the characteristic uses of the receiving water, nor accumulation of deposits which: (a) Exceed sediment criteria or standards; or (b) have an adverse biological effect." "The greatest reasonable reduction" means control of each CSO outfall such that an average of no more than one untreated discharge may occur per year. Ecology includes specific conditions in the proposed permit to ensure that City of Anacortes continues to meet water quality goals for each CSO outfall in its system. Section V of this fact sheet contains more detailed information on these CSO requirements.

Mixing zones

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

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

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(ii-iii) or WAC 173-201A-400(7)(b)(ii-iii)].

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

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 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 liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

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

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

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

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

Ecology has determined that the treatment provided at Anacortes 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 uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: <https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html>.

Table 10. Critical Conditions Used to Model the Discharge

Critical Condition	Value
Water depth at MLLW	-31 feet (9.4 m)
Density profile	Maximum stratification 1.02081-1.02296 g/cm ³ Minimum stratification 1.02134-1.02163 g/cm ³
10 th percentile current speeds for acute mixing zone	0.167 ft/s (0.051 m/sec)
50 th percentile current speeds for chronic and human health mixing zones	0.173 m/sec
Maximum daily flow for acute mixing zone	9.1 MGD
Maximum average monthly effluent flow for chronic and human health non-carcinogen	4.5 MGD
Annual average flow for human health carcinogen	2.0 MGD

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from the *Outfall Dilution Study Report* (January, 1996) and *Addendum to the Outfall Dilution Study Report* (November 7, 1996), prepared by CH2M Hill.

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.

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. Because tidal currents change direction, the plume orientation within the mixing zone changes. 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.**

Ecology determined the acute criteria will be met at 10% of the distance of the chronic mixing zone.

- **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 using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.
 - a. Extraordinary quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
 - b. Excellent quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

- c. Good quality salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.
- d. Fair quality salmonid and other fish migration.

The *Aquatic Life Uses* and the associated criteria for this receiving water are identified below.

Table 11. Marine Aquatic Life Uses and Associated Criteria

Excellent Quality	
Temperature Criteria – Highest 1D MAX	16°C (60.8°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	6.0 mg/L
Turbidity Criteria	<ul style="list-style-type: none"> • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- To protect shellfish harvesting, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have 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 43 colonies/100 mL.
- The *recreational use* is primary contact recreation.

The recreational uses for this receiving water are identified below.

Table 12. Recreational Uses

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 14 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 43 colonies /100 mL.

- The *miscellaneous marine water uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the outfall.

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

Ecology must consider the narrative criteria described in WAC 173-201A-160 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.

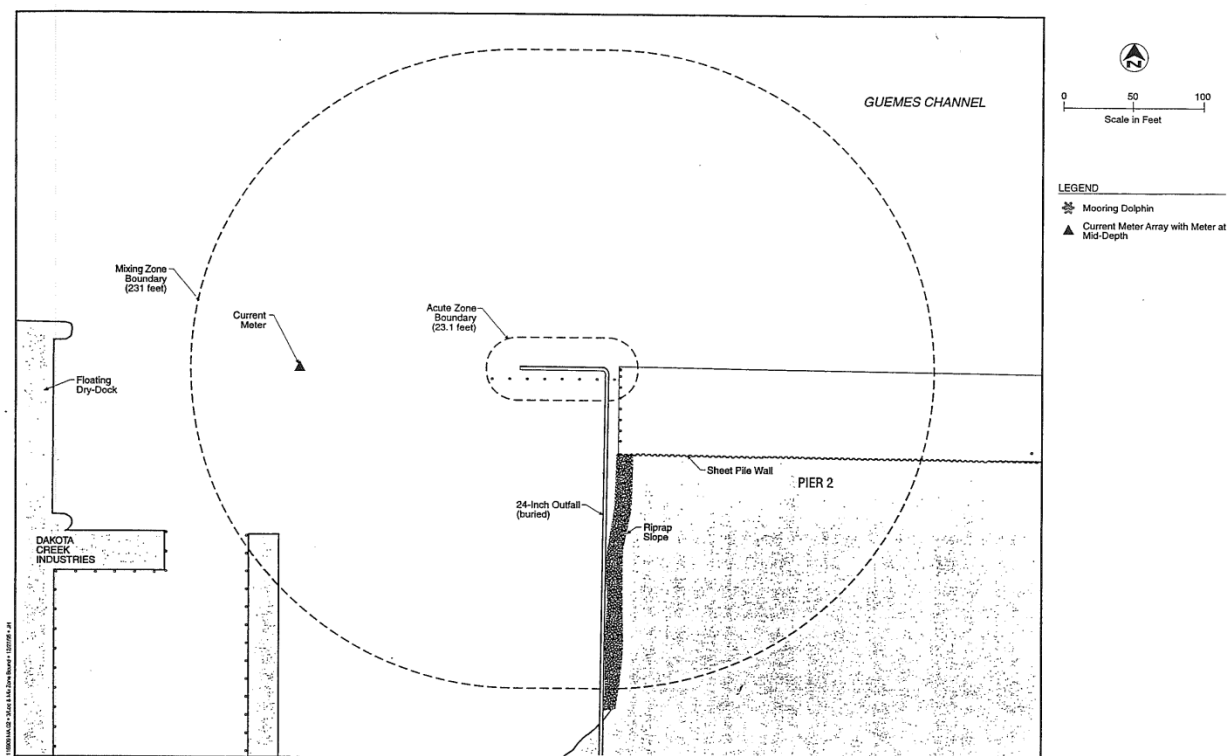
G. Evaluation of surface water quality-based effluent limits for numeric criteria

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD₅) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

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

The diffuser at Outfall 001 is 52 feet long with a diameter of 24 inches. The diffuser has a total of seven 6-inch diameter ports. The distance between ports is 8.7 feet. The diffuser depth is 31 feet below mean lower low water (MLLW). Ecology obtained this information from the *Outfall Dilution Study Report* (January, 1996) and *Addendum to the Outfall Dilution Study Report* (November 7, 1996), prepared by CH2M Hill. A mixing zone diagram (CH2M Hill, 1996) is shown below.

Figure 2. Outfall Mixing Zone Depiction



Chronic Mixing Zone -- WAC 173-201A-400(7)(b) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports and may not occupy more than 25% of the width of the water body as measured during MLLW.

The horizontal distance of the chronic mixing zone is 231 feet. The mixing zone extends from the bottom to the top of the water column.

Acute Mixing Zone -- WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The acute mixing zone for Outfall 001 extends 23.1 feet in any direction from any discharge port.

The dilution study used fluorescent dye and field measurements along with the model UDHKDEN to estimate dilution factors for a range of effluent flows. Ecology selected the dilution factors that occur within these zones at the critical conditions specified in Ecology's Permit Writers Manual. The dilution factors are listed below.

Table 13. Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	31	72
Human Health, Carcinogen		305
Human Health, Non-carcinogen		72

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

Dissolved Oxygen -- BOD₅ and Ammonia Effects -- Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD₅) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

With technology-based limits, this discharge results in a small amount of BOD₅ relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

pH -- Compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water.

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 72.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

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, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, silver, and zinc. 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, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient station in section II.B (Description of the receiving water) and Ecology spreadsheet tools.

No valid ambient background data were available for other pollutants listed above. Ecology used zero for background.

Ecology determined that ammonia, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, silver, and zinc pose 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.

Ecology derived effluent limits for the toxic pollutant chlorine, because at the technology-based limit of 0.75 mg/L it has a reasonable potential to cause a violation of the water quality standards. Ecology calculated effluent limits using methods from EPA, 1991 as shown in **Appendix D**. The effluent limits for total chlorine residual are as follows:

- Average Monthly Limit (AML) – 154 µg/L
- Maximum Daily Limit – 403 µg/L

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), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

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

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

- Protections for temperature acute effects

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

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

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

Reasonable Potential Analysis

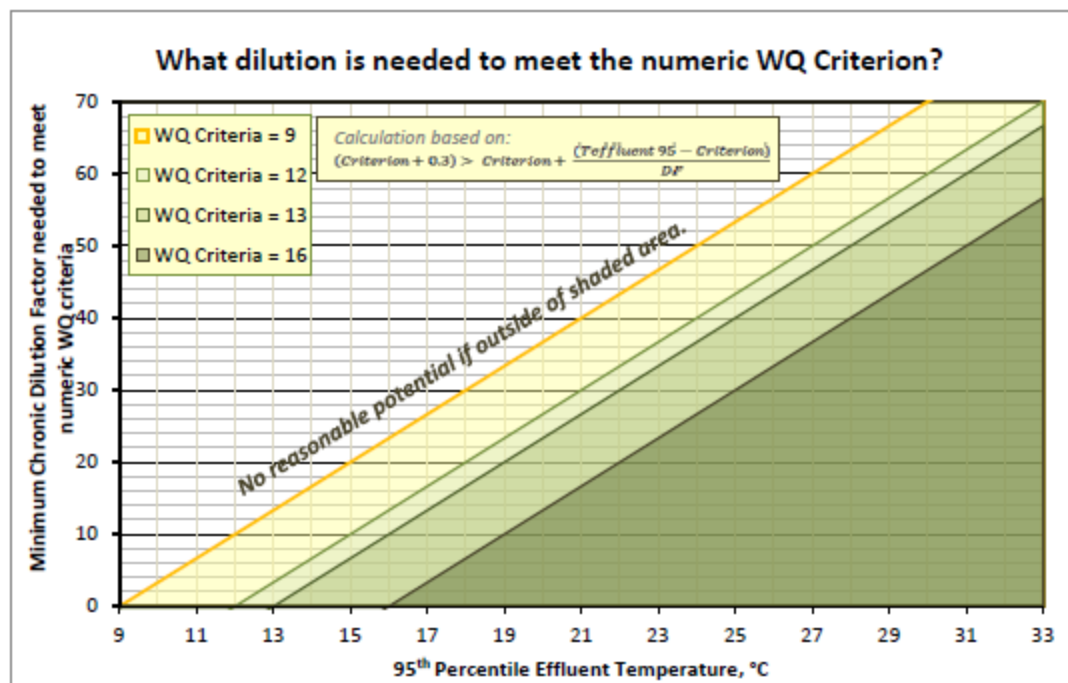
Annual summer maximum and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum and the incremental warming criteria at the edge of the chronic mixing zone during critical condition. No reasonable potential exists to exceed the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

$(\text{Criterion} + 0.3) > [\text{Criterion} + (\text{Teffluent95} - \text{Criterion})/\text{DF}]$.

$$(16 + 0.3) > (16 + (24.6 - 16)/72) \Rightarrow 16.3 > 16.1$$

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



Therefore, the proposed permit does not include a temperature limit. The permit requires additional monitoring of effluent temperatures. 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 that Ecology must consider when writing NPDES permits. In accordance with the requirements of CWA section 303(c)(2)(B), EPA has finalized 144 new and revised Washington-specific human health criteria for priority toxic pollutants, to apply to waters under Washington's jurisdiction, and has approved 45 new human health criteria submitted by Washington. For arsenic, dioxin, and thallium, the existing criteria from the National Toxics Rule (40 CFR 131.36) remain in effect.

Ecology determined the effluent contains chemicals of concern for human health, based on data or information reported in priority pollutant testing that indicate regulated chemicals occur in the discharge. A list of the pollutants of concern for human health includes acrolein, arsenic, cyanide, 1,4-dichlorobenzene, mercury, nickel, selenium, zinc, bis(2-ethylhexyl) phthalate, chloroform, tetrachloroethylene, and toluene.

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 for acrolein, arsenic, cyanide, 1,4-dichlorobenzene, mercury, nickel, selenium,

zinc, chloroform, tetrachloroethylene, and toluene. Effluent limits are not needed for the pollutants listed above. Ecology will reevaluate this discharge for impacts to human health at the next permit reissuance.

The new criteria for bis(2-ethylhexyl) phthalate (DEHP) significantly changed from the previously adopted standard. DEHP, a known carcinogen, is frequently detected in wastewater effluent. Phthalates are plasticizers that are commonly used in hundreds of common consumer and building products. The ubiquitous chemical has also been identified as a common sampling and laboratory contaminant. If phthalates are detected in a facility's effluent, permittees are required to re-sample their effluent using clean sampling techniques to confirm that the detection is not a result of either sampling or laboratory contamination. The proposed permit includes additional sampling requirements for this pollutant.

The permittee should work with an accredited laboratory on specific clean sampling requirements. At a minimum, samples should be collected in clean glass bottles with polytetrafluoroethylene (PFTE or Teflon™) lids. Standard practice may also include an equipment rinse with a non-polar solvent to remove possible organics. Accidental sample contamination from safety equipment (e.g. gloves) is also possible. All samples must be kept from directly contacting plastics of any kind.

To help assess the sample contamination potential, permittees may opt to collect a field blank for comparison with the effluent sample so that field collection contamination may be quantified. It is the laboratory's responsibility to analyze method blanks and laboratory control samples when analyzing batches consisting of 20 or less discrete samples. These laboratory QA results must be submitted with the laboratory report.

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.
<http://www.ecy.wa.gov/programs/tcp/smu/sediment.html>

The proposed permit requires a sediment sampling and analysis plan and a subsequent sediment data report.

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.

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.

- *Chronic toxicity tests measure various sublethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC50, EC50, IC25, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (<https://fortress.wa.gov/ecy/publications/SummaryPages/9580.html>), which is referenced in the permit. Ecology recommends that the City of Anacortes send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during the previous permit term showed the facility's effluent has a reasonable potential to cause acute toxicity in the receiving water. The proposed permit will include an acute toxicity limit. **The effluent limit for acute toxicity is: No acute toxicity detected in a test sample representing the acute critical effluent concentration (ACEC).** The ACEC is the concentration of effluent at the boundary of the acute mixing zone during critical conditions. The ACEC equals 2.6% effluent.

Compliance with an acute toxicity limit is measured by an acute toxicity test comparing test organism survival in the ACEC (using a sample of effluent diluted to equal the ACEC) to survival in nontoxic control water. The City of Anacortes is in compliance with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC and the control.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not include a chronic WET limit. The City of Anacortes must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. The City of Anacortes may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased and include an effluent characterization for chronic toxicity in the new permit.

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 City of Anacortes does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

L. Comparison of effluent limits with the previous permit issued on June 21, 2012

Table 14. Comparison of Previous and Proposed Effluent Limits

Parameter	Basis of Limit	Previous Effluent Limits: Outfall No. 001		Proposed Effluent Limits: Outfall No. 001	
		Average Monthly	Average Weekly	Average Monthly	Average Weekly
BOD5	Technology	25 mg/L 938 lbs/day 85% removal	40 mg/L 1,501 lbs/day 85% removal	No change	No change
TSS	Technology	30 mg/L 1,126 lbs/day 85% removal	45 mg/L 1,689 lbs/day 85% removal	No change	No change

Parameter	Basis of Limit	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	Technology	200/100 mL	400/100 mL	No change	No change

Parameter		Limit	Limit
pH	Technology	6.0-9.0	No change

Parameter	Basis of Limit	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Total Residual Chlorine	Water Quality	189 µL	494 µL	154 µL	403 µL

Parameter	Basis of Limit	Previous Effluent Limits: Outfall No. 001	Proposed Effluent Limits: Outfall No. 001
Acute Toxicity	Aquatic Life	The effluent limit for acute toxicity is no acute toxicity detected in a test concentration representing the acute critical effluent concentration (ACEC).	No change

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 S.2. 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 an activated sludge treatment plant with average design flow of 2.0-5.0 MGD.

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 the parameters listed below.

Table 15. Accredited Parameters

General Chemistry				
Parameter name	Analyte code	Method description	NELAC code	Matrix *
Dissolved Oxygen	1880	Hach 10360 Rev 1.1	60027807	N
Total Suspended Solids	1960	SM 2540 D-97	20051201	N
Total Residual Chlorine	1940	SM 4500-Cl D-00	20081612	N
Total Residual Chlorine	1940	SM 4500-Cl G-00	20081612	N
pH	1900	SM 4500-H+ B-00	20105219	N
Ammonia	1515	SM 4500-NH3 D-97	20109404	N
Dissolved Oxygen	1880	SM 4500-O C-01	20120825	N
BOD, CBOD	1532	SM 5210 B-01	20135006	N
Microbiology				
Parameter name	Analyte code	Method description	NELAC code	Matrix *
Fecal Coliform-Count	2530	SM 9222 D (m-FC)-97	20210008	N
* Matrix key: N = non-potable water				

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 City of Anacortes to:

- Take the actions detailed in proposed permit Special Condition S.4.

- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S.4 restricts the amount of flow.

If a municipality intends to apply for Ecology-administered funding for the design or construction of a facility project, the plan must meet the standard of a “Facility Plan”, as defined in WAC 173-98-030. A complete “Facility Plan” includes all elements of an “Engineering Report” along with State Environmental Review Process (SERP) documentation to demonstrate compliance with 40 CFR 35.3140 and 40 CFR 35.3145, and a cost effectiveness analysis as required by WAC 173-98-730. The municipality should contact Ecology’s regional office as early as practical before planning a project that may include Ecology-administered funding.

C. Operation and maintenance

The proposed permit contains Special Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that the City of Anacortes takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment. The proposed permit requires submission of an updated facility operation and maintenance manual.

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 Anacortes 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.

Requirements for performing an industrial user survey

This POTW has the potential to serve significant industrial or commercial users and must conduct an industrial user (IU) survey. The purpose of the IU Survey is to identify all facilities that may be subject to pretreatment standards or requirements so that Ecology can take appropriate measures to control these discharges. The POTW should identify each such user, and require them to apply for a permit before allowing their discharge to the POTW to commence. For SIUs, the POTW must require they actually are issued a permit prior to accepting their discharge. The steps the POTW must document in their IU Survey submittal include:

1. The POTW must develop a master list of businesses that may be subject to pretreatment standards and requirements and show their disposition. This list must be based on several sources of information including business licenses, and water and sewer billing records.
2. The POTW must canvas all the potential sources, having them either complete a survey form or ruling them out by confirming they only generate domestic wastewater.
3. The POTW must develop a list of the SIUs and potential SIUs in all areas served by the POTW. The list must contain sufficient information on each to allow Ecology to decide which discharges merit further controls such as a state waste discharge permit.

Ecology describes the information needed in IU Survey submittals to allow Ecology to make permitting decision in the manual “Performing an Industrial User Survey”. Properly completing an Industrial User Survey helps Ecology control discharges that may otherwise harm the POTW including its collection system, processes, and receiving waters. Where surveys are incomplete, Ecology may take such enforcement as appropriate and/or require the POTW to develop a fully delegated pretreatment program.

The proposed permit requires City of Anacortes to conduct an industrial user survey to determine the extent of compliance of all industrial users of the sanitary sewer and wastewater treatment facility with federal pretreatment regulations [40 CFR Part 403 and Sections 307(b) and 308 of the Clean Water Act], with state regulations (chapter 90.48 RCW and chapter 173-216 WAC), and with local ordinances.

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. Combined sewer overflows

Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same piping system. Most of the time, combined sewer systems transport all wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the combined sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. Chapter 173-245 WAC and EPA’s CSO control policy (59 FR 18688) identify the required measures for control of overflows from combined sewer systems.

CSO Reduction Plan/Long-Term Control Plan and CSO Reduction Plan Amendments

Ecology requires municipalities to develop combined sewer overflow (CSO) reduction plans per chapter 173-245 WAC requirements. These plans are substantially equivalent to the long-term control plan (LTCP) as defined by EPA in its CSO control policy. Chapter 173-245 WAC requires that “All CSO sites shall achieve and at least maintain the greatest reasonable reduction, and neither cause violations of applicable water quality standards, nor restrictions to the characteristic uses of the receiving water, nor accumulation of deposits which: (a) Exceed sediment criteria or standards; or (b) have an adverse biological effect.” “The greatest reasonable reduction” means control of each CSO outfall such that an average of no more than one untreated discharge may occur per year.

Under EPA’s CSO Control Policy’s presumption approach, CSO controls are presumed to attain WQS if certain performance criteria are met. Ecology presumes that a program that meets the criteria specified in WAC 173-245 and EPA’s CSO control policy provides an adequate level of control to meet the water quality-based requirements of the Clean Water Act. This presumption must be verified via a post-construction monitoring program by characterization, monitoring, and modeling of the system, including consideration of sensitive areas.

The City of Anacortes adopted a CSO reduction plan in 1990 and amended the plan in 2010. Because all CSOs are controlled to the state standard of one untreated discharge per year per CSO, the City of Anacortes is not required to submit an amendment to the CSO reduction plan as described in WAC 173-245-090(2) for this permit term. If there are substantial changes or updates to the plan the Permittee must submit the updated plan to Ecology for review and approval.

Nine Minimum Controls

Municipalities with combined sewer overflow outfalls must implement nine minimum controls as technology-based standards for CSO discharges. The nine minimum controls are largely programmatic policies and practices designed to minimize the impacts untreated CSOs have on human health and the environment. It is not possible with current knowledge and technology to calculate numeric water quality-based effluent limits for CSOs. Ecology may include numeric water quality-based effluent limits in the future permits only after the long-term control plan is in place and after collection of sufficient water quality data.

The nine minimum controls include:

1. Use proper operations and maintenance practices within the combined collection system to reduce the magnitude, frequency and duration of CSOs.
2. Implement procedures that maximize storage capacity of the combined collection system.
3. Minimize pollution from non-domestic wastewater sources through close management of a pretreatment program.
4. Maximize treatable flow to the wastewater treatment plant during wet weather.
5. Prevent CSO discharges during dry weather and properly report any dry weather CSO discharges immediately to Ecology.
6. Implement procedures to control solid and floatable materials in CSOs.
7. Implement and maintain a pollution prevention program designed to keep pollutants from entering the combined sewer system.

8. Establish a process to notify the public when and where CSOs occur.
9. Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls, including event-based monitoring of all CSO flow quantity, frequency and duration.

CSO Monitoring

The proposed permit requires the City of Anacortes to monitor the volume, duration and precipitation associated with each CSO discharge event at each identified outfall.

Annual CSO Report

The City of Anacortes must submit annual reports according to the requirements of WAC 173-245-090(1). This report: (a) details the past year's frequency and volume of combined sewage discharge from each CSO site, (b) explains the previous year's CSO reduction accomplishments, and (c) lists the projects planned for the next year. The report must indicate whether a CSO site has increased over the baseline annual condition. If an increase has occurred, the Permittee must propose a project and/or schedule to reduce that site below its baseline conditions. The report must document implementation of the nine minimum controls, and wet weather operation (flow blending) at the treatment plant.

The City of Anacortes must also assess in its annual reports whether identified outfalls meet the state standard of one untreated discharge per year per CSO. Assessment may be based on a long-term average which is currently defined as 5 years.

Post-Construction Monitoring Program

The federal CSO control policy (59 FR 18688) requires post-construction monitoring to verify implemented CSO control strategies comply with water quality standards. Post-construction monitoring applies to any CSO outfall that is controlled to meet the "greatest reasonable reduction" of combined sewer overflows, as defined in chapter 173-245 WAC. Implementation requires development of a monitoring plan and completion of a data report that documents compliance. The City of Anacortes submitted a post-construction monitoring plan to Ecology in 2015. The proposed permit requires the City to implement the monitoring plan and to report monitoring data in the annual CSO report.

CSO Events Summary

Ecology originally approved the City of Anacortes's CSO reduction plan in 1990. In 1990, the City of Anacortes had three combined sewer overflow outfalls. Since 1990, the City has controlled all three CSO outfalls. Specifically, the City has permanently decommissioned CSO outfall 003 (M Avenue), which has had no discharges since 1997. The CSO outfall 002 (B Avenue) had no discharge from 1998-2016. The CSO outfall 004 (Q Avenue) had three discharge events during 2012-2016, or approximately 0.6/year. The following table summarizes the CSO events from 1998 to 2016.

Table 16. CSO frequency

Year	Outfall 002 B Avenue CSO Events	Outfall 004 Q Avenue CSO Events	Volume Discharged (gallons)
2016	0	1	76,471
2015	0	2	206,600
2014	0	0	
2013	0	0	
2012	0	0	
2011	0	0	
2010	0	1	128,887
2009	0	1	96,704
2008	0	0	
2007	0	2	38,212
2006	0	0	
2005	0	0	
2004	0	0	
2003	0	1	648
2002	0	0	
2001	0	0	
2000	0	1	Not available
1999	0	0	
1998	0	0	

G. Wet weather operation

The Anacortes WWTP has a larger primary treatment capacity than secondary treatment capacity. The design flow through the influent pump station, headworks, primary clarifiers, chlorine contact basin, and outfall is 9.6 MGD. Design peak flow for secondary treatment is 7.8 MGD. The proposed permit authorizes bypass of the secondary treatment portion of the Anacortes WWTP only when the instantaneous flow rate to the WWTP exceeds 7.8 MGD as a result of precipitation events. The bypass flows receive primary treatment, and are mixed with the secondary treated effluent before disinfection and final discharge. The mixed final effluent must meet the permit limits at all times. The City of Anacortes must report CSO-related bypass events in the monthly discharge monitoring reports and in the annual CSO report.

One effective strategy to abate pollution resulting from CSOs is to maximize the delivery of flows during wet weather to the treatment plant. This practice is consistent with EPA's Nine Minimum Control #4, eliminates or minimizes overflows, and it provides at least primary treatment to combined sewer flows. Under EPA regulations, the intentional diversion of waste streams from any portion of a treatment facility, including secondary treatment, is a bypass. A bypass is allowed only under specific limited circumstances. EPA's *Combined Sewer Overflow Guidance for Permit Writers* states that a CSO-related bypass at a wastewater treatment plant can only occur if there is no feasible alternative. The no feasible alternative analysis requirement can be met if the record demonstrates that the secondary treatment system is properly operated and maintained, that the system has been designed to meet secondary limits for flows greater than the peak dry weather flow plus an appropriate wet weather flow, and that it is either technically or financially infeasible to provide secondary treatment for greater amounts of flow.

- Inspections and monitoring records demonstrate that the secondary treatment system is properly operated and maintained.
- The City of Anacortes completed planning, design, and construction of secondary treatment and CSO correction in an integrated fashion between 1987 and 1992. Sewer separation projects reduced inflow substantially prior to construction of the secondary treatment facility. The system is designed for a maximum average monthly flow of 4.5 MGD. Peak flows up to 7.8 MGD are treated in the secondary aeration basins and clarifiers; the primary treatment system and outfall can handle peak flows up to 9.6 MGD. Since the WWTP has been designed to treat flows to meet secondary limits and well in excess of the future maximum monthly average flow, the WWTP meets the criteria for treating the peak dry weather flow plus an appropriate amount of wet weather flow. Flows higher than 7.8 MGD to the secondary treatment units would cause substantial physical damage by washing out the biological system. The quality of the blended effluent meets all permit limits based on secondary treatment technology.
- The administrative record includes extensive documentation of the engineering decisions, cost-effectiveness analyses, and environmental impacts review done during the design phase, as these projects were financially supported by the state and federal agencies.
- The City of Anacortes is continuing to implement projects to improve the capacity of the collection system and to reduce inflow and CSOs, as documented in the City's 2016-2021 Capital Facilities Plan. At this time, it is not technically or financially feasible to provide additional secondary treatment for peak wet weather flows at the treatment plant.

H. Outfall evaluation

The proposed permit requires the City of Anacortes to conduct one outfall inspection for the Anacortes WWTP and submit report detailing the findings of those inspection (Special Condition S.11). 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.

On September 26, 2016, the City conducted an outfall inspection and discovered that the pipe was leaking. In October 2017, the City completed outfall pipe repairs. The outfall inspection is to evaluate the effectiveness of the repairs and the performance of the outfall over time.

I. 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 5 years.

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.
1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.
1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.
1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.
1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

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

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

Washington State Department of Ecology.

- January 2015. *Permit Writer's Manual*. Publication Number 92-109
(<https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html>)
- September 2011. *Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation*. Publication Number 11-10-073
(<https://fortress.wa.gov/ecy/publications/summarypages/1110073.html>)
- October 2010 (revised). *Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits*. Publication Number 06-10-100 (<https://fortress.wa.gov/ecy/publications/summarypages/0610100.html>)
- Laws and Regulations (<http://www.ecy.wa.gov/laws-rules/index.html>)
- Permit and Wastewater Related Information
(<http://www.ecy.wa.gov/programs/wq/permits/guidance.html>)

Water Pollution Control Federation.

1976. *Chlorination of Wastewater*.

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(E2). (Cited in EPA 1985 op.cit.)

Appendix A -- Public Involvement Information

Ecology proposes to reissue a permit to Anacortes 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 September 25, 2017, in the *Skagit Valley Herald* to inform the public and to invite comment on the proposed draft State Waste Discharge permit and fact sheet.

The notice:

- Told where copies of the draft permit and fact sheet were available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offered to provide the documents in an alternate format to accommodate special needs.
- Asked people to tell us how well the proposed permit would protect the receiving water.
- Invited people to suggest fairer conditions, limits, and requirements for the permit.
- Invited comments on Ecology's determination of compliance with antidegradation rules.
- Urged people to submit their comments, in writing, before the end of the comment period.
- Told how to request a public hearing about the proposed NPDES permit.
- Explained 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://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html>.

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 Kevin Leung.

Appendix B -- Your Right to Appeal

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

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

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

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

ADDRESS AND LOCATION INFORMATION

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

Appendix C -- Glossary

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

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

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

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

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

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

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

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

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

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

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

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

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

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

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

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

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated 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 $(1, 2, \text{ or } 5) \times 10^n$, where n is an integer (64 FR 30417).

ALSO GIVEN AS:

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

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

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

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 year(s), respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD₅ -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD₅ test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD₅ test is sufficient to remove the particulate organic fraction.

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

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a 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: <http://www.ecy.wa.gov/programs/wq/permits/guidance.html>.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (C_{mz}) is based on the following calculation:

$$C_{mz} = Ca + \frac{(Ce - Ca)}{DF}$$

where: C_e = Effluent Concentration
 C_a = Ambient Concentration
 DF = Dilution Factor

Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

$$WLA_a = (\text{acute criteria} \times DF_a) - [(\text{background conc.} \times (DF_a - 1))]$$

$$WLA_c = (\text{chronic criteria} \times DF_c) - [(\text{background conc.} \times (DF_c - 1))]$$

where: DF_a = Acute Dilution Factor

DF_c = Chronic Dilution Factor

- Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c .

$$LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$$

where: $\sigma^2 = \ln[CV^2 + 1]$
 $z = 2.326$
 $CV = \text{coefficient of variation} = \text{std. dev}/\text{mean}$

$$LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$$

where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$
 $z = 2.326$

- Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

MDL = Maximum Daily Limit

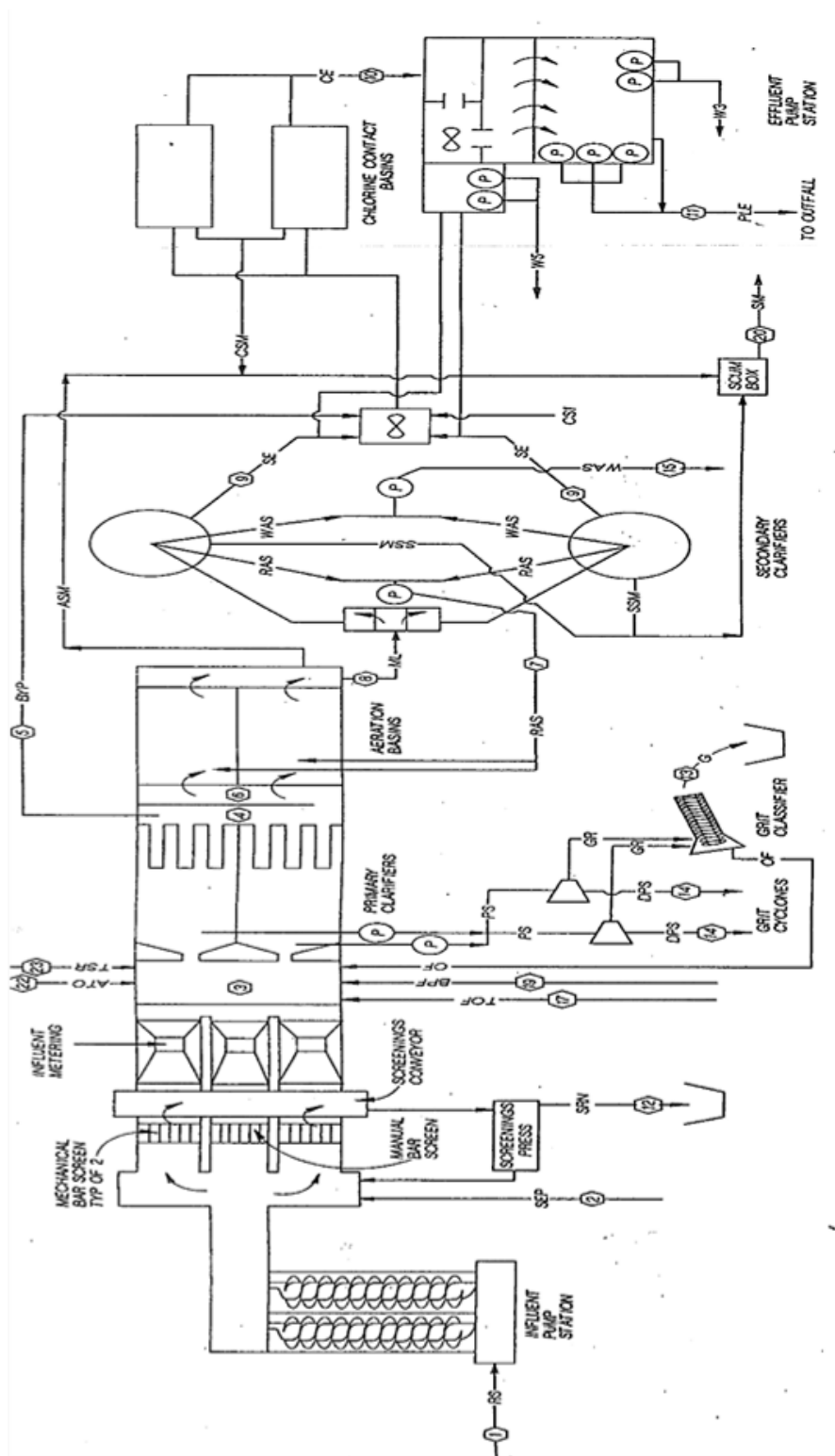
$$MDL = LTA \times e^{(z\sigma - 0.5\sigma^2)}$$

where: $\sigma^2 = \ln[CV^2 + 1]$
 $z = 2.326$ (99th percentile occurrence)
 $LTA = \text{Limiting long term average}$

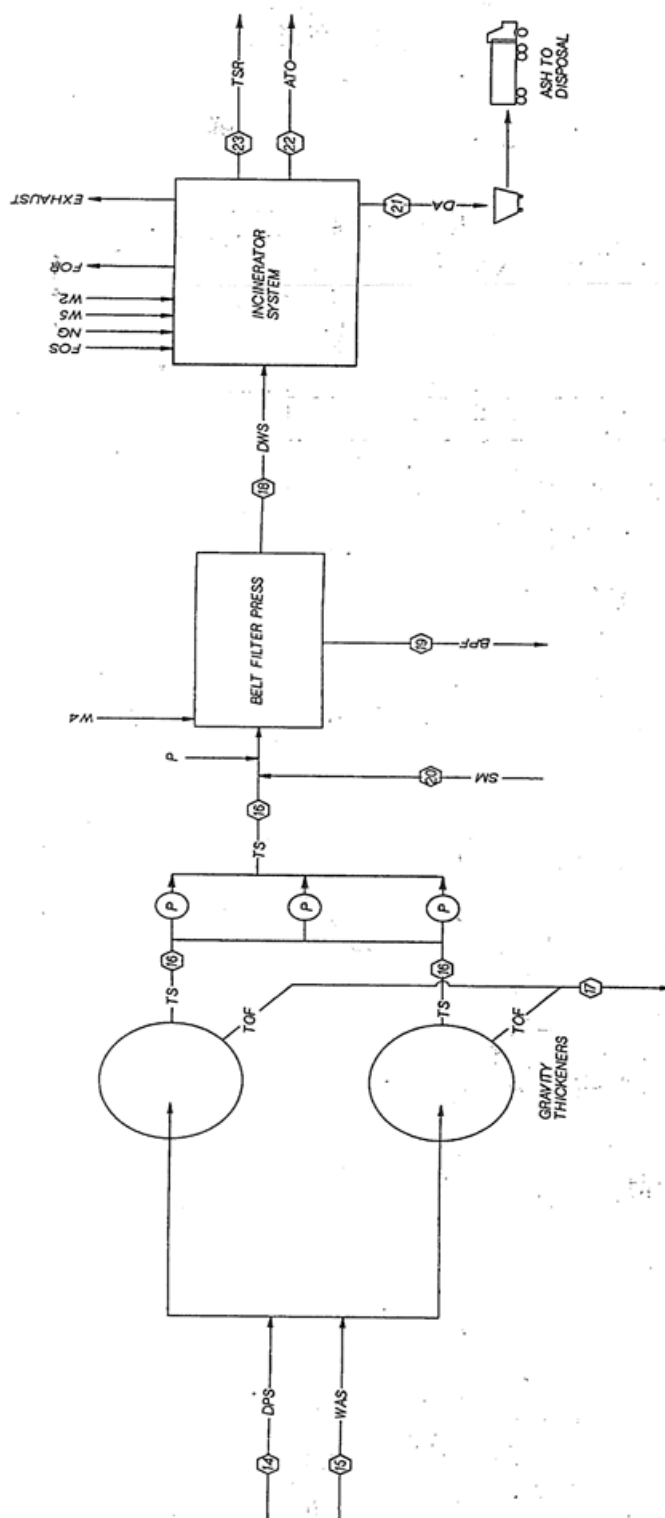
AML = Average Monthly Limit

$$AML = LTA \times e^{(z\sigma_n - 0.5\sigma_n^2)}$$

where: $\sigma^2 = \ln[(CV^2 \div n) + 1]$
 $n = \text{number of samples/month}$
 $z = 1.645$ (95th % occurrence probability)
 $LTA = \text{Limiting long term average}$



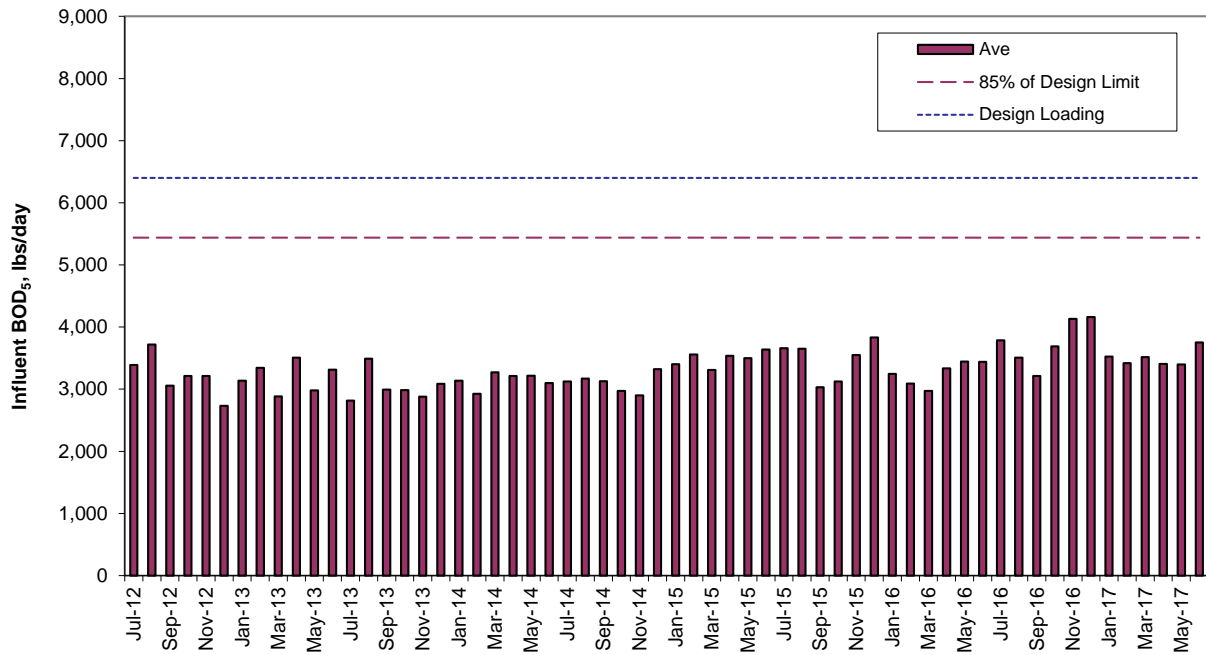
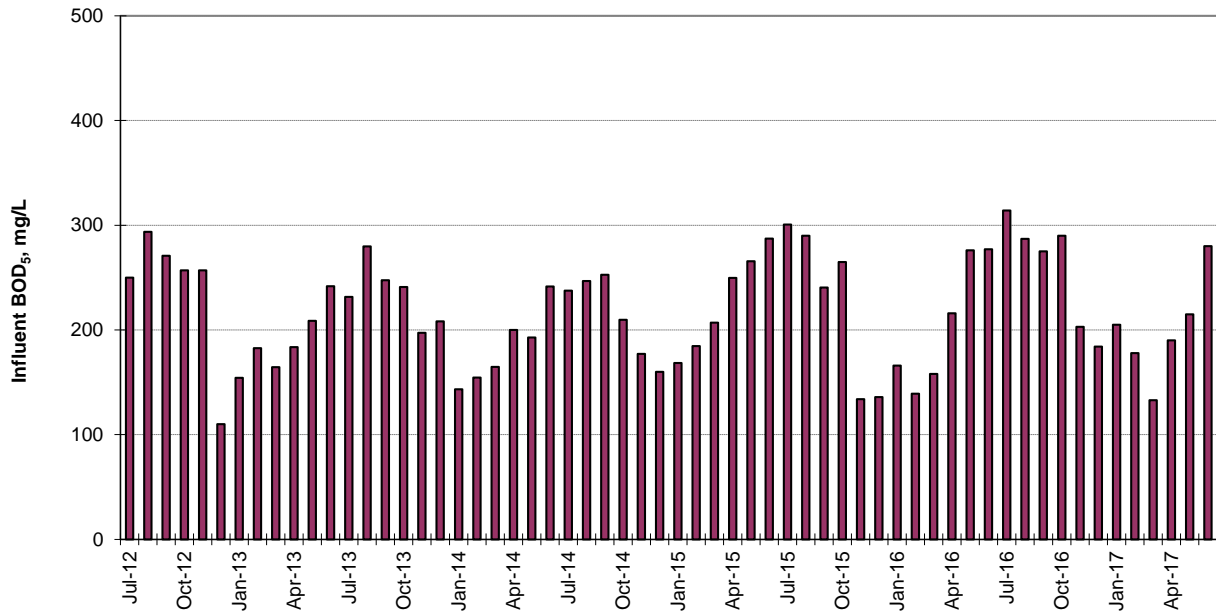
Anacortes WWTP - Solids Process Flow Diagram



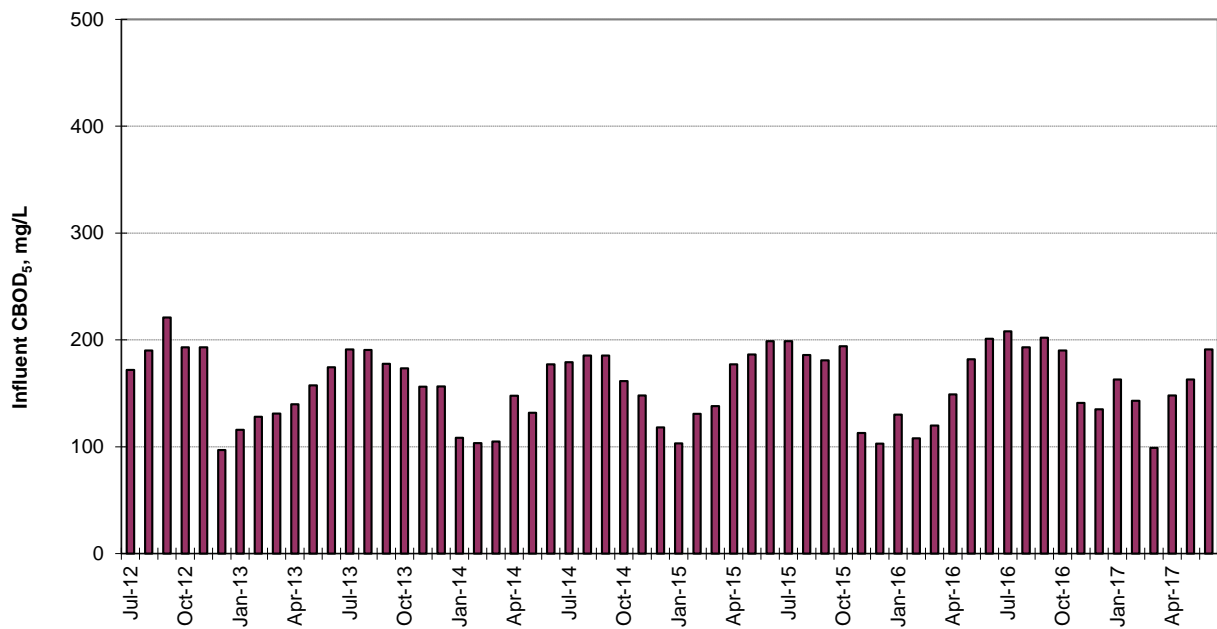
Anacortes WWTP Data (2012-2017)

Influent																SB		Effluent																								
Date	BOD ₅ , mg/L		BOD ₅ , mg/L	BOD ₅ , ppd		BOD ₅ , ppd		CBOD ₅ , mg/L		CBOD ₅ , mg/L		TSS, mg/L		TSS, mg/L		TSS, ppd	TSS, ppd	Flow, MGD	Flow, MGD	Flow, MGD	CBOD ₅ , mg/L		CBOD ₅ , mg/L		CBOD ₅ , ppd		CBOD ₅ , % Removal		TSS, mg/L		TSS, mg/L		TSS, ppd	TSS, ppd	TSS, % Removal	Fecal Coliform, #/100 mL	Fecal Coliform, #/100 mL	PH	PH	Cl, µg/L	Cl, µg/L	Temperature, °C
	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Total			Ave	Max Day	Mnthly Ave	Wkly Ave	Mnthly Ave	Wkly Ave	Ave	Mnthly Ave	Wkly Ave	Mnthly Ave	Wkly Ave	Ave	Mnthly Ave	Wkly Ave	Mnthly Ave	Wkly Ave	Ave	GEM	GM7	Min	Max	Ave	Max	Max	
Jul-12	250	302	3391	4134	172	242	332	465	4601	6486	0	1.7	4.3	3.0	4.3	42	165	98	5.3	7.2	79	116	98	5	3	6.9	7.3	37	320	22.3												
Aug-12	294	314	3717	4029	190	220	379	498	4674	6237	0	1.5	1.7	6.0	11.2	84	145	97	9.7	12.8	122	165	97	4	10	7.1	7.5	40	200	24.2												
Sep-12	271	288	3058	3218	221	356	337	467	3833	5269	0	1.4	1.6	5.0	5.8	61	69	98	7.6	8.7	91	103	98	3	12	7.2	7.4	23	150	23.7												
Oct-12	257	289	3211	3394	193	247	298	498	3909	5558	0	1.7	3.3	5.1	6.9	74	99	97	8.7	11.8	121	147	97	6	12	7.0	7.4	19	80	24.6												
Nov-12	257	289	3211	3394	193	247	298	498	3909	5558	0	1.7	3.3	5.1	6.9	74	99	97	8.7	11.8	121	147	97	6	12	7.0	7.4	19	80	24.6												
Dec-12	110	131	2731	3387	97	152	165	257	3792	5601	0	2.8	4.1	5.0	8.4	122	218	95	6.7	9.0	158	231	96	6	22	7.1	7.3	49	370	16.0												
Jan-13	154	220	3138	3784	116	200	200	391	4256	8468	0	2.8	4.8	5.2	6.6	133	216	96	9.6	11.0	228	347	95	10	52	7.1	7.6	53	90	14.0												
Feb-13	183	222	3343	3786	128	150	218	300	3972	5480	0	2.3	3.2	4.2	6.4	77	109	97	8.6	12.5	163	229	96	3	4	7.2	7.4	50	50	14.3												
Mar-13	165	193	2885	3005	331	211	231	338	4053	5682	0	2.2	3.0	6.1	8.2	115	149	95	9.4	11.8	172	199	96	4	10	7.2	7.3	55	190	15.1												
Apr-13	184	208	3506	4441	140	198	236	370	4441	7927	0	2.4	3.7	8.1	16.1	142	231	94	9.6	10.7	192	249	96	2	6	7.1	7.8	64	200	15.7												
May-13	209	256	2982	3377	158	219	291	463	4206	7301	0	1.8	2.3	5.2	8.7	79	122	97	9.3	12.4	140	174	97	2	4	7.1	7.3	108	220	18.5												
Jun-13	242	300	3315	3978	174	226	347	629	4470	7723	0	1.6	2.3	4.7	6.2	69	101	97	7.7	10.1	108	152	98	6	17	7.2	7.4	57	140	21.0												
Jul-13	232	285	2877	3492	191	258	364	579	4449	7195	0	1.5	1.8	5.4	7.1	70	91	97	8.4	10.1	108	132	98	4	16	7.1	7.4	86	200	22.8												
Aug-13	280	311	3491	3758	191	256	376	526	4568	6356	0	1.5	1.7	4.1	5.9	54	77	98	8.0	9.8	103	125	98	6	15	7.3	7.5	84	220	24.5												
Sep-13	248	288	2991	3612	178	211	332	402	4232	5448	0	1.6	2.6	3.3	3.9	45	53	98	6.4	6.9	89	106	98	95	200	7.2	7.8	95	200	24.0												
Oct-13	241	301	2984	3869	173	222	306	550	3755	6370	0	1.6	2.0	2.6	3.9	35	53	99	4.3	5.7	57	94	99	4	6	7.2	7.5	105	200	21.0												
Nov-13	197	227	2881	3480	156	188	273	398	4025	5927	0	1.9	3.4	3.3	3.8	55	85	98	4.8	5.6	78	86	98	2	3	7.1	8.1	56	140	18.8												
Dec-13	208	246	3085	3165	156	198	264	370	4387	6158	0	2.2	4.1	2.8	3.1	60	98	4.2	4.5	78	120	98	1	3	7.1	7.4	60	190	15.7													
Jan-14	143	187	3138	3463	108	174	213	327	4381	5835	0	2.6	4.9	4.5	8.9	97	193	96	6.6	15.9	153	361	97	2	4	7.2	7.5	75	310	13.9												
Feb-14	155	218	2926	3505	104	150	200	270	4708	5587	0	2.7	6.7	9.2	20.0	199	340	91	12.9	17.1	271	398	94	4	8	7.2	7.5	56	180	14.0												
Mar-14	165	172	3273	3819	105	158	192	310	4314	5343	0	2.9	5.6	6.7	12.8	157	305	94	8.1	9.3	188	278	96	5	14	7.1	7.4	100	230	14.3												
Apr-14	200	241	3211	4368	148	203	274	371	4392	7294	0	2.0	2.9	7.4	29	127	122	95	7.8	10.0	134	169	97	19	52	7.2	7.4	117	200	16.7												
May-14	193	238	3216	3672	132	194	249	347	4203	5337	0	2.1	3.3	5.5	6.2	95	113	96	7.8	9.5	138	171	97	9	28	7.1	7.4	85	200	17.5												
Jun-14	242	260	3099	3361	177	222	334	442	4318	5849	0	1.6	1.8	6.1	6.9	83	97	97	9.2	9.9	126	136	97	15	24	7.2	7.6	64	200	16.8												
Jul-14	238	259	3122	3345	179	226	344	500	4381	6104	0	1.6	2.3	6.2	9.7	87	132	97	9.6	12.4	131	164	97	40	56	7.0	7.4	50	50	23.3												
Aug-14	247	277	3169	3963	185	243	353	438	4389	5377	0	1.6	1.9	7.5	18.4	100	240	96	5.7	6.6	76	88	98	30	75	7.1	7.4	50	50	23.4												
Sep-14	253	305	3130	3557	186	246	338	540	4178	6165	0	1.6	2.0	4.0	4.3	53	60	98	5.0	5.8	66	78	99	8	13	7.1	7.7	61	140	23.6												
Oct-14	210	240	2972	3519	161	236	367	385	3793	4788	0	1.8	3.2	3.5	4.1	54	73	98	3.7	4.0	58	68	99	13	31	6.8	8.6	85	290	21.4												
Nov-14	177	247	2900	3664	148	223	224	356	3867	7843	0	2.3	4.5	3.9	4.6	72	109	97	5.6	6.2	108	161	98	5	19	6.9	7.5	58	180	19.5												
Dec-14	160	209	3323	3927	118	174	221	393	4191	8269	0	2.5	3.7	5.1	6.4	108	152	96	7.9	10.8	167	216	96	1	2	6.9	7.2	56	140	16.7												
Jan-15	168	200	3404	3836	103	143	181	282	4553	7633	1.47	3.1	8.6	5.9	7.8	173	331	94	8.6	12.5	274	607	95	3	35	7.1	7.3	70	190	14.5												
Feb-15	185	211	3557	3862	131	170	218	306	4089	5153	0	2.4	3.4	4.8	5.7	92	117	96	5.6	8.1	108	159	97	1	3	7.1	7.2	59	190	15.1												
Mar-15	207	249	3310	3651	138	198	243	354	4152	6889	0	2.1	3.3	4.4	5.2	76	83	97	5.8	7.0	104	134	98	1	2	7.1	7.3	61	210	17.0												
Apr-15	250	276	3537	3946	177	211	305	485	4235	6891	0	1.9	2.0	7.9	9.6	125	145	96	10.9	12.9	171	208	96	2	5	7.2	7.3	62	180	17.7												
May-15	266	292	3497	3775	186	232	322	430	4187	5559	0	1.7	2.5	6.7	8.8	98	150	96	10.6	14.5	153	242	97	1	1	7.2	7.4	85	200	20.8												
Jun-15	287	300	3637	3865	199	282	337	652	4124	8108	0	1.6	1.9	5.1	7.2	67	87	97	8.9	11.4	116	145	97	2	6	7.1	7.5	51	70	22.9												
Jul-15	301	322	3661	3982	199	222	347	540	4143	6276	0	1.5	1.6	4.1	5.4	53	72	98	6.1	8.9	78	116	98	2	3	7.2	7.4	57	280	23.7												
Aug-15	290	327	3652	4197	186	213	340	458	4266	5229	0	1.6	1.9	4.9	7.2	66	97	97	10.1	13.7	135	183	97	2	2	7.1	7.3	50	50	24.4												
Sep-15	241	278	3029	3334	181	218	296	360	3703	4721	0	1.6	2.2	3.4	4.7	46	62	98	10.2	13.0	138	177	97	2	3	7.1	7.3	54	180	22.7												
Oct-15	265	274	3124	3227	194	270	333	465	4097	5425	0	1.8	4.5	3.1	3.8	45	58	98	7.3	9.7	100	130	98	2	7	7.1	7.5	54	180	21.8												
Nov-15	134	202	3548	3818	113	160	200	430	4347	8751	1.20	3.2	8.0	5.7	10.1	147	220	95	9.8	11.2	255	435	95	15	50	7.0	7.2	64	170	18.5												
Dec-15	136	204	3831	4467	103	183	146	227	4200	7939	0.06	3.8	6.4	5.4	7.3	173	269	95	8.0	13.4	252	439	95	2	4	7.0	7.6	50	50	15.9												
Jan-16	166	175	3246	3546	130	173	206	281	3845	4978	0	2.4	3.4	4.0	4.9	79	104	97	3.9	4.6	76	83	98	1	1	7.0	7.3	50	50	14.3												
Feb-16	139	182	3089	3273	108	166	188	252	3902	7702	1.62	3.2	9.1	3.8	4.4	115	237	96	4.1	5.2	131	305	98	2	6	7.0	7.5	50	50	14.7												
Mar-16	158	201	2970	3707	120	157	195	273	3680	4417	0	2.3	3.3	5.1	6.3	99	114	96	6.6	8.9	128	171	97	1	1	6.6	7.3	55	120	16.8												
Apr-16	216	270	3336	3612	149	217	244	392	3701	5244	0	1.9	2.7	5.3	7.1	86	108	96	7.7	9.1	125	166	97	1	2	7.1	7.4	60	200	18.5												
May-16	276	310	3444	3895	182	225	238	695	4218	5892	0	1.6	1.7	6.2	6.9	81	90	97	11.2	11.7	145	151	97	1	1	7.2	7.8	84														

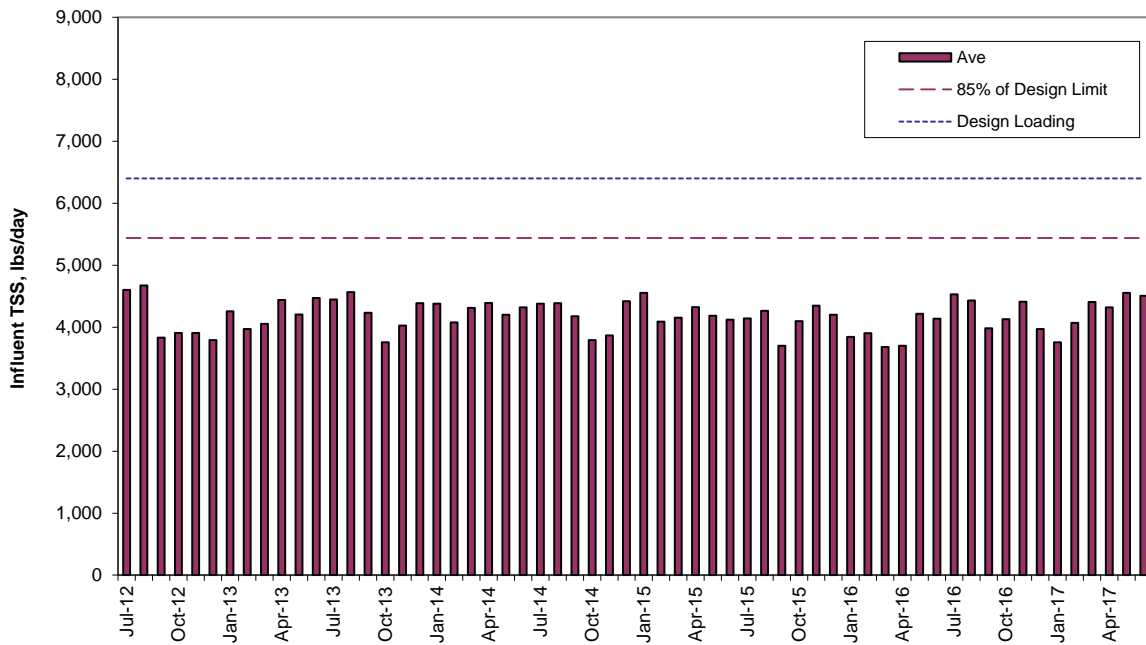
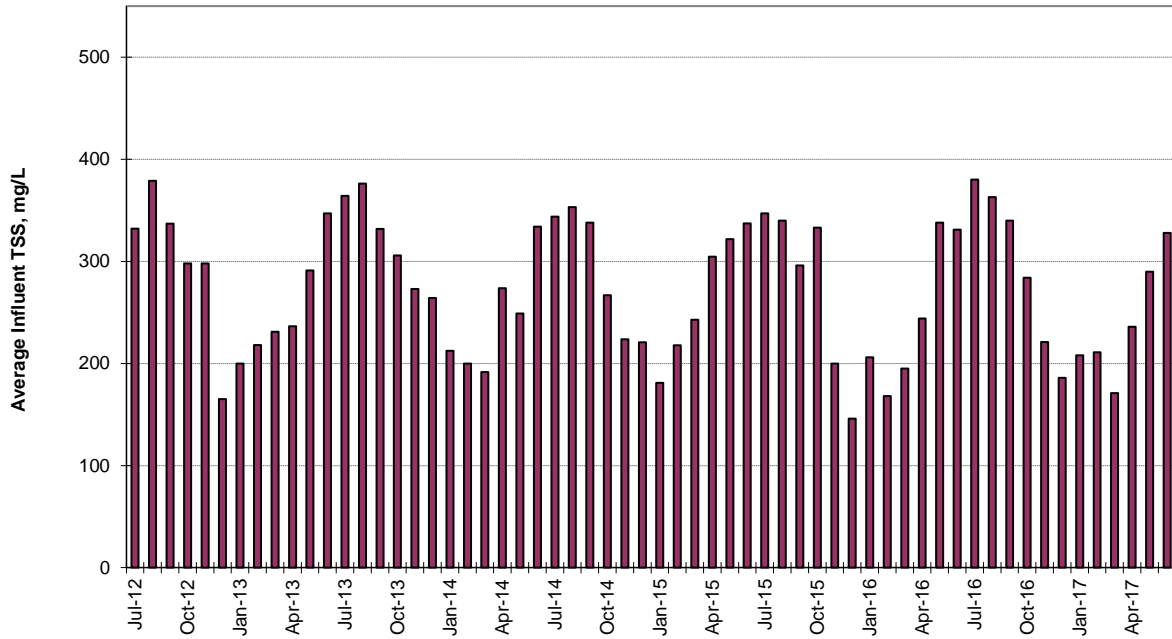
Anacortes WWTP Influent – BOD₅



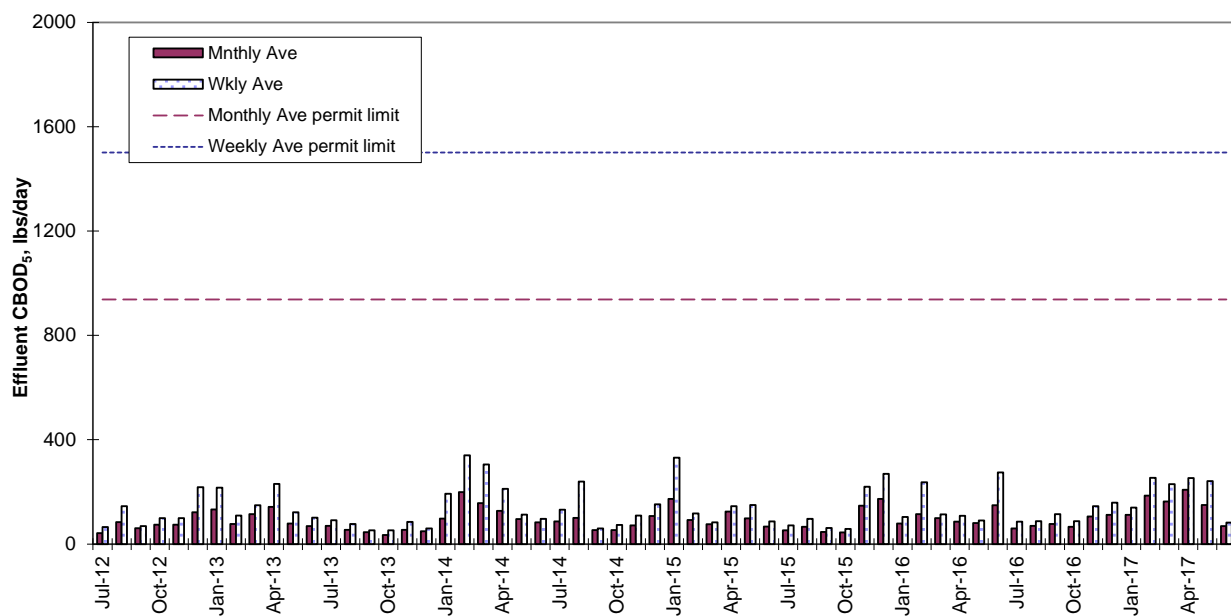
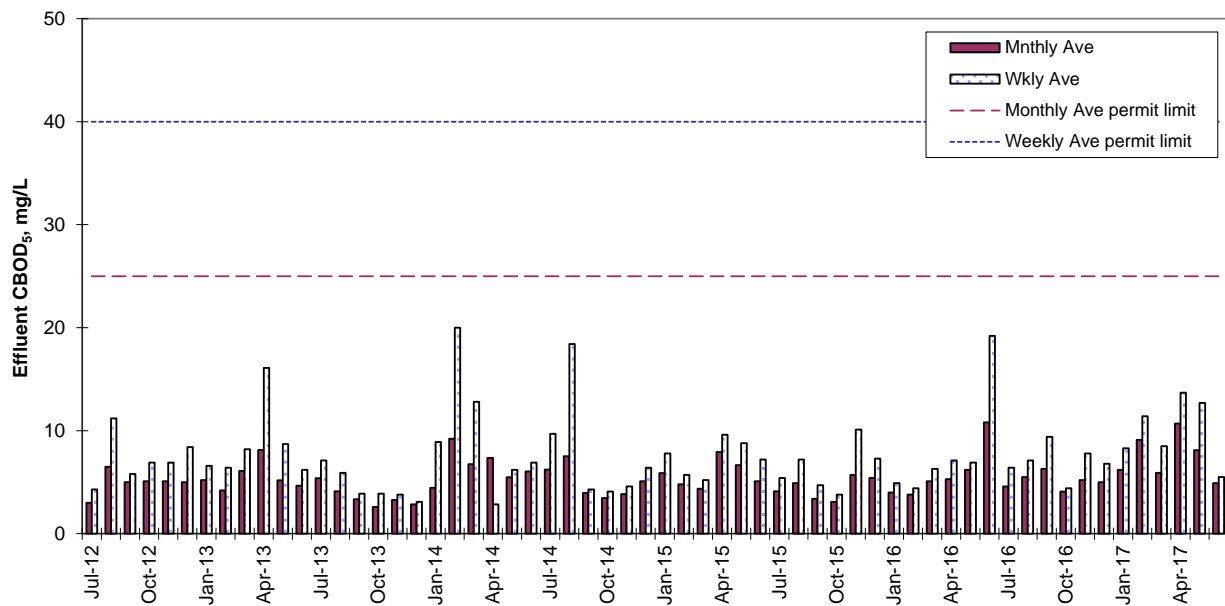
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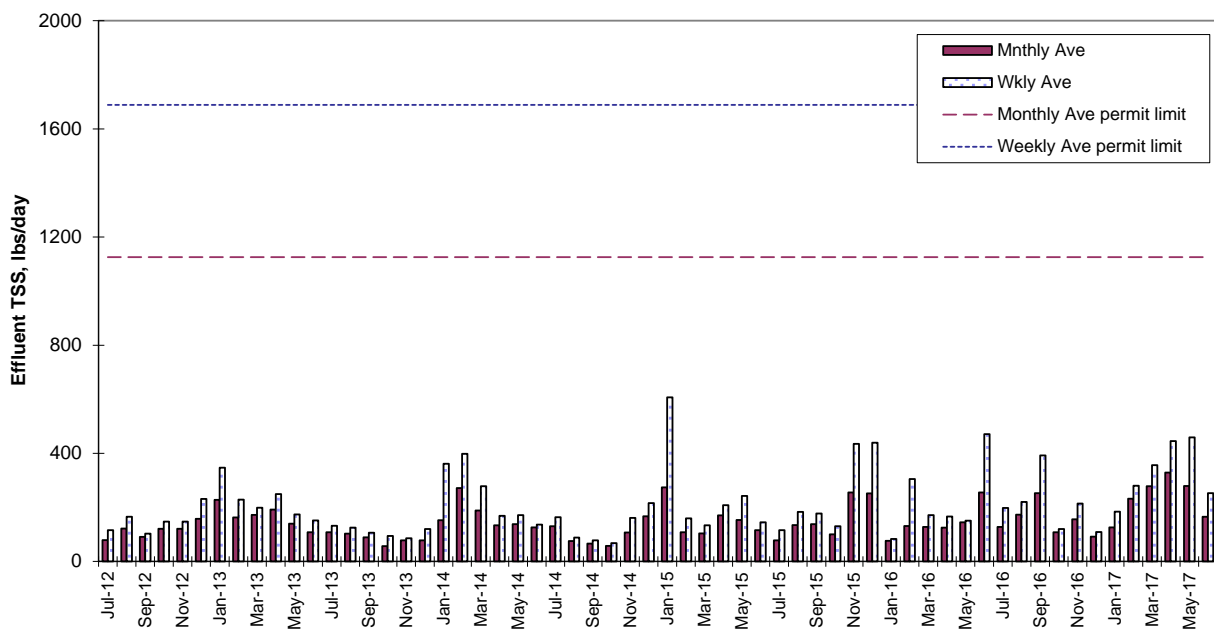
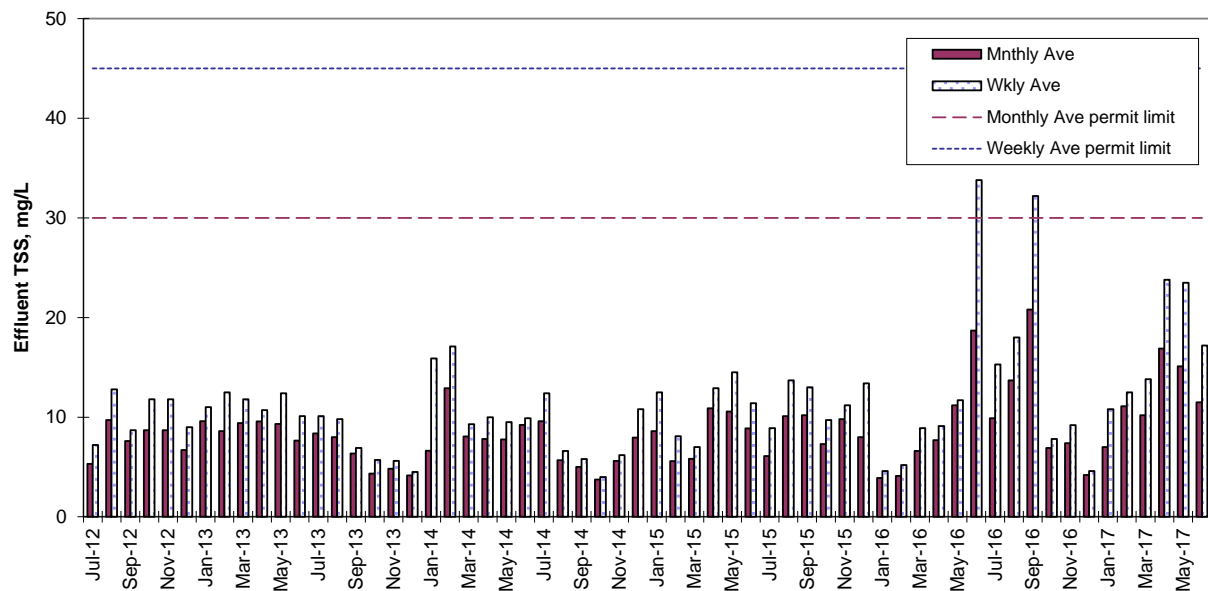
Anacortes WWTP Influent - TSS



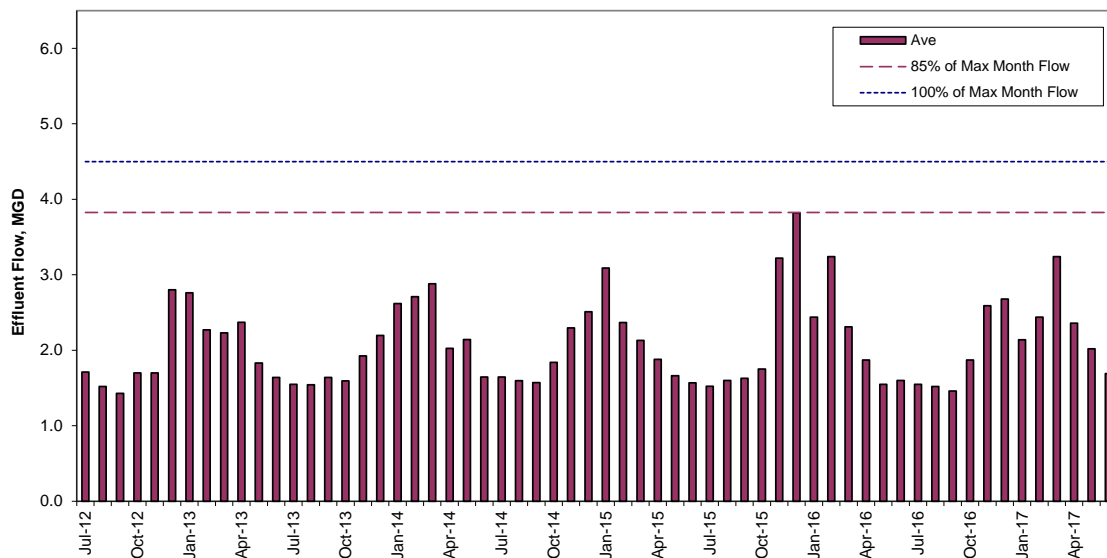
Anacortes WWTP Effluent – CBOD₅



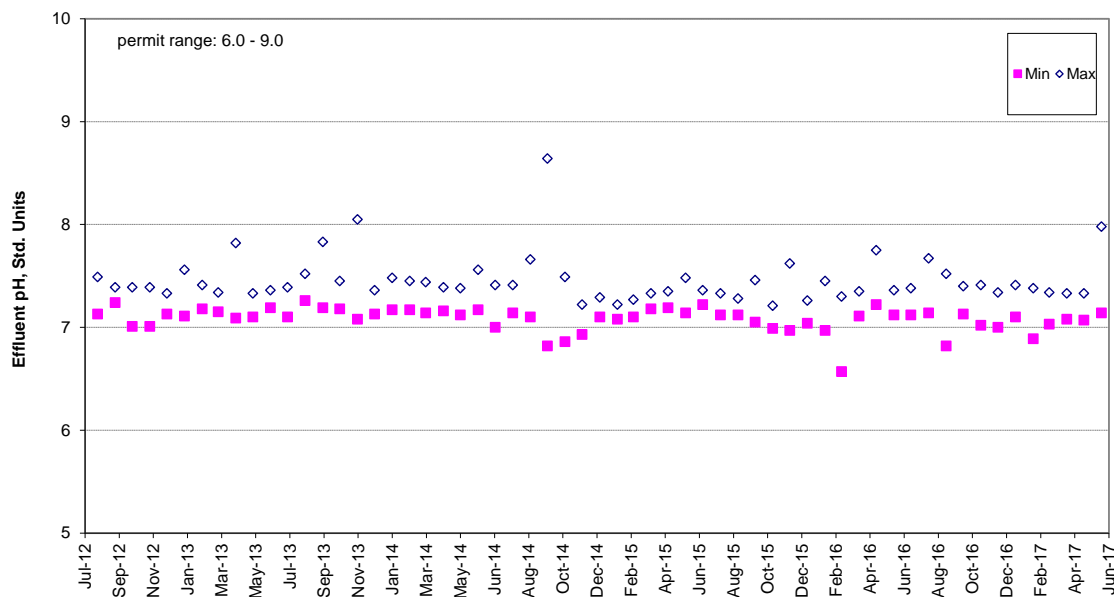
Anacortes WWTP Effluent - TSS



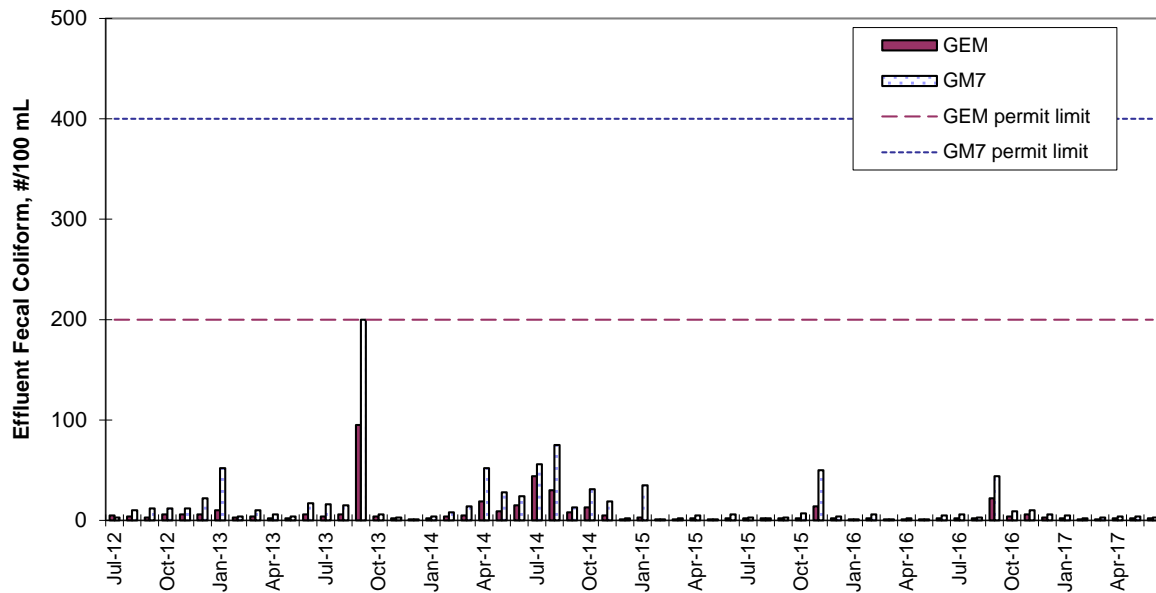
Anacortes WWTP Effluent – Flow



Anacortes WWTP Effluent - pH



Anacortes WWTP Effluent – Fecal Coliform



Anacortes WWTP - Additional Effluent Data

Anacortes WWTP - Priority Pollutant Data (only those parameters with at least one set of results > the detection limit (DL) are listed)																
Parameters	Arsenic, µg/L	Cadmium, µg/L	Chromium, µg/L	Copper, µg/L	Mercury, µg/L	Nickel, µg/L	Selenium, µg/L	Silver, µg/L	Zinc, µg/L	Cyanide, Total, µg/L	Acrolein, µg/L	Chloroform, µg/L	Tetrachloro ethylene, µg/L	Toluene, µg/L	Bis (2- Ethylhexyl) phthalate, µg/L	1,4- Dichlorob enzene, µg/L
No. of Samples:	17	17	17	17	4	17	17	17	17	4	4	4	4	4	4	4
AVE:	1.14	0.25	2.05	7.82	0.005	3.98	2.07	0.26	30	0.005	1.99	1.85	0.26	2.98	8.30	0.99
MAX:	2.00	0.30	10.00	11.00	0.005	14.00	5.00	1.00	47	0.010	4.00	2.10	0.50	4.60	14.60	2.50
Data: Anacortes WWTP Permit Renewal Application (received 12/27/16)																

Anacortes WWTP Effluent – Acute NOEC

NOEC, LOEC, and PMSD as Percent Effluent Acute WET Test Results for Anacortes WWTP (WA0020257)								
Scheduled	Test Code	Collected	Start Date	Organism	Endpoint	NOEC	LOEC	PMSD
2012 August	RMAR2668	8/14/2012	8/15/2012	<i>Pimephales promelas</i>	96-Hour Survival	25%	50%	7.4%
				Fathead minnow				
2013 February	RMAR2836	2/13/2013	2/14/2013	<i>Pimephales promelas</i>	96-Hour Survival	50%	100%	12.0%
				Fathead minnow				
2013 August	RMAR3067	8/20/2013	8/21/2013	<i>Ceriodaphnia dubia</i>	48-Hour Survival	50%	100%	9.2%
				Water flea				
2014 February	RMAR3226	2/19/2014	2/20/2014	<i>Ceriodaphnia dubia</i>	48-Hour Survival	100%	>100%	5.0%
				Water flea				
2014 August	RMAR3346	8/6/2014	8/7/2014	<i>Pimephales promelas</i>	96-Hour Survival	100%	>100%	8.2%
				Fathead minnow				
2015 February	RMAR3534	2/19/2015	2/20/2015	<i>Pimephales promelas</i>	96-Hour Survival	100%	>100%	10.7%
				Fathead minnow				
2015 August	RMAR3740	8/18/2015	8/19/2015	<i>Ceriodaphnia dubia</i>	48-Hour Survival	50%	100%	29.6%
				Water flea				
2016 February	RMAR3885	2/23/2016	2/24/2016	<i>Ceriodaphnia dubia</i>	48-Hour Survival	100%	>100%	na
				Water flea				
2016 August	JAMM0125	8/16/2016	8/17/2016	<i>Pimephales promelas</i>	96-Hour Survival	100%	>100%	7.4%
				Fathead minnow				
2017 February	JAMM0093	2/27/2017	2/28/2017	<i>Pimephales promelas</i>	96-Hour Survival	100%	>100%	2.5%
				Fathead minnow				
LOEC = Lowest observed effect concentration.								
NOEC = No observed effect concentration.								
PMSD = Percent minimum significant difference.								
na = Not applicable.								

Anacortes WWTP Effluent – Acute %Survival

Percent Survival in 100% Effluent WET Test Results for Anacortes WWTP (WA0020257)							
Scheduled	Test Code	Collected	Start Date	Duration	Organism	Endpoint	Survival
2012 August	RMAR2668	8/14/2012	8/15/2012	Acute	<i>Pimephales promelas</i>	96-Hour Survival	0%
					Fathead minnow		
2013 February	RMAR2836	2/13/2013	2/14/2013	Acute	<i>Pimephales promelas</i>	96-Hour Survival	70%
					Fathead minnow		
2013 August	RMAR3067	8/20/2013	8/21/2013	Acute	<i>Ceriodaphnia dubia</i>	48-Hour Survival	5%
					Water flea		
2014 February	RMAR3226	2/19/2014	2/20/2014	Acute	<i>Ceriodaphnia dubia</i>	48-Hour Survival	100%
					Water flea		
2014 August	RMAR3346	8/6/2014	8/7/2014	Acute	<i>Pimephales promelas</i>	96-Hour Survival	85%
					Fathead minnow		
2015 February	RMAR3534	2/19/2015	2/20/2015	Acute	<i>Pimephales promelas</i>	96-Hour Survival	100%
					Fathead minnow		
2015 August	RMAR3740	8/18/2015	8/19/2015	Acute	<i>Ceriodaphnia dubia</i>	48-Hour Survival	0%
					Water flea		
2016 February	RMAR3885	2/23/2016	2/24/2016	Acute	<i>Ceriodaphnia dubia</i>	48-Hour Survival	100%
					Water flea		
2016 August	JAMM0125	8/16/2016	8/17/2016	Acute	<i>Pimephales promelas</i>	96-Hour Survival	92%
					Fathead minnow		
2017 February	JAMM0093	2/27/2017	2/28/2017	Acute	<i>Pimephales promelas</i>	96-Hour Survival	100%
					Fathead minnow		

Anacortes WWTP Effluent – Chronic NOEC

NOEC, LOEC, and PMSD as Percent Effluent Chronic WET Test Results for Anacortes WWTP (WA0020257)								
Scheduled	Test Code	Collected	Start Date	Organism	Endpoint	NOEC	LOEC	PMSD
2016 April	JAMM0126	4/19/2016	4/19/2016	<i>Atherinops affinis</i>	7-day Survival	30%	100%	19.3%
				Pacific Topsmelt	Biomass	30%	100%	29.8%
					Weight	30%	>30%	30.2%
2016 April	JAMM0127	4/19/2016	4/19/2016	<i>Americamysis bahia</i>	7-day Survival	30%	100%	11.4%
				Atlantic Mysid Shrimp	Biomass	30%	100%	20.9%
					Weight	30%	>30%	15.9%
2016 October	JAMM0128	10/17/2016	10/18/2016	<i>Atherinops affinis</i>	7-day Survival	30%	>30%	15.8%
				Pacific Topsmelt	Biomass	30%	>30%	22.7%
					Weight	30%	>30%	27.4%
2016 October	JAMM0129	10/17/2016	10/18/2016	<i>Americamysis bahia</i>	7-day Survival	30%	100%	14.0%
				Atlantic Mysid Shrimp	Biomass	2.6%	10%	21.2%
					Weight	2.6%	10%	16.6%
	LOEC	= Lowest observed effect concentration.						
	NOEC	= No observed effect concentration.						
	PMSD	= Percent minimum significant difference.						

Reasonable Potential Calculations

Reasonable Potential Calculation

Facility	Anacortes WWTP
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	31.0	72.0
Human Health Carcinogenic		72.0
Human Health Non-Carcinogenic		305.0

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	ACROLEIN 107028 1V	ARSENIC (inorganic)	CADMIUM - 7440439 4M Hardness dependent	CHLORINE (Total Residual) 7782505	CHLOROFORM 67663 11V	CHROMIUM(HEX) 18540299 - Dissolved	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	1,4 DICHLOROBENZENE 106467 22B	MERCURY 7439976 8M
Effluent Data	# of Samples (n)	1326	4	17	17	365	4	17	17	4	4	4
	Coeff of Variation (Cv)	0.36	0.6	0.28	0.05	0.6	0.6	2.26	0.18	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	34,900	4		0.3	750	2.1	10	11	0.01	2.5	0.005
	Calculated 50th percentile Effluent Conc. (when n>10)			2								
Receiving Water Data	90th Percentile Conc., ug/L	0			0	0		0	0	0		0
	Geo Mean, ug/L		0	0			0			0	0	0
Water Quality Criteria	Aquatic Life Criteria, Acute ug/L	12,214	-	-	42	13	-	1100	4.8	1	-	1.8
	Chronic ug/L	1,835	-	-	9.3	7.5	-	50	3.1	1	-	0.025
	WQ Criteria for Protection of Human Health, ug/L	-	1.1	0.14	-	-	600	-	-	100	200	0.15
	Metal Criteria, Acute	-	-	-	0.994	-	-	-	0.83	-	-	0.85
	Translator, decimal	-	-	-	0.994	-	-	-	0.83	-	-	-
	Carcinogen?	N	N	Y	N	N	Y	N	N	N	N	N

Aquatic Life Reasonable Potential

Effluent percentile value		0.950		0.950	0.950		0.950	0.950	0.950	0.950		0.950
s	$s^2 = \ln(CV^2 + 1)$	0.349		0.050	0.555		1.345	0.179	0.555			0.555
Pn	$Pn = (1 - \text{confidence level})^{1/n}$	0.998		0.838	0.992		0.838	0.838	0.473			0.473
Multiplier		1.00		1.03	1.00		2.42	1.12	2.59			2.59
Max concentration (ug/L) at edge of...	Acute	1,126		0.010	24.194		0.780	0.331	0.001			0.000
	Chronic	485		0.004	10.417		0.336	0.143	0.000			0.000
Reasonable Potential? Limit Required?		NO		NO	YES		NO	NO	NO			NO

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month				30	
LTA Coeff. Var. (CV), decimal				0.6	
Permit Limit Coeff. Var. (CV), decimal				0.6	
Waste Load Allocations, ug/L	Acute			403	
	Chronic			540	
Long Term Averages, ug/L	Acute			129.3965	
	Chronic			284.8141	
Limiting LTA, ug/L				129.3965	
Metal Translator or 1?				1.00	
Average Monthly Limit (AML), ug/L				154	
Maximum Daily Limit (MDL), ug/L				403	

Human Health Reasonable Potential

s	$s^2 = \ln(CV^2 + 1)$	0.55451	0.274733		0.554513		0.55451	0.55451	0.55451
Pn	$Pn = (1 - \text{confidence level})^{1/n}$	0.473	0.838		0.473		0.473	0.473	0.473
Multiplier		1.03846	0.762275		1.038459		1.03846	1.03846	1.03846
Dilution Factor		305	72		72		305	305	305
Max Conc. at edge of Chronic Zone, ug/L		0.01362	0.027778		3.0E-02		3.4E-05	0.00851	1.7E-05
Reasonable Potential? Limit Required?		NO	NO		NO		NO	NO	NO

Reasonable Potential Calculation - Page 2

Facility	Anacortes WWTP	Dilution Factors:	Acute	Chronic
Water Body Type	Marine	Aquatic Life	31.0	72.0
		Human Health Carcinogenic		72.0
		Human Health Non-Carcinogenic		305.0

Pollutant, CAS No. & NPDES Application Ref. No.		NICKEL - 7440020 9M - Dependent on hardness	SELENIUM 7782492 10M	SILVER - 7740224 11M dependent on hardness.	TETRACHLOROETHYLENE 127184 24V	TOLUENE 108883 25V	ZINC- 7440666 13M hardness dependent					
Effluent Data	# of Samples (n)	17	17	17	4	4	17					
	Coeff of Variation (Cv)	0.74	0.76	0.83	0.6	0.6	0.59	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	14	5	1	0.5	4.6	47					
	Calculated 50th percentile Effluent Conc. (when n>10)	3	2				30					
Receiving Water Data	90th Percentile Conc., ug/L	0	0	0			0					
	Geo Mean, ug/L	0	0		0	0	0					
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute 74	290	1.9	-	-	90					
		Chronic 8.2	71	-	-	-	81					
	WQ Criteria for Protection of Human Health, ug/L	100	200	-	2.9	130	1000					
	Metal Criteria	Acute 0.99	-	0.85	-	-	0.946					
	Translator, decimal	Chronic 0.99	-	-	-	-	0.946					
	Carcinogen?	N	N	N	Y	N	N					

Aquatic Life Reasonable Potential

Effluent percentile value		0.950	0.950	0.950		0.950
s	$s^2 = \ln(CV^2 + 1)$	0.661	0.675	0.724		0.547
Pn	$Pn = (1 - \text{confidence level})^{1/n}$	0.838	0.838	0.838		0.838
Multiplier		1.54	1.56	1.61		1.43
Max concentration (ug/L) at edge of...	Acute	0.690	0.251	0.044		2.054
	Chronic	0.297	0.108	0.022		0.884
Reasonable Potential? Limit Required?		NO	NO	NO		NO

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month		
LTA Coeff. Var. (CV), decimal		
Permit Limit Coeff. Var. (CV), decimal		
Waste Load Allocations, ug/L	Acute	
	Chronic	
Long Term Averages, ug/L	Acute	
	Chronic	
Limiting LTA, ug/L		
Metal Translator or 1?		
Average Monthly Limit (AML), ug/L		
Maximum Daily Limit (MDL), ug/L		

Human Health Reasonable Potential

s	$s^2 = \ln(CV^2 + 1)$	0.66084	0.67521	0.55451	0.554513	0.546531
Pn	$Pn = (1 - \text{confidence level})^{1/n}$	0.838	0.838	0.473	0.473	0.838
Multiplier		0.52052	0.51318	1.03846	1.038459	0.582751
Dilution Factor		305	305	72	305	305
Max Conc. at edge of Chronic Zone, ug/L		0.00984	0.00656	0.00721	0.015662	9.8E-02
Reasonable Potential? Limit Required?		NO	NO	NO	NO	NO

Calculations for Fecal Coliform

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	72.0
Receiving Water Fecal Coliform, #/100 mL	0
Effluent Fecal Coliform - worst case, #/100 mL	400
Surface Water Criteria, #/100 mL	14
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 mL	6
Difference between mixed and ambient, #/100 mL	6
Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.	

Calculations for Ammonia

Marine Un-ionized Ammonia Criteria Calculation

Calculation of seawater fraction of un-ionized ammonia from Hampson (1977). Un-ionized ammonia criteria for salt water are from EPA 440/5-88-004. Revised 19-Oct-93.

INPUT	
1. Receiving Water Temperature, deg C (90th percentile):	13.1
2. Receiving Water pH, (90th percentile):	7.9
3. Receiving Water Salinity, g/kg (10th percentile):	30.2
4. Pressure, atm (EPA criteria assumes 1 atm):	1.0
5. Unionized ammonia criteria (mg un-ionized NH_3 per liter) from EPA 440/5-88-004:	
Acute:	0.233
Chronic:	0.035
OUTPUT	
Using mixed temp and pH at mixing zone boundaries?	No
1. Molal Ionic Strength (not valid if >0.85):	0.621
2. pKa8 at 25 deg C (Whitfield model "B"):	9.317
3. Percent of Total Ammonia Present as Unionized:	1.6%
4. Total Ammonia Criteria (mg/L as NH_3):	
Acute:	14.85
Chronic:	2.23
RESULTS	
Total Ammonia Criteria (mg/L as <u>N</u>)	
Acute:	12.21
Chronic:	1.83

Calculations for Temperature

Marine Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)–(ii) and Water Quality Program Guidance. All Data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at:

<http://www.ecy.wa.gov/biblio/0610100.html>

INPUT	Summer	Winter
1. Chronic Dilution Factor at Mixing Zone Boundary	72.0	72.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	13.1 °C	13.1 °C
3. 1DADMax Effluent Temperature (95th percentile)	24.6 °C	14.5 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C	16.0 °C
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	13.26 °C	13.12 °C
6. Incremental Temperature Increase or decrease:	0.16 °C	0.02 °C
7. Incremental Temperature Increase $12/(T-2)$ if $T \leq \text{crit}$:	1.08 °C	1.08 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	14.18 °C	14.18 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	NO	NO
10. Temp increase allowed at mixing zone boundary, if required:	---	---
B. If ambient temp is cooler than WQ criterion but within $12/(T_{\text{amb}}-2)$ and within 0.3 °C of the criterion		
11. Does temp fall within this incremental temp. range?	NO	NO
12. Temp increase allowed at mixing zone boundary, if required:	---	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within $12/(T_{\text{amb}}-2)$ of the criterion		
13. Does temp fall within this Incremental temp. range?	NO	NO
14. Temp increase allowed at mixing zone boundary, if required:	---	---
D. If ambient temp is cooler than (WQ criterion - $12/(T_{\text{amb}}-2)$)		
15. Does temp fall within this Incremental temp. range?	YES	YES
16. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
RESULTS		
17. Do any of the above cells show a temp increase?	NO	NO
18. Temperature Limit if Required?	NO LIMIT	NO LIMIT

Appendix E -- Response to Comments

During the public comment period, no comments were received.