Fact Sheet for NPDES Permit WA0029548

City of Snohomish Wastewater Treatment Plant

October 30, 2012

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 Snohomish 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 Snohomish WWTP, NPDES permit WA0029548, are available for public review and comment from September 27, 2012, until October 27, 2012. For more details on preparing and filing comments about these documents, please see *Appendix A – Public Involvement Information.*

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

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

Summary

The City operates an aerated lagoon wastewater treatment plant that discharges to the Snohomish River. Ecology issued the previous permit for this facility on July 31, 2006, and administratively extended it on May 11, 2011. The proposed permit contains the same effluent concentration limits for Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), Fecal Coliform, Total Residual Chlorine and maximum pH as the previous permit; the minimum pH limit has increased slightly. Ecology changed the TMDL-based mass limits for $CBOD_5$ and Ammonia to a single equivalent limit that combines both parameters. Wet-season $CBOD_5$ mass limits remain unchanged from the previous permit. Finally, the proposed permit includes a single set of concentration and mass limits on Total Suspended Solids (TSS) rather than two sets of seasonal limits.

The City also operates a partially combined collection system that occasionally discharges untreated combined wastewater and stormwater to the river at two locations. The proposed permit includes conditions related to Combined Sewer Overflows (CSOs) from the collection system. Those conditions require the City to monitor CSO discharges and report them annually to Ecology. The permit also requires the City to maintain technology-based controls to minimize pollutants discharged during CSOs and to develop a Post-Construction Monitoring Plan to validate that the City's CSO reduction measures comply with state Water Quality Standards.

Table of Contents

I. Introduction ***5***

II. Background Information ***6***

A. Description of the facility **7**
History 7
Collection system status 7
Combined sewer overflows 8
Treatment processes 9
Discharge outfall 10
Residual solids 10

B. Treatment plant loading summary **10**

C. Effluent characterization **10**

D. Permit status and compliance summary **12**

E. State environmental policy act (SEPA) compliance **14**

III. Proposed Permit Limits ***14***

A. Design criteria **14**

B. Technology-based effluent limits **15**
Effluent concentration limits 15
Mass limits 15
Total suspended solids 16
Residual chlorine 16
Technology standards for combined sewer overflows 17

C. Surface water quality-based effluent limits **17**
Description of the receiving water 17
Designated uses and surface water quality criteria 18
Narrative criteria 19
Antidegradation policy 19
Water quality consideration for combined sewer overflows 20
Water quality impairments 20
Mixing zone authorization 20
Evaluation of surface water quality-based effluent limits for numeric criteria 23

D. Whole effluent toxicity **26**

E. Sediment quality **27**

F. Ground water quality limits **27**

G. Comparison of effluent limits with the previous permit issued on July 31, 2006 ..... **27**

IV. Monitoring Requirements ***28***

A. Lab accreditation **28**

B. Wastewater monitoring **28**

V. Other Permit Conditions ***29***

A. Reporting and record keeping **29**

B. Prevention of facility overloading **29**

C. Operation and maintenance **29**

D. Pretreatment **29**
Duty to enforce discharge prohibitions 29
Federal and state pretreatment program requirements 30
Routine identification and reporting of industrial users 30
Requirements for performing an industrial user survey 31

E. Solid wastes **31**

F. Combined sewer overflows **32**
CSO reduction plan/long-term control plan and CSO reduction plan amendments 32
Nine minimum controls 32
CSO monitoring 33
Annual CSO report 33
Post-construction monitoring program 33

G. Outfall evaluation **34**

H. General conditions **34**

VI. Permit Issuance Procedures ***34***

A. Permit modifications **34**

B. Proposed permit issuance **34**

VII. References for Text and Appendices ***35***

Appendix A—Public Involvement Information ***37***

Appendix B—Your Right to Appeal ***38***

Appendix C—Glossary ***39***

Appendix D—Monitoring Data Summary ***46***

Appendix E—Use of State Water Quality Standards in NPDES Permits ***60***

Appendix F—Technical Calculations ***66***

Appendix G—Response to Comments ***74***

Tables:

Table 1. General Facility Information…… 6

Table 2. Combined Sewer Overflow Summary…… 8

Table 3. Wastewater Influent Characterization…… 10

Table 4. Wastewater Effluent Characterization…… 11

Table 5. Expanded Effluent Characterization…….. 11
Table 6. Reported Daily Limit Violations…… 12
Table 7. Reported Average Limit Violations……13
Table 8. Design Criteria for the Snohomish WWTP…… 15
Table 9. Technology-based Limits……... 15
Table 10. Technology-based Mass Limits…… 16
Table 11. Ambient Background Data……... 18
Table 12. Freshwater Aquatic Life Uses and Associated Criteria…… 19
Table 13. Recreational Uses and Associated Criteria…….. 19
Table 14. Critical Conditions Used to Model the Discharge……21
Table 15. Dilution Factors (DF)…….. 22
Table 16. Comparison of Previous and Proposed Effluent Limits for Outfall 001……. 27
Table 17. Accredited Parameters……. 28

Figures:

Figure 1 Facility Location Map 6
Figure 2. Treatment Process 9
Figure 3. Mixing Zone Location..... 22

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 ground waters (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:

- 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.

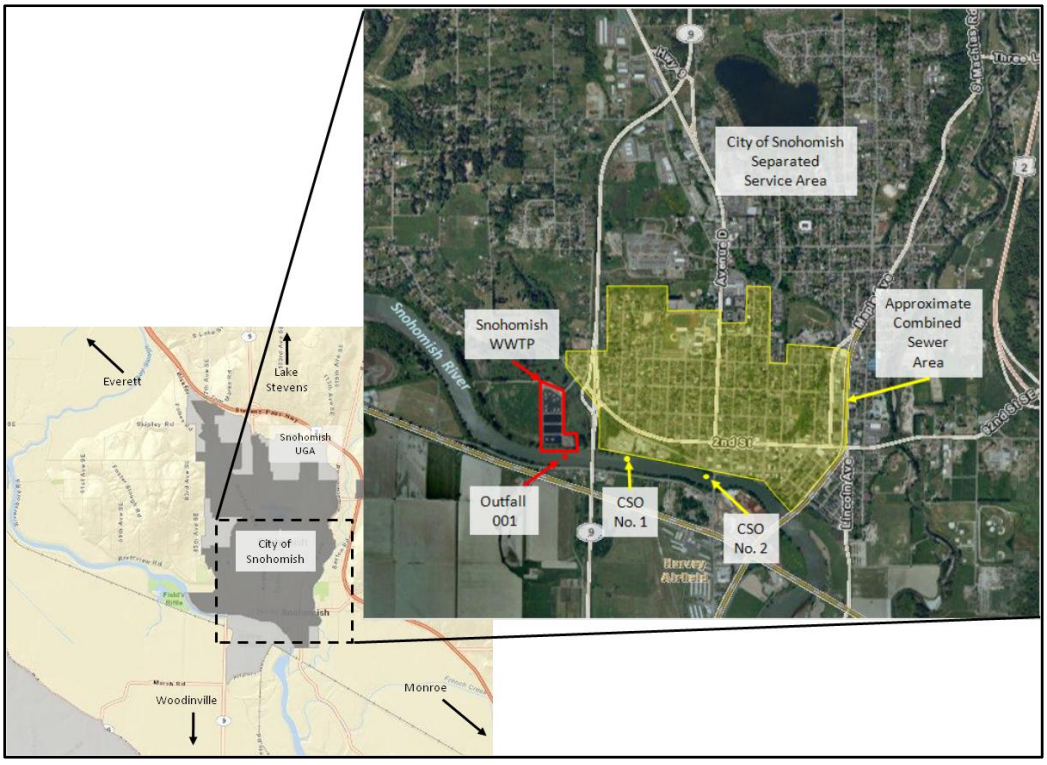
Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where 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 G.*

II. Background Information

Table 1. General Facility Information

Facility Information	
Applicant	City of Snohomish 116 Union Avenue Snohomish, WA 98290
Facility Name and Address	Snohomish Wastewater Treatment Plant 2115 2nd Street Snohomish, WA 98290
Type of Treatment	Dual Powered Aerated Lagoon Augmented with Integrated Fixed-Film Media System (by Late 2012).
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.91587 Longitude: -122.11129
WWTP Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Outfall 001, Snohomish River Latitude: 47.912552 Longitude: -122.110974
CSO Discharge Waterbody Name and Locations (NAD83/WGS84 reference datum)	CSO #1 (Outfall 002), Snohomish River Latitude: 47.912119 Longitude: -122.104180 CSO #2 (Outfall 003), Snohomish River Latitude: 47.911389 Longitude: -122.100000

Figure 1. Facility Location Map



A. Description of the facility

History

The City of Snohomish owns and operates a lagoon wastewater treatment system that serves the residents and businesses within the City's incorporated boundaries. The service territory encompasses approximately two square miles (1,240 acres) between the Snohomish River to the south and US Hwy 2 to the north. State Route 9 and the Pilchuck River generally border the service area to the west and east, respectively. Approximately 26% (325 acres) of the plant's service area operates as a combined sewer system.

The treatment plant is located in the southwest corner of the City on the north bank of the Snohomish River west of State Route 9. The City constructed the original treatment plant on the site in 1958. The original plant consisted of a 40 acre facultative lagoon treatment system with chlorine disinfection. In 1989, the City upgraded disinfection and disposal by adding a new chlorine contact tank, chlorine feed and mixing equipment, and a new outfall.

The City converted the facility to a dual-powered, multi-cellular aerated lagoon system in 1995. The project added a new headworks consisting of three influent screw pumps, a rotary screen, and a manually cleaned bar screen. The new lagoon system consists of four aerated lagoon cells on ten acres previously occupied by the old system. The first cell is a 10 million gallon (MG) completely mixed aerated basin. This cell is followed by three 3.5 MG partially mixed basins. The upgrade also included an effluent filtration system and dechlorination facilities.

The City started construction on a project in early 2012 to enhance the performance of the existing lagoon system. This project will add 54 Submerged Fixed-Film (SFF) Media modules to the final three partially-mixed lagoon cells. The SFF modules contain a proprietary nylon web material that supports growth of treatment biota. The project will also add an aeration system and chemical (alkalinity) delivery system to support the SFF treatment process. The project is scheduled for completion by the fall of 2012.

Collection system status

The first sewage collection systems within the City were installed in the early 1900s and operated as a combined sanitary and storm sewer system with numerous outfalls to the Snohomish River. The City expanded its combined sewer system to meet the needs of population growth until the 1950s. The City began constructing separate sanitary sewer systems in new areas developed after 1950. The existing system consists of approximately 40,000 feet of sewer lines in the combined sewer area and 130,000 feet of lines in the separated areas.

The collection system includes 14 sewage pump stations, three of which pump flows from the combined sewer area. The City has installed permanent backup power generators at four pump stations: pump stations 6, 7, and 8 adjacent to Blackmans Lake and the new CSO/Stormwater pump station facility (pump station #1) at the west end of 1st Street. The remaining pump stations have the ability to connect to a portable generator during power outages. The City is in the process of upgrading the telemetry at all of the pump stations.

Combined sewer overflows

The City of Snohomish's combined sewer system is confined to 325 acres of the historic downtown area. The combined system has two overflow outfalls (CSOs) that discharge untreated wastewater directly into the Snohomish River whenever rainfall causes combined sewage flow to exceed the sewer system's capacity. CSO outfall #1 discharges upstream of the State Route 9 Bridge near the Public Works Shops site and CSO outfall #2 discharges downstream of the Avenue D Bridge.

The City uses a fixed weir overflow control structure located at the intersection of 2nd Street and Avenue H to regulate discharges from CSO outfall #1. The City upgraded this structure as part of their CSO control project in 2011 and added a parallel 18-inch sewer line from the structure to the wastewater treatment plant. This improvement was designed to convey peak flows up to 7.4 MGD (approximately 5,100 gpm) without causing an overflow. The controlled flow rate is based on the estimated peak flow for a design storm with a recurrence frequency of 1.01 years.

An overflow manhole located at 1st Street and Avenue E, near the site of the old "Ironworks" pump station, regulates overflows to CSO outfall #2. The 2011 control project replaced the "Ironworks" pump station with a new, larger-capacity pump station located near the intersection of 1st and 2nd streets. The project also extended a 30-inch gravity sewer line from the old pump station site to the new pump station. Overflows from CSO outfall #2 occur when surcharging of the new 30-inch line and new pump station causes combined sewage in the manhole to reach the outfall elevation (21.0 feet, MSL). This control is designed to accommodate a peak flow of 8.0 MGD (approximately 5,555 gpm) before overflowing.

The City has limited flow history prior to November 2008 due to challenges with equipment reliability and vendor responsiveness. Table 2 below summarizes the recent record of CSO discharges from both outfalls from November 2008 through July 2011, as reported in Annual CSO Reports. Since the City had not completed any CSO control projects prior to 2011, the data should be viewed as representative of baseline conditions. The City anticipates that the control project completed in 2011 will reduce overflow frequencies to an average of no more than one discharge per year, per outfall.

Table 2. Combined Sewer Overflow Summary

Monitoring Year[1]	CSO Outfall #1		CSO Outfall #2		Total Annual Rainfall (inches)
	Number of Overflow Events	Discharge Volume (MG)	Number of Overflow Events	Discharge Volume (MG)	
2008-2009[2]	17	2.03	21	5.36	27.37
2009-2010	27	2.87	41	8.6	46.15
2010-2011[3]	8	0.70	32	10.85	55.19
Average	**17.3**	**1.9**	**31.3**	**8.3**	**42.9**

[1] City's reporting based on Aug-July water year rather than calendar year.

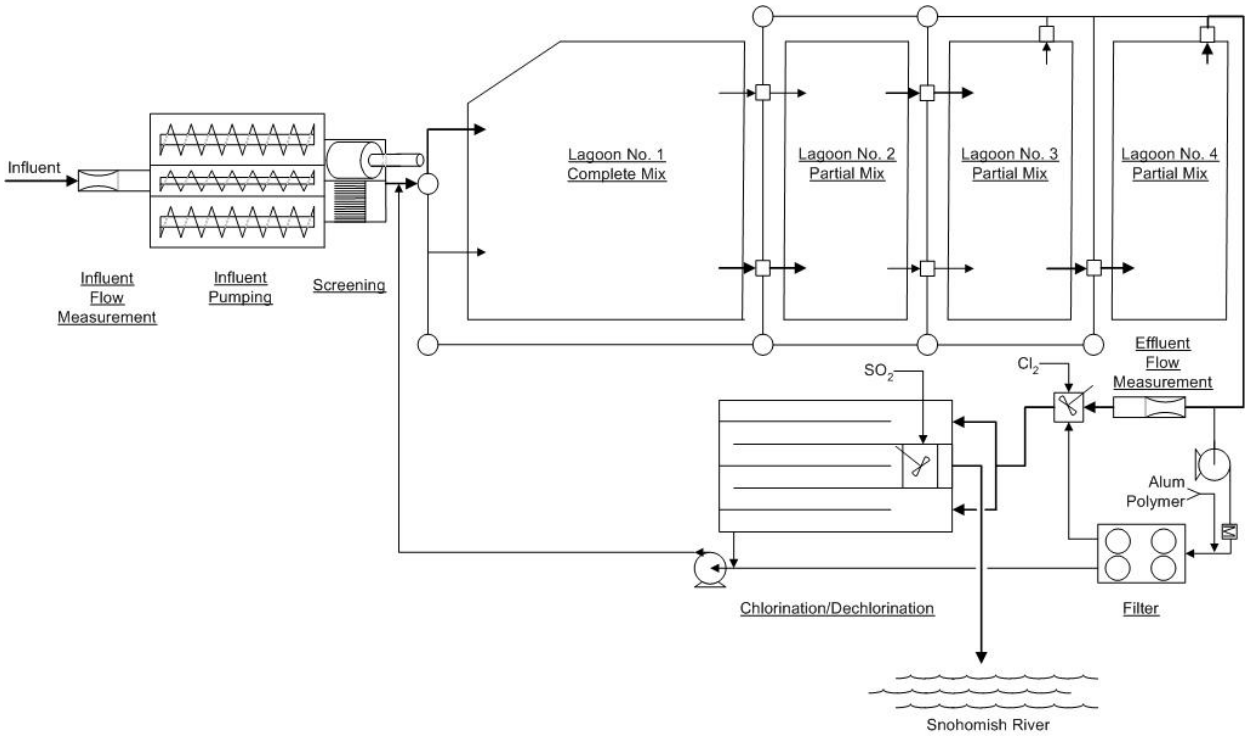
[2] Monitoring prior to November 2008 inconsistent due to problems with monitoring provider

[3] CSO Outfall #1 controls improvements online part way through 2010-2011 monitoring year.

Treatment processes

The city of Snohomish uses a Dual-Powered, Multi-Cellular aerated lagoon system to treat domestic sewage from its service territory. Figure 2 illustrates the typical process flow for the facility. Raw wastewater enters the facility through a headworks structure that consists of a Parshall Flume for flow measurement, screw pumps and a coarse screening system. Screened wastewater then flows by gravity from the headworks to a 10 MG completely mixed aerated lagoon before passing through a series of three 3.5 MG partially-mixed lagoon cells. Treated wastewater from lagoon cell #4 flows to an effluent control structure that controls flow routing to effluent filters and the disinfection system. Operators have the option to treat a portion of the effluent flow (up to 0.8 MGD) using continuous-backwash sand filters to enhance TSS removal during the summer. All effluent flow, whether filtered or unfiltered, passes through a chlorine contact chamber for disinfection prior to discharge. The City uses chlorine gas for disinfection and sulfur dioxide gas for dechlorination.

Figure 2. Treatment Process



The City started construction in March 2012 on a project designed to improve treatment during the summer. The existing lagoon has historically struggled to comply with TMDL-based limits on ammonia and CBOD during the July through October critical season. The project will add 54 Integrated Fixed-Film Media Modules to lagoon cells 2, 3, and 4 to enhance CBOD and ammonia treatment. The project also adds systems to provide supplemental alkalinity to support the process enhancement and upgrades the headworks screens to ¼-inch mechanically cleaned screens. Improvements are scheduled to come online in September 2012.

Discharge outfall

Treated, disinfected and dechlorinated effluent discharges to the Snohomish River via outfall #001. The outfall consists of a 30-inch ductile iron pipe and a 24-foot long HDPE diffuser section. The diffuser has four equally-spaced 12-inch ports; three ports facing downstream and the fourth at the pipe end facing across the river channel. The outfall and diffuser extend approximately 40 feet in to the channel and sits at a depth of 14 feet at MLLW.

An outfall inspection in 2008 found no damage to the outfall structure and assessed the stainless steel hardware on the extension to be in "new" condition. The report noted that a large log had settled on an upstream protective barrier. Divers also noted that flow from the ports at the time of the inspection was not sufficient to blow sediments away from the openings and suggested that there was a high potential for the natural bottom to build up around the diffuser ports. Based on the divers' findings, Ecology will include a requirement in the proposed permit to re-inspect the outfall and to develop a corrective plan if sedimentation has increased.

Residual solids

Waste sludge is currently stabilized and stored in the three partially mixed lagoons. The completely mixed lagoon was designed to keep solids in suspension and not accumulate sludge. Since the facility began operation in 1995, sludge has never been removed. The City evaluated the need to remove solids during the design of the current improvement project and determined removal was not necessary at this time. Solids removed by screens at the headworks and incidental solids removed during routine maintenance are drained and disposed of as solid waste.

B. Treatment plant loading summary

The Snohomish WWTP monitors influent flow and waste loading to verify actual loading does not exceed approved design capacity. Table 3 below summarizes loading to the facility from the period of August 2006 to December 2011.

Table 3. Wastewater Influent Characterization

Parameter	Average Value	Maximum Value
Monthly Average Daily Flow	1.2 MGD	2.4 MGD
Monthly Maximum Daily Flow	2.7 MGD	7.9 MGD
Monthly Average BOD_5	206 mg/L 1,800 lbs/day	330 mg/L 2,800 lbs/day
Monthly Average $CBOD_5$	188 mg/L 1,650 lbs/day	316 mg/L 2,395 lbs/day
Monthly Average TSS	160 mg/L 1,450 lbs/day	232 mg/L 2,190 lbs/day

C. Effluent characterization

The Snohomish WWTP reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. Table 4 below summarizes effluent data for routinely monitored parameters as reported in monthly DMRs between August 2006 and December 2011. Table 5 summarizes expanded conventional, non-conventional and priority pollutant parameters, as reported in the application.

Table 4. Wastewater Effluent Characterization

Parameter	Average Value	95th Percentile Value
Monthly Average 5-Day Carbonaceous Biochemical Oxygen Demand	9.1 mg/L 106 lbs/day	16.1 mg/L 222 lbs/day
Monthly Average Total Suspended Solids	11 mg/L 125 lbs/day	23 mg/L 274 lbs/day
Monthly Geometric Mean of Fecal Coliform Bacteria	9 cfu/100 mL	20.5 cfu/ 100 mL
Average pH Range	6.5-7.3	--
Monthly Average Chlorine	6.5 μg/L	10.4 μg/L
Temperature, Summer Daily Maximum	19.6 °C	24.6 °C
Temperature, Summer 7-day Average of Daily Maximums	19.7 °C	24.4 °C
Ammonia-Nitrogen, Critical (Jul-Oct) Season	3.5 mg/L	9.5 mg/L
Ammonia-Nitrogen, Non-critical (Nov-Jun) Season	16.7 mg/L	25.4 mg/L
Copper	9.4 μg/L	14.1 μg/L
Silver	0.5 μg/L	0.7 μg/L
Zinc	29.3 μg/L	50.7 μg/L

Table 5. Expanded Effluent Characterization

Parameter	Average Value	Maximum Value
Dissolved Oxygen	3.2 mg/L	--
Nitrate+Nitrite – Nitrogen	7.4 mg/L	22.7 mg/L
Total Kjeldahl Nitrogen	16.1 mg/L	24.7 mg/L
Total Phosphorus	3.83 mg/L	4.49 mg/L
Oil and Grease	<1.4 mg/L	<1.4 mg/L
Alkalinity (as $CaCO_3$)	100 mg/L	136 mg/L
Hardness (as $CaCO_3$)	44.8 mg/L	50.8 mg/L
Antimony	--	0.0009 mg/L
Arsenic	.0012 mg/L	0.002 mg/L
Lead	--	0.001 mg/L
Mercury	0.0113 μg/L	0.0136 μg/L
Nickel	.0025 mg/L	0.003 mg/L
Total Phenolic Compounds	0.717 mg/L	2.8 mg/L
Chloroform	2.0 μg/L	2.9 μg/L
Dichlorobromomethane	--	0.5 μg/L
Toluene	9.53 μg/L	36 μg/L
Bis(2-ethylhexyl)phthalate	1.83 μg/L	2.4 μg/L

D. Permit status and compliance summary

Ecology issued the previous permit for the Snohomish WWTP on July 31, 2006. That permit placed effluent limits on 5-day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), Total Suspended Solids (TSS), pH, fecal coliform bacteria, and total residual chlorine. The permit also included seasonal, TMDL-based mass limits for $CBOD_5$ and total ammonia for the summer (July-October) months.

The City of Snohomish submitted an application for permit renewal on February 2, 2011 and Ecology accepted the application as complete on May 10, 2011. Although the permit was set to expire on July 31, 2011, Ecology administratively extended it on May 11, 2011. The permit remains in effect until issuance of this proposed renewal.

The City of Snohomish struggled to comply with conditions in the 2006 permit, especially with respect to the TMDL-based limits. Table 6 below summarizes instances of daily permit limit violations reported by the City. Table 7 summarizes violations of monthly or weekly average limits.

Table 6. Reported Daily Limit Violations

Violation Month	Parameter	Reported Value	Units	Limit Value	Days Violated
August-06	Daily Maximum Ammonia	155.12	Lbs/Day	99	6
August-06	Daily Maximum 5-day Carbonaceous BOD	186.82	Lbs/Day	93	9
September-06	Daily Maximum Ammonia	277.95	Lbs/Day	99	4
September-06	Daily Maximum 5-day Carbonaceous BOD	295.4	Lbs/Day	93	6
October-06	Daily Maximum 5-day Carbonaceous BOD	134.86	Lbs/Day	93	6
October-06	Daily Maximum Ammonia	125.5	Lbs/Day	99	6
October-06	Daily Maximum Total Residual Chlorine	345	µg/L	209	1
July-07	Daily Maximum 5-day Carbonaceous BOD	135	Lbs/Day	93	1
August-07	Daily Maximum 5-day Carbonaceous BOD	121.43	Lbs/Day	93	5
September-07	Daily Maximum 5-day Carbonaceous BOD	120.51	Lbs/Day	93	4
October-07	Daily Maximum 5-day Carbonaceous BOD	253.7	Lbs/Day	93	6
July-08	Daily Maximum 5-day Carbonaceous BOD	115.43	Lbs/Day	93	2
October-08	Daily Maximum 5-day Carbonaceous BOD	133.11	Lbs/Day	93	3
January-09	Daily Maximum Total Residual Chlorine	375	µg/L	209	1
August-09	Daily Maximum Total Residual Chlorine	500	µg/L	209	2
October-09	Daily Maximum 5-day Carbonaceous BOD	126.6	Lbs/Day	93	2
November-10	Daily Minimum pH	5.95	Std Units	6	1
February-11	Daily Maximum Total Residual Chlorine	8400	µg/L	209	1

Table 7. Reported Average Limit Violations

Violation Month	Parameter	Reported Value	Units	Limit Value
August-06	Monthly Average Ammonia	106.38	Lbs/Day	29
August-06	Monthly Average 5-day Carbonaceous BOD	134.72	Lbs/Day	58
September-06	Monthly Average Ammonia	141.22	Lbs/Day	29
September-06	Monthly Average 5-day Carbonaceous BOD	147.97	Lbs/Day	58
October-06	Monthly Average 5-day Carbonaceous BOD	109.05	Lbs/Day	58
October-06	Monthly Average Ammonia	104.56	Lbs/Day	29
November-06	Weekly Geometric Mean Fecal Coliform	1333	#/100ml	400
June-07	Weekly Geometric Mean Fecal Coliform	453	#/100ml	400
July-07	Monthly Average 5-day Carbonaceous BOD	61	Lbs/Day	58
August-07	Monthly Average 5-day Carbonaceous BOD	94.46	Lbs/Day	58
September-07	Monthly Average 5-day Carbonaceous BOD	98.12	Lbs/Day	58
October-07	Monthly Average 5-day Carbonaceous BOD	126.38	Lbs/Day	58
October-07	Monthly Geometric Mean Fecal Coliform	243	#/100ml	200
October-07	Weekly Geometric Mean Fecal Coliform	664	#/100ml	400
November-07	Weekly Geometric Mean Fecal Coliform	583	#/100ml	400
June-08	Weekly Geometric Mean Fecal Coliform	894.4	#/100ml	400
July-08	Monthly Average Ammonia	30.688	Lbs/Day	29
August-08	Monthly Average Ammonia	45.91	Lbs/Day	29
September-08	Monthly Average 5-day Carbonaceous BOD	67.846	Lbs/Day	58
October-08	Monthly Average 5-day Carbonaceous BOD	81.93	Lbs/Day	58
November-08	Weekly Geometric Mean Fecal Coliform	436.94	#/100ml	400
July-09	Monthly Average Ammonia	48.13	Lbs/Day	29
August-09	Monthly Average Ammonia	50.33	Lbs/Day	29
September-09	Monthly Average Ammonia	50.57	Lbs/Day	29
July-10	Monthly Average Ammonia	29.86	Lbs/Day	29
August-10	Monthly Average Ammonia	30.18	Lbs/Day	29
February-11	Monthly Average Total Residual Chlorine	311.26	µg/L	83

Ecology and the City of Snohomish negotiated two Agreed Orders, which were signed in September 2010, to address the history of violations and the facility. Agreed Order # 7973 requires the City to implement Near-Term Improvements to the treatment plant by September 2012. The City's current construction project to add Integrated Fixed-film Media Modules to the lagoons was undertaken to comply with this order. The second order, Agreed Order #7974, requires the City to complete construction of a project that ensures long-term, sustained compliance with water quality standards. Under the terms of the order, the City must complete construction of this project by November 2016. Both orders contain stipulated penalties that the City must pay if they fail to meet specific milestones and conditions in the orders.

E. State environmental policy act (SEPA) compliance

State law exempts reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions 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. Table 8 below summarizes the approved design criteria for the Snohomish WWTP. Ecology approved the design criteria in the 1996 Wastewater Treatment Plant Expansion Design Documents, prepared by Vasey Engineering. Although the 2011 design documents for the Near-Term Wastewater Treatment Plant Improvement Project, prepared by Kennedy-Jenks, justify improvements in overall process efficiency at the facility, the plans retained the originally approved design parameters listed below as the basis for the upgraded facility design.

Table 8. Design Criteria for the Snohomish WWTP

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	2.8 MGD
BOD_5 Loading for Maximum Month	3,960 lb/day
TSS Loading for Maximum Month	4,400 lb/day

B. Technology-based effluent limits

Effluent concentration limits

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

The table below identifies technology-based limits for pH, fecal coliform, $CBOD_5$, and TSS, as listed in chapter 173-221 WAC. The fact sheet discusses development of water quality-based limits in Section III.C.

Table 9. Technology-based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
$CBOD_5$ (concentration)	25 mg/L	40 mg/L
	$CBOD_5$ effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS (concentration)	30 mg/L	45 mg/L
	TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
pH	Effluent pH value shall be between 6.0 and 9.0 standard units.	

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

Parameter	Average Monthly	Daily Maximum
Chlorine	83 μg/L	209 μg/L

Mass limits

Technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-130(11)(b). Ecology calculated the monthly and weekly average mass limits for $CBOD_5$ and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

where:

CL = Technology-based concentration limits listed in Table 10

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 10. Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
$CBOD_5$ Monthly Average	25	584
$CBOD_5$ Weekly Average	40	934
TSS Monthly Average	30	701
TSS Weekly Average	45	1,051

Total suspended solids

The previous permit included alternative technology-based limits for total suspended solids (TSS). Chapter 173-221-050 WAC allows Ecology to apply alternative limits for facilities operating waste stabilization ponds (lagoons) and for facilities treating flow from combined sewer systems. The alternative limits in the previous permit were as follows:

- No percent removal requirement for TSS during all months.
- Average Monthly Limit of 37 mg/L, 355 lbs/day during the summer season (July-October).
- Average Weekly limit of 56 mg/L, 537 lbs/day during the summer season.

Monitoring data from August 2006 to December 2011 demonstrate that the Snohomish WWTP can meet standard technology-based concentration and percent removal limits during all months. Therefore the proposed permit will not retain the existing alternate summer season concentration limits and will include the 85% removal requirement. Furthermore, Ecology will apply standard mass limits in Table 10 above for all months and will not retain the restrictive mass limits in the previous permit. Ecology does not consider this increase in mass loading as a relaxation of the limit because the previous limits used an assumed summer-season average flow that was not supported in design documents. Since the mixing zone modeling and evaluations of water quality limits discussed later in this fact sheet use the projected maximum month average design flow of 2.8 MGD for the critical (summer) season analyses, it is appropriate to use that flow rate as the basis for calculating the technology-based TSS mass limit.

Residual chlorine

Facilities using chlorine for disinfection must use enough chlorine to ensure adequate effluent disinfection while ensuring that the final residual amount does not present a toxicity risk to aquatic life. Ecology derived general technology-based monthly average limit for chlorine from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, *Wastewater Engineering, Treatment, Disposal and Reuse*, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/L chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/L.

In developing the previous permit for the Snohomish WWTP, Ecology determined that the general technology-based chlorine limit had a reasonable potential to exceed water quality standards. Chlorine limits listed in Table 9 above are water quality-based limits in the previous permit. Through the use of a dechlorination step the facility has demonstrated a capability of meeting the water quality-based limit. By policy Ecology will retain the previous limit in the proposed permit as a technology-based limit.

Technology standards for combined sewer overflows

The federal CSO Control Policy (59 FR 18688) requires entities with Combined Sewer Overflows to implement "Nine Minimum Controls" as technology-based performance standards for CSO discharges. The proposed permit requires the City to continue to comply with this technology standard. Further details of the Nine Minimum Controls are included in the overall CSO discussion found in Section V of this fact sheet.

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).

Ecology evaluates the potential impacts on surface water quality of each discharge authorized by an NPDES permit. This evaluation process uses numeric criteria developed to protect aquatic life and human health; narrative criteria for situations when specific numeric criteria does not exist or is not practical; and an antidegradation policy to restore and maintain the highest possible quality for surface waters of Washington. The following sections discuss the establishment of limits and special conditions necessary to ensure the discharge complies with the State's water quality standards. Detailed background information regarding the standards can be found in Appendix E. Information regarding technical calculations can be found in Appendix F.

Description of the receiving water

The Snohomish WWTP discharges to the Snohomish River at approximately river mile 12.1. Other point source discharges permitted nearby include Seattle Snohomish Mill Company and Riverside Topsoil, both with General Industrial Stormwater Permits. Ecology has issued a Phase II Municipal General Stormwater Permit to the City of Snohomish for stormwater discharges from the city and a Phase I Municipal General Stormwater Permit to Snohomish County for stormwater discharges from unincorporated areas nearby. Agricultural runoff also contributes significant nearby non-point sources of pollutants.

Ecology conducts long-term water quality monitoring of the Snohomish River at the Avenue D Bridge, located approximately one half mile upriver of outfall #001 (monitoring station #07A090). Table 11 below summarizes ambient conditions for conventional parameters measured during the critical season (July-October) between 2005 and 2010. The table also includes results from ambient metals monitoring conducted between October 2008 and August 2009 (bimonthly monitoring, 6 total samples).

Table 11. Ambient Background Data

Parameter	Average Value	90th Percentile Value	Geometric Mean Value
Temperature, 1-DADMax	14.8° C	18.3° C	--
Dissolved Oxygen	9.7 mg/L	8.8 mg/L (10th percentile)	--
Suspended Solids	6.4 mg/L	13 mg/L	--
pH (min/max range: 6.83-7.43)	7.23	--	--
Fecal Coliform	--	390/100 mL (Maximum Value)	35/100 mL
Total Ammonia-N	0.015 mg/L	0.019 mg/L	--
Nitrate + Nitrite N	0.164 mg/L	0.215 mg/L	0.156 mg/L
Total Phosphorus-P,	0.0172 mg/L	0.0343 mg/L	--
Alkalinity	14.4 mg/L as CaCO3	17 mg/L as CaCO3	--
Hardness	17.9 mg/L as CaCO3	23.4 mg/L as CaCO3	--
Arsenic	0.66 µg/L	0.8 µg/L	--
Chromium	0.28 µg/L	0.35 µg/L	--
Copper	0.87 µg/L	1.18 µg/L	0.83 µg/L
Lead	0.099 µg/L	0.191 µg/L	--
Mercury	0.0021 µg/L	0.0022 µg/L	0.002 µg/L
Nickel	0.38 µg/L	0.54 µg/L	0.36 µg/L
Zinc	3.2 µg/L	5.45 µg/L	--

Designated uses and surface water quality criteria

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

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified in Table 12.

Table 12. Freshwater Aquatic Life Uses and Associated Criteria

Salmonid Spawning, Rearing, and Migration	
Temperature Criteria – Highest 7-DAD MAX	17.5°C (63.5°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

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

Table 13. Recreational Uses and Associated Criteria

Recreational Use	**Criteria**
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.

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

Narrative criteria

Ecology has determined that compliance with technology-based effluent limits, water quality-based effluent limits, and whole effluent toxicity standards included in the proposed permit will ensure discharges from the Snohomish WWTP will not violate the state's narrative water quality standards.

Antidegradation policy

Washington's Antidegradation Policy establishes three tiers of protection 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.

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

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

- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter 173-201A WAC.

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

Water quality consideration for 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 the City of Snohomish continues to make progress towards meeting water quality goals for each CSO outfall in its system. Section V of this fact sheet contains more detailed information on these CSO requirements.

Water quality impairments

Ecology developed a TMDL for the Snohomish River Estuary in 1999 to address dissolved oxygen impairments in the basin. This TMDL, which EPA approved in 2002, placed waste load allocations on $CBOD_5$ and ammonia from several point sources, including the Snohomish WWTP's outfall. The proposed permit incorporates these waste load allocations as water quality based limits for $CBOD_5$ and ammonia-nitrogen in the form of a combined parameter NBOD+CBOD.

The Snohomish River in the vicinity of the discharge is listed as impaired for fecal coliform bacteria (listing #16696). Ecology has not completed a formal TMDL specific to this listing; however, a TMDL has been approved for tributaries to this river segment. Compliance with technology-based limits for fecal coliform bacteria and continued work to abate CSO discharges will ensure that the Snohomish WWTP does not contribute to further fecal coliform impairments.

Mixing zone authorization

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

With technology-based controls (AKART), predicted pollutant concentrations in the discharge may exceed water quality criteria for several parameters. Chapter 173-201A WAC allows Ecology to authorize a mixing zone for discharges to state waters. Ecology determined that the mixing zone authorized by the proposed permit complies with applicable constraints on geometric configuration, flow restriction, and other limitations imposed on mixing zones by state regulation. The following paragraphs explain facts Ecology used to determine the appropriate mixing zone constraints for the Snohomish WWTP outfall. Appendix E contains detailed discussions regarding the general conditions all discharges must comply with in order to receive a mixing zone authorization from Ecology.

Outfall 001 is equipped with a 24-foot long diffuser section consisting of four 12-inch diameter ports spaced 8-feet apart. Based on flow characteristics of the Snohomish River in the vicinity of the discharge, Ecology considers the waterbody as an "Estuary" due to significant tidal variations and tidally-influenced flow reversal.

Cosmopolitan Engineering evaluated the outfall and used modeling to predict dilution for the outfall with a 4-port diffuser. Table 14 summarizes critical conditions used in the modeling. The project used the UM3 subroutine of EPA's Plumes dilution model to predict acute mixing and used rivplume5 to predict chronic mixing. The modeling used the seven-day-average low river flow with a recurrence interval of twenty years (7Q20) for consistency with flows used in the Snohomish Estuary TMDL study.

Table 14. Critical Conditions Used to Model the Discharge

Critical Condition	Value
7Q20 River Flow	1,051 cfs
River depth at the 7Q20, Mean Lower Low Water (MLLW) period	14 feet
10^{th} percentile river velocity (used for acute mixing)	0.05 fps
90^{th} percentile river velocity (used for acute mixing)	0.63 fps
Median river velocity (used for chronic mixing)	0.25 fps
Manning roughness coefficient	0.03
Channel width	360 feet
Acute reflux factor	1.31%
Chronic reflux factor	0.56%
Salinity	0 part per thousand
Design maximum daily flow for acute mixing zone	6.55 MGD
Design maximum average monthly effluent flow for chronic and human health non-carcinogen	2.8 MGD
Ambient temperature	18° C
Effluent temperature	20.8° C
Source: City of Snohomish Amended Effluent Mixing Zone Study, Cosmopolitan Engineering, December 2000.	

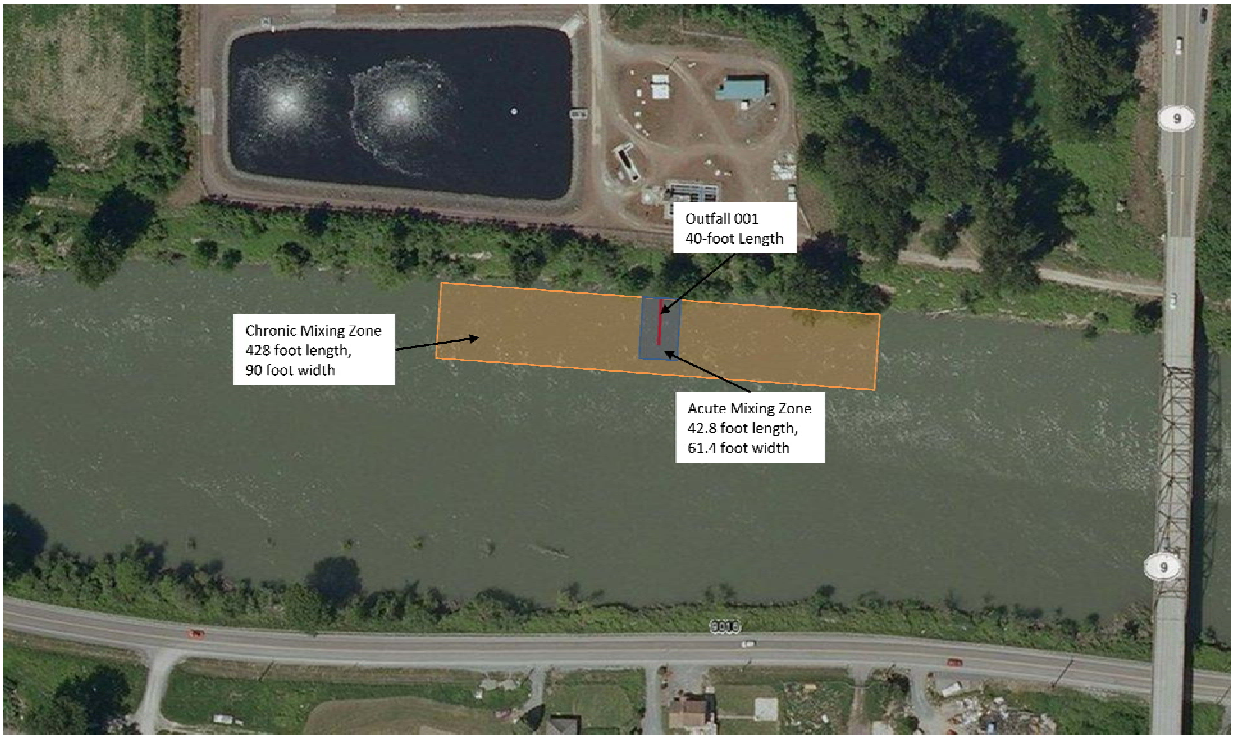
Chronic mixing zone--WAC 173-201A-400(7)(b) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports and may not occupy more than 25% of the width of the water body as measured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

chronic mixing zone for outfall 001 based on a 7Q20/MLLW depth of 14 feet and the river width of 360 feet. The mixing zone extends 214 feet upstream and downstream for the centerline of the outfall and 90 feet across the river channel from the north bank. The mixing zone extends from the top of the discharge ports to the water surface.

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, as measured independently from each port. Using this restriction the proposed permit authorizes an acute mixing zone that extends 21.4 feet upstream and downstream from the centerline of the outfall. Given the overall outfall and diffuser length of 40 feet and the diffuser design with one port discharging transversely across the channel, the authorized acute mixing zone extends 61.4 feet across the river channel from the north bank.

The following image illustrates the approximate size and location of the authorized mixing zones.

Figure 3. Mixing Zone Location



The proposed permit authorizes dilution factors for the authorized mixing zones, as shown in Table 15 below. Ecology used dilution values derived from modeling by Cosmopolitan Engineering, completed in December 2000.

Table 15. Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	11	28
Human Health, Carcinogen		28
Human Health, Non-carcinogen		28

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

Ecology determined the impacts of dissolved oxygen deficiency, nutrients, pH, fecal coliform, chlorine, ammonia, metals, other toxics, and temperature as described below, using the dilution factors in Table 15. 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--BOD_5 and Ammonia Effects--Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

The 1999 *Snohomish River Estuary Dissolved Oxygen TMDL* established waste load allocations (WLAs) for carbonaceous biochemical oxygen demand ($CBOD_5$) and ammonia for discharges occurring during the July-October critical season. Waste load allocations for the Snohomish WWTP are:

- 93 lbs/day $CBOD_5$
- 99 lbs/day Ammonia (N)

The previous permit included effluent limits on each parameter based on these WLAs. Because the combination of $CBOD_5$ and ammonia determine the effluent's total oxygen demand, different combinations of the two parameters can also meet the TMDL allocation. Ecology established a WLA exchange rate for Snohomish Estuary Dischargers of 2.1 pounds of $CBOD_5$ for each pound of ammonia (*Lake Stevens WWTP, WA0020893*). The total WLA can be expressed as a combined parameter, which Ecology calls "NBOD+CBOD", which is calculated as follows:

NBOD+CBOD lbs/day = (2.1*ammonia lbs/day) + $CBOD_5$ lbs/day

WLA = (2.1 * 99) + 93 = 301 lbs/day NBOD+CBOD

The WLA is the maximum daily limit (MDL). According to federal NPDES regulations, all permit limits must be expressed as both average monthly and maximum daily limits. The average monthly limit (AML) is calculated according to the method in EPA's Technical Support Document for Water Quality-based Toxics Control (1991). See Appendix F for detailed calculations. The AML calculation is affected by effluent variability and number of samples per month. Ecology calculated the average monthly limit based on 8 sampling events per month (2 per week) and a calculated coefficient of variation (CV) of 0.51. Average monthly and daily maximum limits for the proposed permit are:

MDL = WLA = 301 lbs/day NBOD+CBOD

AML = 146 lbs/day NBOD+CBOD

The proposed permit will continue to enforce technology-based limits for $CBOD_5$ concentration during the critical season.

pH--Ecology modeled the impact of the effluent pH on the receiving water using the calculations from EPA, 1988, and the chronic dilution factor in Table 15. Modeling evaluates pH based on

two points of criteria: final pH at the edge of the mixing zone and amount of change for ambient condition. The analysis assumes discharges at each end of the technology-based limit of 6.0 and 9.0 and the average ambient pH of 7.23.

As shown in the detailed model results in *Appendix F*, modeling predicts that discharges at a pH of 6.0 will violate the pH criteria for the receiving water by causing a change from background of more than 0.5 standard units. Modeling does not predict violations when effluent pH is 9.0. Therefore, the proposed permit includes water quality-based effluent limits for pH of 6.2 to 9.0.

Fecal Coliform--Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml, an ambient concentration of 35 organisms per 100 ml and a dilution factor of 28.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. Modeling predicts concentrations will increase to 48 organisms per 100 ml at the edge of the chronic mixing zone. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

Turbidity—Ambient data from Ecology's long-term monitoring station 07A090 indicates that a linear correlation exists between TSS concentrations and turbidity measurements in the Snohomish River. Data shows that each NTU of turbidity equates to a TSS concentration of approximately 2.08 mg/L. Using this assumed correlation and simple mixing within the chronic mixing zone, Ecology evaluated the reasonable potential for technology-based TSS limits to violate turbidity standards. The simple mixing analysis predicts that an effluent TSS concentration of 45 mg/L will cause TSS concentration to increase by 1.1 mg/L at the edge of the chronic mixing zone. This increase equates to an increase of 0.5 NTU in turbidity. Since this increase is lower than the 5 NTU increase allowance in the water quality standards, the technology-based limits for TSS are sufficient to protect water quality in the vicinity of the discharge.

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.

Appendix F contains detailed explanations of each element. Ecology evaluates each criterion noted above independently to determine reasonable potential and to derive appropriate permit limits, if necessary.

Annual summer maximum, and incremental warming criteria--Ecology evaluated 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 summer season. State Water Quality Standards do not include Supplemental Spawning Criteria for the Snohomish River in the vicinity of the discharge. The evaluation used the calculated 95th percentile of summer 7-Day Average of Daily Maximum (7DADMax) effluent temperature listed in Table 4. Continuous ambient temperature monitoring was unavailable to calculate ambient 7DADMax. This analysis assumes the 90th percentile of 1-day maximum ambient temperature of 18.3°C is consistent with the ambient 7DADMax. As shown in Appendix F, no reasonable

potential exists to exceed the temperature criterion and the incremental increase for this discharge is within the allowable amount. Therefore, the proposed permit does not include a temperature limit.

Protection against acute effects--A discharge does not pose a reasonable potential to risk acute effects when it meets the following conditions:

- Effluent temperature must not exceed 33°C or cause ambient temperature to exceed 33°C two seconds after discharge.
- Does not increase ambient temperature more than 0.3°C when receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.
- Does not cause temperature to warm more than 0.3°C above 17.5°C at locations where eggs are incubating.

Data presented in this fact sheet show that discharges from the Snohomish WWTP comply with each of these criteria. Therefore, the proposed permit does not require a limit to protect against acute effects.

Pollutants toxic to aquatic life--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 City's permit application identified that the discharge contains pollutants with water quality standards for the protection of aquatic life. Those pollutants include: ammonia, chlorine, copper, silver, zinc, arsenic, lead, mercury, and nickel. As noted in Part III.B of this fact sheet (Technology-based Limits), the Snohomish WWTP has demonstrated the ability of meeting the previous water quality-based limit for chlorine and therefore, Ecology has retained that limit in the proposed permit as a performance-based technology standard for the facility. That limit remains sufficiently protective of water quality in the receiving water. Ecology conducted a reasonable potential analysis (See Appendix F) on the remaining parameters to determine whether it would require effluent limits in this permit. The analysis used effluent concentrations based on monitoring done by the City of Snohomish and ambient background concentrations listed in Table 11. The results show that the discharge poses no reasonable potential to exceed the water quality criteria at the critical condition and, therefore, the permit does not require effluent limits for ammonia, copper, silver, zinc, arsenic, lead, mercury, and nickel. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Pollutants of concern to human health--Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

The City's permit application identified that the discharge contains pollutants with human health-based water quality standards. Those pollutants include copper, antimony, mercury, nickel, bis(2-ethylhexyl) phthalate, chloroform, dichlorobromethane, 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 results show that the discharge poses no reasonable potential to exceed the human health-based water quality criteria at the critical condition and, therefore, the permit does not require effluent limits for these pollutants.

D. 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* (http://www.ecy.wa.gov/biblio/9580.html), which is referenced in the permit. Ecology recommends that City of Snohomish send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute or chronic toxicity. The proposed permit will not include an acute or chronic WET limit. The Snohomish WWTP 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 Snohomish may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and/or chemical analyses after the process or material changes have been made. Ecology recommends that the Permittee check with it first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

E. 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

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

F. Ground water quality limits

The ground water quality standards (chapter 173-200 WAC) protect beneficial uses of ground water. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100). The Snohomish WWTP does not discharge wastewater to the ground. The proposed permit does not contain limits to protect ground water, nor does it authorize discharges to groundwater.

G. Comparison of effluent limits with the previous permit issued on July 31, 2006

Table 16. Comparison of Previous and Proposed Effluent Limits for Outfall 001

	Previous Effluent Limits:		**Proposed Effluent Limits:**	
Parameter	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Carbonaceous Biochemical Oxygen Demand (5-day) Concentration Limits	25 mg/L 85% Removal	40 mg/L	25 mg/L 85% Removal	40 mg/L
$CBOD_5$ Mass Limits *Effective Nov.-June Only*	584 lbs/day	934 lbs/day	584 lbs/day	934 lbs/day
Total Suspended Solids *Effective Nov-June Only*	30 mg/L 701 lbs/day	45 mg/L 1,051 lbs/day	30 mg/L 701 lbs/day 85% Removal	45 mg/L 1,051 lbs/day
Total Suspended Solids *Effective July-Oct Only*	37mg/L 355 lbs/day	56 mg/L 537 lbs/day	Limits above now apply during all months.	
Parameter	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	200/100 ml	400/100 ml	200/100 ml	400/100 ml
Parameter	**Limit**		**Limit**	
pH	Within the range of 6.0 to 9.0		Within the range of 6.2 to 9.0	
Parameter	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Total Residual Chlorine	83 µg/L	209 µg/L	83 µg/L	209 µg/L
$CBOD_5$, Seasonal mass limit *Effective July-Oct. Only*	58 lbs/day	93 lbs/day	N/A	N/A
Total Ammonia (as N), Seasonal mass limit, *Effective July-Oct. Only*	29 lbs/day	99 lbs/day	N/A	N/A
NBOD+CBOD, Seasonal Mass Limit *Effective July-Oct. Only*	N/A	N/A	146 lbs/day	301 lbs/day

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.

A. Lab accreditation

Ecology requires facilities to 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). The laboratory at the Snohomish WWTP holds an accreditation (#M509-11) for the following parameters:

Table 17. Accredited Parameters

General Chemistry	
parameter name	**method description**
Alkalinity as CaCO3	SM 2320 B
Ammonia as N	SM 19/20 4500-NH3 D
Biochemical oxygen demand	SM 5210 B
pH	SM 4500-H
Solids, Total Suspended	SM 2540 D
Total residual chlorine	SM 4500-Cl G
Microbiology	
parameter name	**method description**
Fecal coliform-count	SM 9222 D

B. 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 92-09) for sewage lagoons with design flows greater than 0.5 MGD. The monitoring schedule also includes monitoring of effluent ammonia and temperature in addition to standard parameters (flow, pH CBOD, TSS, fecal coliform and chlorine). The proposed permit does not include monitoring for copper, silver and zinc included in the previous permit since the facility has demonstrated no reasonable potential to violate water quality standards for these parameters.

Ecology currently requires all domestic wastewater facilities to conduct additional monitoring of nutrients. Data from this monitoring may support future work in evaluating treatment technology standards or in assessing the need for revised water quality-based limits.

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.

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 Snohomish to:

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

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 Snohomish takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

Special Condition S.5.G requires the City of Snohomish to update the wastewater treatment plant's operation and maintenance manual to incorporate new systems installed as part of the Near-Term Wastewater Treatment Plant Improvement Project. The revised manual must fulfill the requirements of WAC 173-240-080 and RCW 90.48.110. Section G1-4.4 of the 2008 Edition of the *Criteria for Sewage Works Design* (Orange Book, Ecology Publication #98-37 WQ) provides extensive guidance on recommended contents and formats for a functional O&M manual. Ecology has an electronic version of the most recent update available at the following web address: http://www.ecy.wa.gov/biblio/9837.html.

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 Snohomish 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 the City of Snohomish 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 Snohomish Health District.

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 of their 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 initially 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 proposed permit requires the City of Snohomish to submit an amendment of its CSO reduction plan in conjunction with its application for permit renewal. The amendment must include an assessment of the effectiveness of the CSO reduction plan, a re-evaluation of CSO project priorities, and a list of projects to be completed in the next five years. In addition, the City of Snohomish must identify in the amendment any newly corrected or controlled CSOs that meet the state's standard of one untreated discharge per year per CSO.

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.

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.

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.

CSO monitoring

The proposed permit requires the City of Snohomish to monitor the volume and duration of each CSO discharge event at each CSO outfall identified in Table 1 and the amount of precipitation associated with each event.

Annual CSO report

The City of Snohomish must submit annual reports on their CSO system 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. The proposed permit specifies that annual reports must report on a calendar-year basis (January-December).

The City of Snohomish must also assess in its annual reports and CSO reduction plan amendment 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 requires post-construction monitoring to verify 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 proposed permit requires the City of Snohomish to develop a post-construction monitoring plan by August 1, 2015 and requires the City to begin compliance testing by January 1, 2016. Guidance on post-construction monitoring is available from EPA at the following web location: http://cfpub.epa.gov/npdes/home.cfm?program_id=5

The City of Snohomish completed construction of their main CSO reduction project in 2011. This project, which was identified in their 2005 CSO Reduction Plan Update, was designed to reduce CSOs to an average of one untreated discharge per year, per outfall. The Post Construction Monitoring requirements in the proposed permit will validate that the project meets the intended performance standard along with demonstrating compliance with state water quality standards.

G. Outfall evaluation

The existing permit required the City of Snohomish to conduct an outfall inspection to evaluate the physical condition of the pipe and diffuser. That inspection report identified the potential for sediment to build up around the diffuser ports and noted debris had settled on the upstream side of the outfall. Based on the findings Ecology believes re-inspection during the upcoming permit cycle warranted. Therefore the proposed permit requires the City to conduct an outfall inspection and submit a report detailing the findings of that inspection (Special Condition S. 9). 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. The evaluation also requires the City to develop a correction plan if the inspection reveals increased sediment deposition near the diffuser ports.

H. 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 ground waters, 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

BHC Consultants

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2011. *Operations and Maintenance Manual, City of Snohomish CSO Pump Station.*

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2000. *City of Snohomish Amended Effluent Mixing Zone Study.*

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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.

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2006. *City of Snohomish Wastewater Staffing Evaluation Report*.

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2005. *City of Snohomish Wastewater System Plan: General Sewer & Wastewater Facilities Plan*.

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Vasey Engineering

1998. *City of Snohomish Wastewater Treatment Plant Operations and Maintenance Manual*.

Washington State Department of Ecology

November 2010. *Permit Writer's Manual*. Publication Number 92-109 (http://www.ecy.wa.gov/biblio/92109.html)

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information
(http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

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1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A--Public Involvement Information

Ecology proposes to reissue a permit to the City of Snohomish Wastewater Treatment Plant. 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 27, 2012, in *The Everett Herald* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System 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 http://www.ecy.wa.gov/biblio/0307023.html.

You may obtain further information from Ecology by telephone, (425) 649-7037, 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 Shawn McKone, PE.

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 ground water from the point of compliance where compliance with the ground water standards is measured. It may be established in the ground water 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 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 ground water at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent

or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

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

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

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

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

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

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

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

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

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

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

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

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

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

Detection limit -- See Method Detection Level.

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, ground water, 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 ground water at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a ground water 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.

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

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

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

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

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

- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

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

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

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

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

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

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

Method detection level (MDL) -- 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.

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 ground water 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 ground water as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

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

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

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

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

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

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

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

Significant industrial user (SIU) --

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

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

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

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

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

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting

Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

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

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

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

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

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

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

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

Total 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—Monitoring Data Summary

The following tables and graphs summarize monitoring data reported by the Snohomish WWTP to Ecology in monthly Discharge Monitoring Reports and other periodic monitoring reports from August 2006 to December 2011.

Facility: Snohomish WWTP
Permit No: WA0029548

Influent

Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	CBOD, mg/L	CBOD, mg/L	CBOD, ppd	CBOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd
	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max	Monthly Ave	Monthly Max
August-06	0.7	1.2	308	380	1878	2,635	259.0	300.0	1473	2,147	231	384	1399	3,747
September-06	0.8	1.4	240	280	1420	1,540	221.0	270.0	1523	2,183	211	304	1426	1,819
October-06	0.8	2.5	215	260	1243	1,518	203.0	240.0	1361	2,642	231	308	1506	2,349
November-06	2.3	4.6	146	320	1797	2,081	109.0	260.0	1660	2,032	114	244	1802	3,309
December-06	2.1	5.1	103	150	1695	2,417	90.0	130.0	1723	2,542	108	290	1806	2,881
January-07	1.7	3.9	141	200	1865	2,395	123.0	180.0	1589	2,265	150	226	2031	3,461
February-07	1.2	1.9	186	232	1713	1,822	155.0	230.0	1533	2,187	154	252	1459	1,913
March-07	1.7	2.9	116	150	1563	1,851	108.0	140.0	1393	1,728	110	154	1533	2,550
April-07	1.1	2.1	173	210	1554	1,814	169.0	200.0	1478	1,775	153	246	1366	2,298
May-07	0.8	1.6	182	224	1235	1,438	187.0	270.0	1265	1,713	197	328	1377	2,708
June-07	0.8	1.4	253	280	1732	2,052	246.0	310.0	1617	1,836	195	260	1308	1,995
July-07	0.7	1.7	280	340	1606	1,957	261.0	320.0	1547	2,252	197	296	1155	1,654
August-07	0.8	1.5	288	350	1785	1,868	250.0	290.0	1495	1,718	181	226	1081	1,263
September-07	0.8	1.8	330	440	2143	2,569	270.0	370.0	1638	2,160	210	384	1274	2,242
October-07	1.0	1.9	242	290	1828	2,226	219.0	300.0	1745	2,665	158	218	1275	1,818
November-07	1.2	2.4	188	240	1695	1,851	173.0	230.0	1602	1,725	174	310	1608	2,430
December-07	2.4	7.9	90	181	1504	1,811	95.0	163.0	1564	1,964	85	148	1435	2,734
January-08	1.7	2.9	155	209	2075	2,507	130.0	172.0	1725	2,089	110	186	1477	2,263
February-08	1.2	2.0	183	255	1814	1,978	159.0	201.0	1570	1,768	129	174	1278	1,437
March-08	1.4	2.4	166	191	1864	2,135	149.0	196.0	1607	1,975	132	175	1422	2,148
April-08	1.5	3.0	139	179	1529	1,777	132.0	160.0	1421	1,679	115	170	1237	1,761
May-08	1.0	1.8	216	255	1882	2,148	200.0	262.0	1770	2,005	150	202	1379	1,795
June-08	1.1	3.6	253	325	2091	2,629	215.0	303.0	2050	2,543	152	232	1501	3,027
July-08	0.8	1.3	261	312	1556	1,795	252.0	350.0	1555	2,072	187	226	1166	1,594
August-08	0.8	1.7	262	314	1759	2,566	207.0	260.0	1440	1,994	218	326	1478	2,043
September-08	0.8	1.1	309	461	1872	2,730	264.0	416.0	1605	2,463	187	254	1139	1,504
October-08	0.8	1.5	255	279	1881	2,510	234.0	266.0	1623	2,082	205	258	1421	2,358
November-08	1.8	5.3	154	200	1885	2,187	143.0	184.0	1680	2,026	121	164	1416	1,669
December-08	1.7	3.7	157	207	1700	1,925	146.0	241.0	1577	1,889	136	262	1475	2,491
January-09	1.9	5.2	140	219	1764	1,997	138.0	210.0	1756	2,371	110	152	1639	3,881
February-09	0.9	1.2	216	233	1677	1,788	203.0	220.0	1601	1,791	180	230	1424	1,861
March-09	1.4	3.4	181	236	2030	3,353	171.0	215.0	1635	2,452	145	196	1584	3,632
April-09	1.4	4.5	179	221	1660	1,935	168.0	194.0	1497	1,719	140	186	1252	1,642
May-09	1.1	2.1	183	220	2116	3,112	171.0	220.0	1789	2,864	140	160	1507	2,829
June-09	0.7	0.9	277	296	1656	1,802	268.0	324.0	1590	2,000	192	216	1141	1,291
July-09	0.7	1.0	316	335	1772	1,900	301.0	334.0	1656	1,894	232	326	1268	1,604
August-09	0.7	1.3	288	330	1600	1,734	274.0	304.0	1591	1,821	225	442	1313	2,322
September-09	0.8	1.3	295	358	1956	2,941	271.0	389.0	1657	2,174	200	242	1247	2,157
October-09	1.2	2.8	218	269	1608	2,154	197.0	260.0	1642	2,314	171	216	1440	2,018
November-09	2.2	4.7	116	184	1749	1,892	130.0	282.0	1765	2,375	89	148	1254	1,464
December-09	1.3	2.4	175	212	1949	2,174	154.0	199.0	1798	3,189	127	178	1445	2,073
January-10	1.7	4.2	131	196	1824	2,030	132.0	189.0	1789	2,420	140	372	1801	3,506
February-10	1.3	2.4	198	266	1925	2,640	146.0	190.0	1437	1,866	141	234	1389	2,322
March-10	1.2	2.3	185	205	1617	1,812	173.0	215.0	1487	1,825	144	196	1239	1,635
April-10	1.4	2.3	168	224	2147	3,465	157.0	207.0	1894	3,256	121	154	1470	2,764
May-10	1.3	2.9	199	241	1728	1,876	172.0	216.0	1663	2,006	147	186	1409	1,789
June-10	1.5	3.0	169	260	1868	2,342	124.0	168.0	1595	1,960	128	176	1583	2,605
July-10	0.7	0.8	244	269	1452	1,593	219.0	283.0	1262	1,652	207	260	1179	1,388
August-10	0.8	4.0	304	390	1694	2,212	256.0	306.0	1411	1,684	215	260	1188	1,431
September-10	1.1	1.9	182	255	1508	1,769	181.0	256.0	1431	1,708	168	278	1324	1,855
October-10	1.0	1.7	233	275	1621	1,789	211.0	235.0	1473	1,616	181	248	1264	1,613
November-10	1.4	2.5	144	193	1717	1,888	136.0	196.0	1641	1,888	125	182	1516	1,965
December-10	2.0	5.8	121	163	1974	2,968	123.0	191.0	1926	2,669	118	264	2025	5,637
January-11	2.2	5.0	125	195	2808	6,649	99.0	169.0	1628	2,264	97	172	1791	3,442
February-11	1.5	2.8	132	163	1653	1,757	131.0	158.0	1562	1,660	106	132	1279	1,771
March-11	2.3	6.1	143	216	2581	4,063	125.0	234.0	2395	3,193	110	180	2190	3,541
April-11	1.8	4.0	126	167	1662	1,755	128.0	167.0	1702	1,928	109	216	1412	2,270
May-11	1.5	3.1	159	210	1706	1,856	160.0	229.0	1746	2,284	137	184	1498	2,066
June-11	1.2	2.5	244	320	2357	3,453	217.0	270.0	2116	2,992	172	198	1679	2,527
July-11	0.9	1.1	271	420	1937	2,872	251.0	380.0	1766	2,599	194	248	1362	1,572
August-11	0.8	0.9	287	330	1798	2,119	274.0	304.0	1718	1,927	219	270	1373	1,711
September-11	0.8	1.1	290	331	1919	2,070	316.0	404.0	2038	2,527	231	282	1493	1,764
October-11	0.9	1.7	281	344	1829	2,209	246.0	280.0	1671	1,811	202	254	1379	1,589
November-11	1.4	5.9	236	300	1986	2,546	204.0	288.0	2112	2,149	171	236	1964	3,838
December-11	1.0	1.6	225	261	1960	2,266	218.0	288.0	1842	2,070	186	238	1634	2,580
AVE:	1.2	2.7	205.7	262	1,799.6	2,269	187.9	249.0	1,647.9	2,139	160.3	236	1,449.0	2,296
MIN:	0.7	0.8	90.0	150	1,235.0	1,438	90.0	130.0	1,262.0	1,616	85.0	132	1,081.0	1,263
MAX:	2.4	7.9	330.0	461	2,808.0	6,649	316.0	416.0	2,395.0	3,256	232.0	442	2,190.0	5,637
Median	1.2	2.4	188.0	255	1,772.0	2,070	173.0	240.0	1,623.0	2,032	153.0	232	1,421.0	2,073
95th Percentile	2.2	5.7	307.2	388	2,146.2	3,433	273.4	378.0	2,047.6	2,966	229.8	363	1,932.4	3,724
85% DESIGN:	2.4				3,366								3,740	
DESIGN:	2.8				3,960								4,400	

approaching design limits (85%)
exceeds design limits

Facility: Snohomish WWTP
Permit No: WA0029548

Effluent

Date	Flow, MGD	Flow, MGD	CBOD, mg/L	CBOD, mg/L	CBOD, ppd	CBOD, ppd	CBOD, ppd	CBOD, % Removal	Ammonia, mg/l (as N)	Ammonia, mg/l (as N)	Ammonia, ppd (as N)	Ammonia, ppd (as N)
	Monthly Ave	Monthly Max	Monthly Ave	Wkly Ave	Monthly Ave	Wkly Ave	Monthly Max	Ave	Monthly Ave	Monthly Max	Monthly Average	Monthly Max
August-06	0.8	1.0	20.6	25.0	**135**	151	**187.0**	92.1	16	20	**106.0**	**155.0**
September-06	0.9	1.7	23.4	29.5	**148**	216	**295.0**	89.0	21	23	**141.0**	**278.0**
October-06	1.0	2.9	17.0	21.5	**109**	133	**135.0**	92.0	16	18	**105.0**	**126.0**
November-06	2.8	5.4	11.4	14.0	225	316	348.0	89.0	13	21	217.0	341.0
December-06	2.4	4.4	13.0	19.5	290	532	605.0	86.0	11	15	244.0	440.0
January-07	2.0	3.2	11.2	14.0	131	247	300.0	90.9	12	16	168.0	220.0
February-07	1.4	1.9	13.0	14.0	159	205	235.0	91.6	22	24	260.0	367.0
March-07	2.1	3.0	8.4	11.5	140	178	221.0	92.2	15	17	265.0	393.0
April-07	1.3	2.1	4.6	6.0	93	70	88.0	96.4	17	20	190.0	250.0
May-07	1.0	1.5	10.2	14.5	84	110	150.0	94.5	26	29	222.0	282.0
June-07	1.0	1.4	16.5	18.0	127	141	170.0	93.3	13	26	102.0	236.0
July-07	0.7	1.0	11.1	13.0	**61**	92	**135.0**	95.7	4	6	21.0	30.0
August-07	0.9	1.1	13.2	15.5	**94**	99	**121.0**	94.7	4	4	27.0	37.0
September-07	0.8	1.0	14.1	16.0	**98**	115	**121.0**	94.8	3	4	24.0	28.0
October-07	1.1	1.9	14.3	18.0	**126**	248	**254.0**	93.5	0	2	4.0	14.0
November-07	1.6	2.1	12.6	14.0	178	222	255.0	92.7	11	16	162.0	270.0
December-07	2.7	7.4	12.1	18.5	364	898	1,103.0	87.2	11	14	309.0	815.0
January-08	2.0	2.7	10.2	12.5	181	250	276.0	92.2	13	15	234.0	315.0
February-08	1.5	2.0	9.4	10.0	116	166	168.0	92.6	16	16	190.0	260.0
March-08	1.6	2.4	11.0	12.5	148	161	186.0	92.6	20	22	264.0	287.0
April-08	1.8	2.8	9.7	11.0	150	169	178.0	89.4	15	16	242.0	335.0
May-08	1.3	1.8	9.0	10.5	99	139	151.0	95.5	21	23	231.0	329.0
June-08	1.1	3.6	9.3	11.0	85	123	171.0	95.7	7	23	68.0	290.0
July-08	1.1	2.5	5.5	8.0	48	107	**115.0**	97.8	4	7	**31.0**	49.0
August-08	0.8	1.0	6.3	10.5	42	69	86.0	97.0	7	9	**46.0**	57.0
September-08	0.9	1.0	10.1	13.5	**68**	84	92.0	96.2	1	4	8.0	32.0
October-08	0.9	1.2	10.3	19.0	**82**	133	**133.0**	95.6	0	1	3.0	4.0
November-08	2.5	8.4	13.0	16.0	209	289	321.0	90.9	6	11	101.0	162.0
December-08	1.8	2.8	14.3	23.0	232	392	422.0	90.2	20	39	358.0	910.0
January-09	2.2	4.3	8.3	10.5	151	292	357.0	94.0	9	12	161.0	321.0
February-09	0.9	1.2	9.6	12.5	82	103	107.0	94.9	21	25	175.0	201.0
March-09	1.6	3.0	10.6	19.5	152	273	275.0	93.8	24	30	319.0	442.0
April-09	1.7	3.2	10.6	12.5	128	153	164.0	91.4	15	18	183.0	232.0
May-09	1.3	1.8	7.8	9.0	85	107	129.0	95.5	22	24	246.0	318.0
June-09	0.8	1.0	13.3	18.5	87	121	135.0	95.0	27	33	183.0	233.0
July-09	0.7	0.8	8.8	12.0	48	77	81.0	97.1	9	13	**48.0**	82.0
August-09	0.7	0.9	4.4	5.5	22	27	32.0	98.4	9	12	**50.0**	82.0
September-09	0.9	1.2	3.4	4.0	26	40	41.0	98.7	7	10	**51.0**	62.0
October-09	1.4	4.7	4.3	5.5	57	120	**127.0**	97.8	2	2	17.0	25.0
November-09	2.6	4.1	5.0	6.5	114	156	170.0	96.1	9	14	239.0	418.0
December-09	1.5	2.0	11.6	26.0	168	403	408.0	92.5	13	15	164.0	251.0
January-10	1.9	3.7	11.4	24.0	185	385	419.0	91.4	15	19	249.0	405.0
February-10	1.5	2.3	5.6	7.0	70	75	88.0	95.1	16	19	224.0	354.0
March-10	1.3	1.7	5.0	6.0	56	70	81.0	97.1	22	25	245.0	330.0
April-10	1.6	2.3	7.0	8.0	102	138	139.0	94.2	21	23	308.0	418.0
May-10	1.5	2.5	5.6	6.5	62	92	95.0	96.7	21	26	226.0	302.0
June-10	1.8	3.0	7.0	8.5	109	167	196.0	94.4	17	24	262.0	459.0
July-10	0.5	1.0	5.4	7.0	19	27	28.0	97.5	7	12	**30.0**	86.0
August-10	0.8	3.6	3.8	4.5	21	26	27.0	98.5	5	6	**30.0**	39.0
September-10	1.4	1.8	4.5	5.0	51	63	65.0	97.5	2	4	20.0	46.0
October-10	1.0	1.4	5.0	5.5	41	44	45.0	97.6	1	2	10.0	21.0
November-10	1.4	2.7	7.1	10.5	88	150	158.0	94.8	3	7	37.0	98.0
December-10	2.5	8.8	6.1	12.5	108	216	228.0	95.0	11	13	197.0	289.0
January-11	3.0	9.6	5.4	6.0	99	146	184.0	94.6	11	14	197.0	243.0
February-11	1.7	2.4	5.9	7.0	92	117	119.0	94.1	13	15	205.0	284.0
March-11	2.5	7.3	5.7	7.5	120	217	242.0	95.4	13	16	290.0	779.0
April-11	2.1	3.2	5.9	8.0	99	121	133.0	94.1	12	15	215.0	320.0
May-11	1.7	2.4	6.6	7.5	87	105	119.0	95.9	15	18	206.0	280.0
June-11	1.2	1.7	7.0	9.5	65	99	110.0	96.8	2	3	13.0	25.0
July-11	0.8	1.1	4.5	5.0	30	35	35.0	98.2	2	2	12.0	15.0
August-11	0.8	0.9	4.5	6.0	27	39	53.0	98.4	2	3	14.0	21.0
September-11	0.7	0.8	5.4	7.0	33	46	47.0	98.3	1	1	5.0	8.0
October-11	0.8	1.2	4.0	5.0	28	31	33.0	98.4	1	1	5.0	6.0
November-11	1.3	3.5	9.0	11.0	81	131	141.0	95.6	11	18	106.0	247.0
December-11	1.0	1.4	9.6	11.0	73	95	99.0	95.6	16	21	123.0	193.0
AVE:	1.4	2.7	9.1	12.0	106	162	183.6	94.5	12	15	144.7	234.6
MIN:	0.5	0.8	3.4	4.0	19	26	27.0	86.0	0	1	3.0	4.0
MAX:	3.0	9.6	23.4	29.5	364	898	1103.0	98.7	27	39	358.0	910.0
Median	1.3	2.1	9.0	11.0	94	131	139.0	94.9	12	15	164.0	247.0
95th Percentile	2.6	7.3	16.1	23.8	222	391	416.8	98.4	22	28	304.4	455.6
LIMIT (July-Oct):			25	40	58		93	85			29	99.0
LIMIT (Nov-June):			25	40	584	934		85				

Reported Values Exceed Permit Limits

Facility: Snohomish WWTP
Permit No: WA0029548

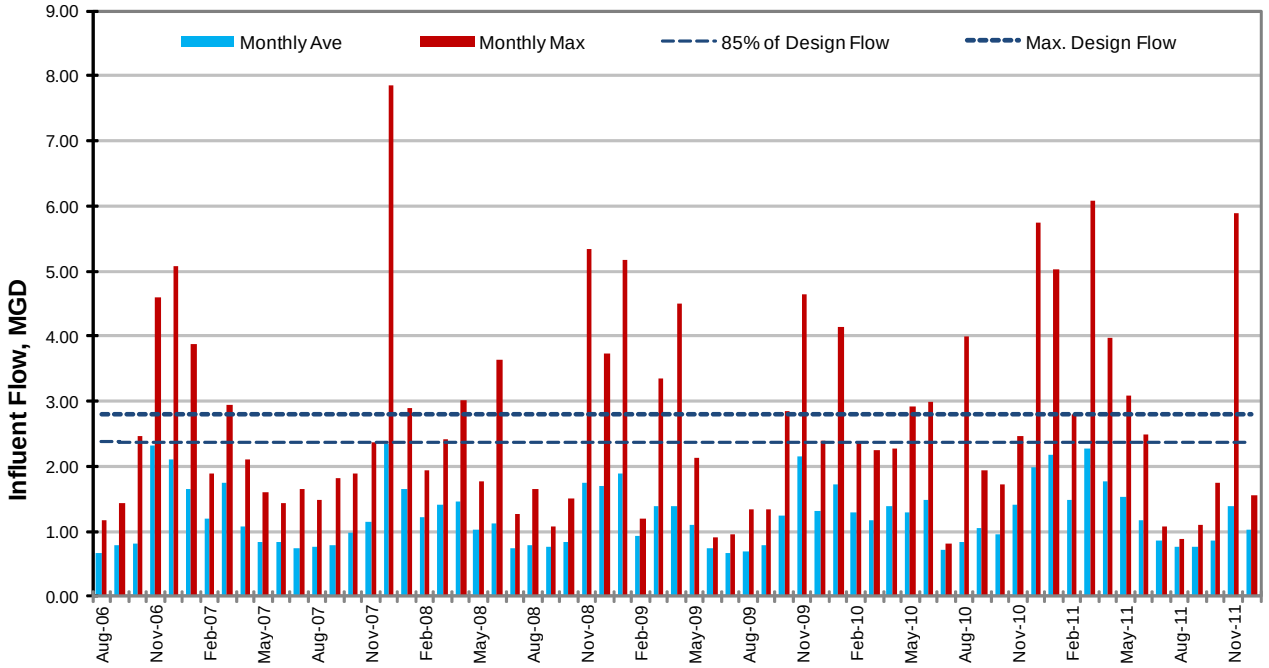
Effluent

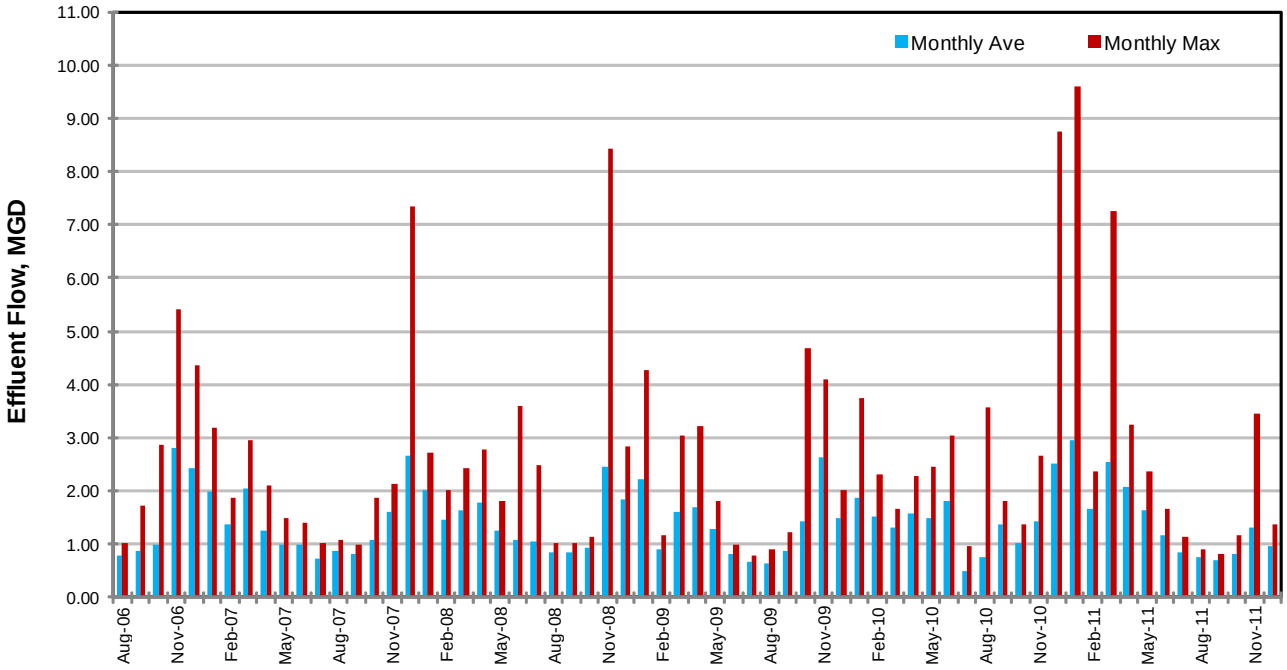
Date	TSS, mg/L Monthly Ave	TSS, mg/L Wkly Ave	TSS, ppd Monthly Ave	TSS, ppd Wkly Ave	TSS, % Removal Ave	PH Min	PH Max	Fecal Coliform, #/100 ml GEM	Fecal Coliform, #/100 ml GM7	Chlorine, µg/L Monthly Ave	Chlorine, µg/L Daily Max
August-06	23	28	151	203	90	6.6	7.36	1.12	1.73	0.00	0
September-06	22	26	154	278	90	6.5	7.27	1.00	1.00	0.03	1
October-06	18	23	116	139	92	6.4	7.02	1.12	1.73	11.30	**345**
November-06	12	17	231	417	90	6.2	7.09	11.25	**1333.00**	4.50	116
December-06	13	17	301	511	88	6.2	7.04	4.80	18.70	0.68	18
January-07	13	15	204	290	91	6.7	7.26	2.48	20.37	0.03	1
February-07	19	22	209	259	88	7.0	8.95	1.10	1.70	1.14	23
March-07	10	16	186	363	91	7.0	7.42	1.30	1.70	0.03	1
April-07	4	6	48	90	97	6.9	7.55	1.26	2.00	0.00	0
May-07	8	12	63	88	96	7.1	7.76	1.00	1.00	0.00	0
June-07	20	27	153	202	90	6.5	7.87	19.30	**453.00**	0.10	2
July-07	23	27	126	137	88	6.4	7.95	11.40	42.90	0.06	2
August-07	24	28	172	214	87	6.3	8.08	6.90	48.70	1.70	22
September-07	24	26	163	176	89	6.5	7.17	10.90	19.50	0.00	0
October-07	25	32	225	442	84	6.2	6.89	**243.00**	**664.00**	5.50	47
November-07	17	22	244	256	90	6.6	7.48	6.30	**583.00**	0.83	9
December-07	8	11	238	532	91	6.8	7.47	9.30	219.00	0.00	0
January-08	10	13	186	258	91	6.5	7.57	1.40	2.50	0.00	0
February-08	10	12	128	191	92	6.3	7.12	1.00	1.40	0.41	11
March-08	8	11	99	133	94	6.5	7.00	2.20	8.90	0.00	0
April-08	5	6	76	109	96	6.2	6.86	1.20	2.50	0.03	1
May-08	8	9	91	125	95	6.4	7.34	1.10	1.40	2.71	44
June-08	16	21	120	154	90	6.0	7.37	58.10	**894.00**	2.00	18
July-08	8	11	67	141	96	6.5	7.23	1.30	3.50	0.17	3
August-08	8	10	52	62	97	6.6	7.26	1.00	1.00	0.03	1
September-08	12	15	81	97	94	6.2	7.21	20.50	63.90	3.30	24
October-08	20	28	155	211	90	6.1	7.05	3.80	13.90	5.30	15
November-08	18	25	298	499	85	6.3	7.11	74.20	**437.00**	6.62	33
December-08	19	26	282	443	86	6.2	7.06	1.70	13.30	3.00	27
January-09	9	10	163	270	92	6.2	6.86	1.60	3.30	13.70	**375**
February-09	12	15	103	120	93	6.5	7.31	1.90	6.40	0.00	0
March-09	9	13	124	168	94	6.6	7.17	1.50	2.80	0.00	0
April-09	8	10	96	145	95	6.6	7.19	1.00	1.00	0.00	0
May-09	5	7	51	61	97	6.8	7.57	1.00	1.00	0.20	5
June-09	10	15	66	85	95	7.2	7.62	1.00	1.00	0.10	4
July-09	9	9	46	58	96	6.7	7.65	1.00	1.00	1.00	7
August-09	5	7	24	29	98	6.9	7.62	1.10	1.40	26.20	**500**
September-09	3	4	26	38	98	7.2	7.44	1.00	1.00	0.90	7
October-09	5	7	62	110	97	6.7	7.43	7.80	36.90	1.10	6
November-09	4	6	96	171	96	6.7	7.59	2.20	8.50	0.00	0
December-09	6	10	84	156	95	6.5	7.13	1.20	2.40	0.00	0
January-10	8	10	136	182	94	6.6	7.20	1.00	1.00	0.10	2
February-10	6	7	77	113	96	6.8	7.22	1.00	1.00	0.10	3
March-10	5	5	52	64	97	6.8	7.23	1.00	1.00	0.00	0
April-10	4	5	53	68	97	6.9	7.32	1.00	1.00	1.90	51
May-10	5	6	54	69	97	6.8	7.48	1.00	1.00	0.90	25
June-10	6	10	86	118	95	6.8	7.28	1.00	1.00	0.00	0
July-10	10	15	35	50	95	6.2	7.28	1.20	2.00	1.30	26
August-10	7	8	35	39	97	6.6	7.03	1.20	2.00	0.90	6
September-10	11	13	117	146	94	6.3	6.79	5.10	34.60	0.20	3
October-10	8	9	68	79	95	6.1	7.36	1.60	6.60	0.10	2
November-10	10	14	125	200	95	**6.0**	7.15	20.30	246.50	0.10	3
December-10	11	14	192	253	91	6.6	7.20	1.60	8.00	1.00	6
January-11	17	22	305	350	83	6.4	7.24	1.10	1.40	1.70	7
February-11	11	12	167	205	90	6.8	7.27	1.20	2.00	**311.00**	**8400**
March-11	9	15	191	386	92	6.8	7.39	1.10	1.30	0.10	3
April-11	7	8	122	201	94	6.2	7.41	1.00	1.00	0.40	13
May-11	7	9	95	154	95	6.2	6.90	1.00	1.00	0.90	10
June-11	9	12	84	99	95	6.1	6.82	10.20	56.00	3.20	16
July-11	9	11	61	74	95	6.6	7.15	1.00	1.00	0.00	0
August-11	11	14	66	77	95	6.7	7.30	1.00	1.00	1.10	12
September-11	15	22	94	139	93	7.0	7.26	1.00	1.00	0.80	9
October-11	10	12	70	90	95	7.1	7.73	1.00	1.00	1.50	15
November-11	19	23	181	333	89	6.7	7.48	2.10	9.80	2.70	18
December-11	16	18	120	134	92	6.3	7.40	1.00	1.00	1.00	12
AVE:	11	14	125	185	93	6.5	7.3	9.0	81.6	6.5	158.6
MIN:	3	4	24	29	83	6.0	6.8	1.0	1.0	0.0	0.0
MAX:	25	32	305	532	98	7.2	9.0	243.0	1,333.0	311.0	8,400.0
Median	10	13	116	146	94	6.6	7.3	1.2	2.0	0.4	6.0
95th Percentile	23	28	274	443	84	7.1	7.8	20.5	557.0	10.4	299.2
LIMIT (July-Oct):	37	56	355	537		6.0	9	200	400	83	209
LIMIT (Nov-June):	30	45	701	1,051		6	9	200	400	83	209

Reported Values Exceed Permit Limits

Discharge Monitoring Data, Influent and Effluent Flow, 2006-2011

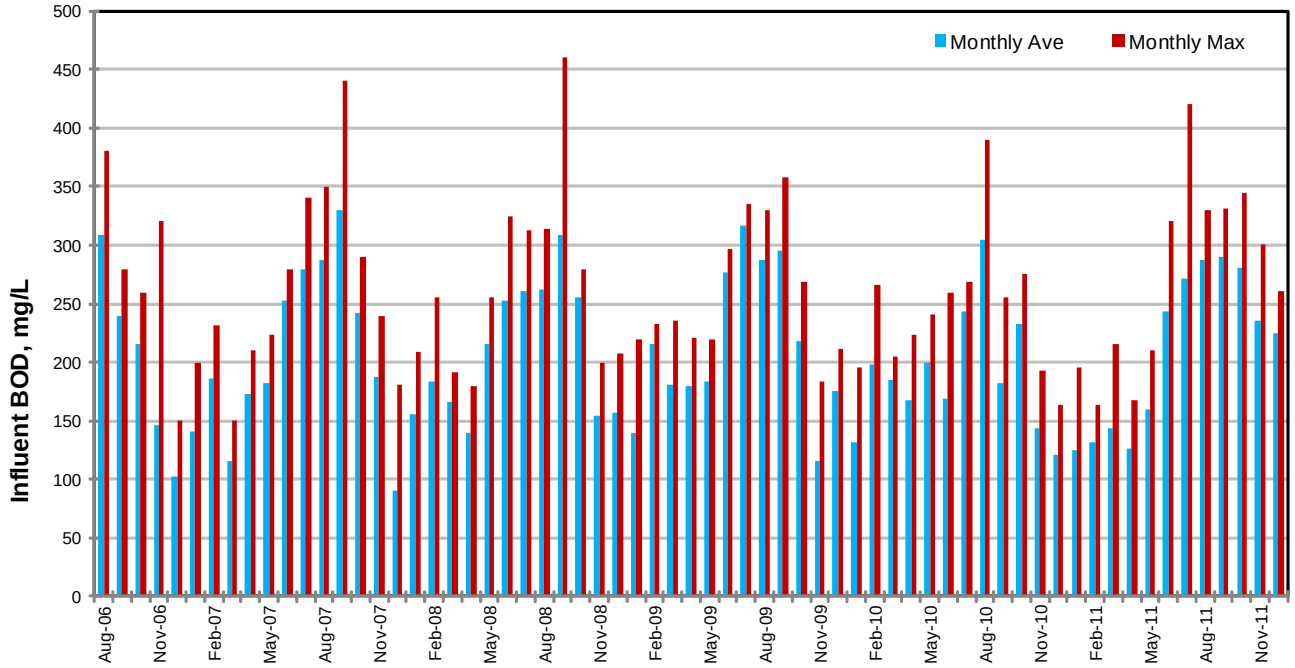
Snohomish WWTP
Permit #WA0029548

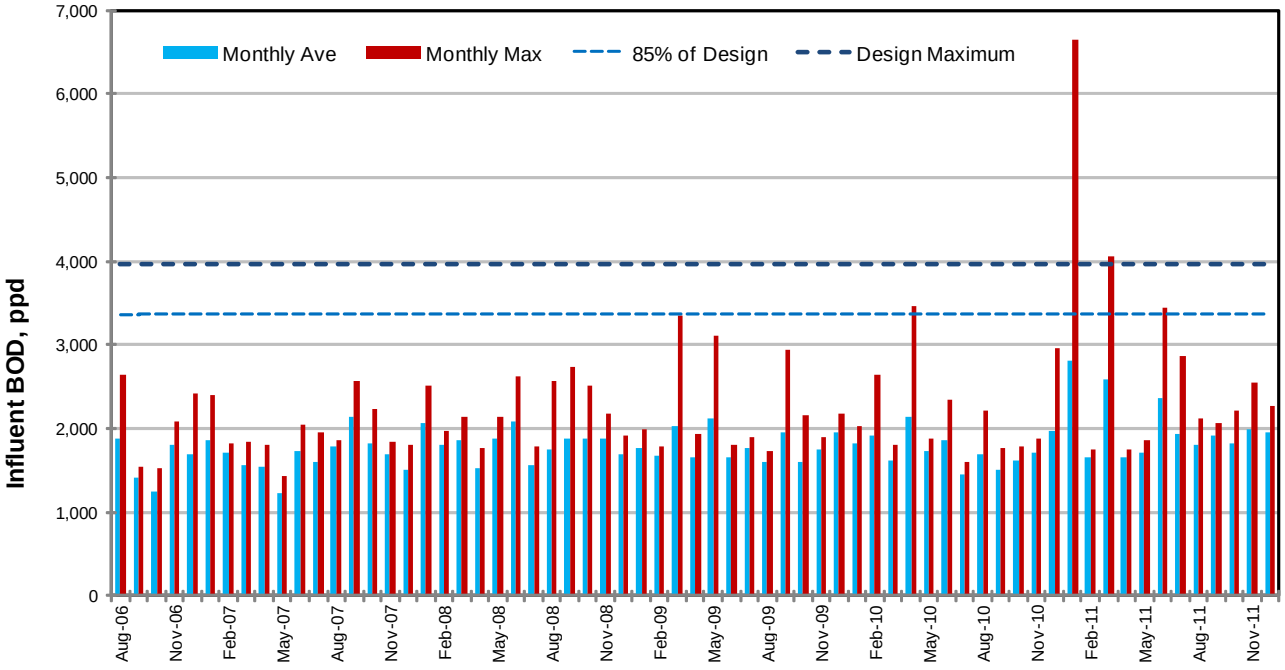




Discharge Monitoring Data, Influent BOD, 2006-2011

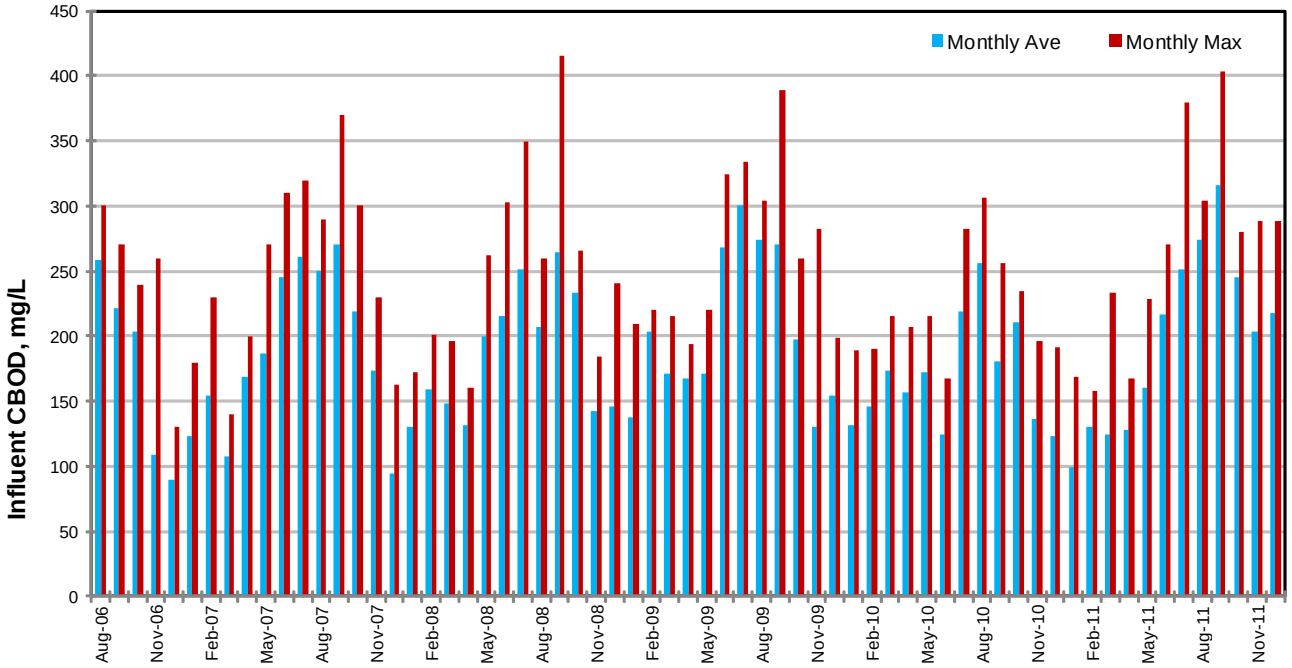
Snohomish WWTP
Permit #WA0029548

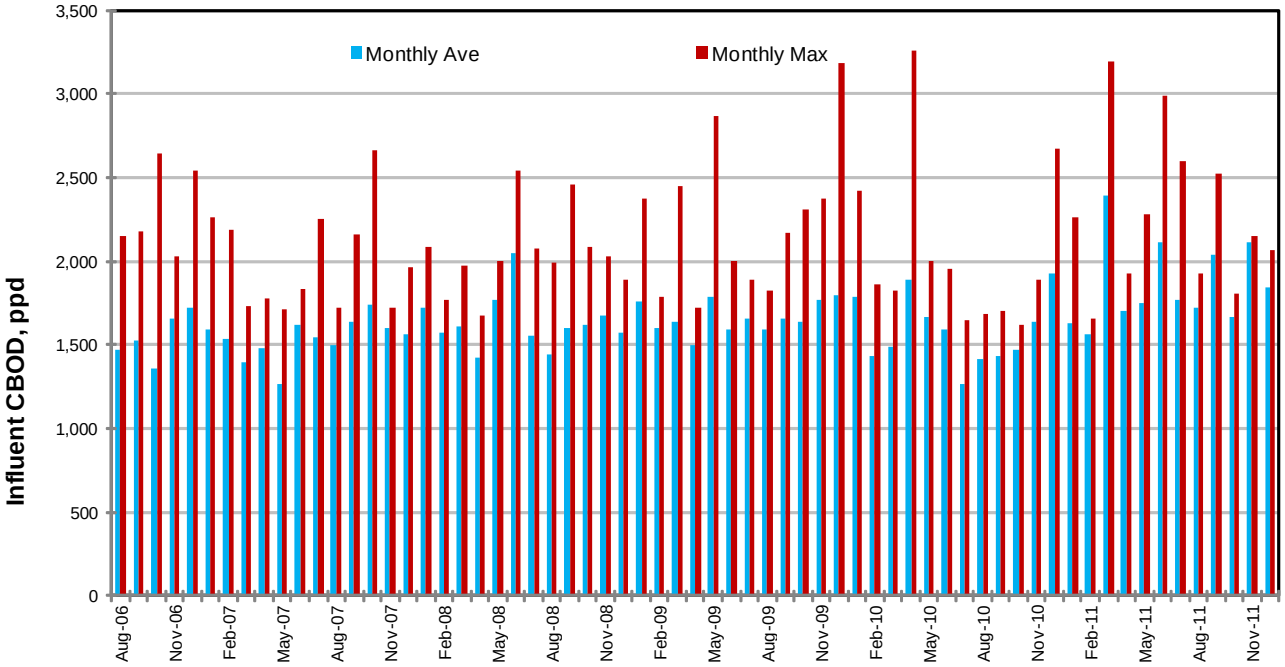




Discharge Monitoring Data, Influent CBOD, 2006-2011

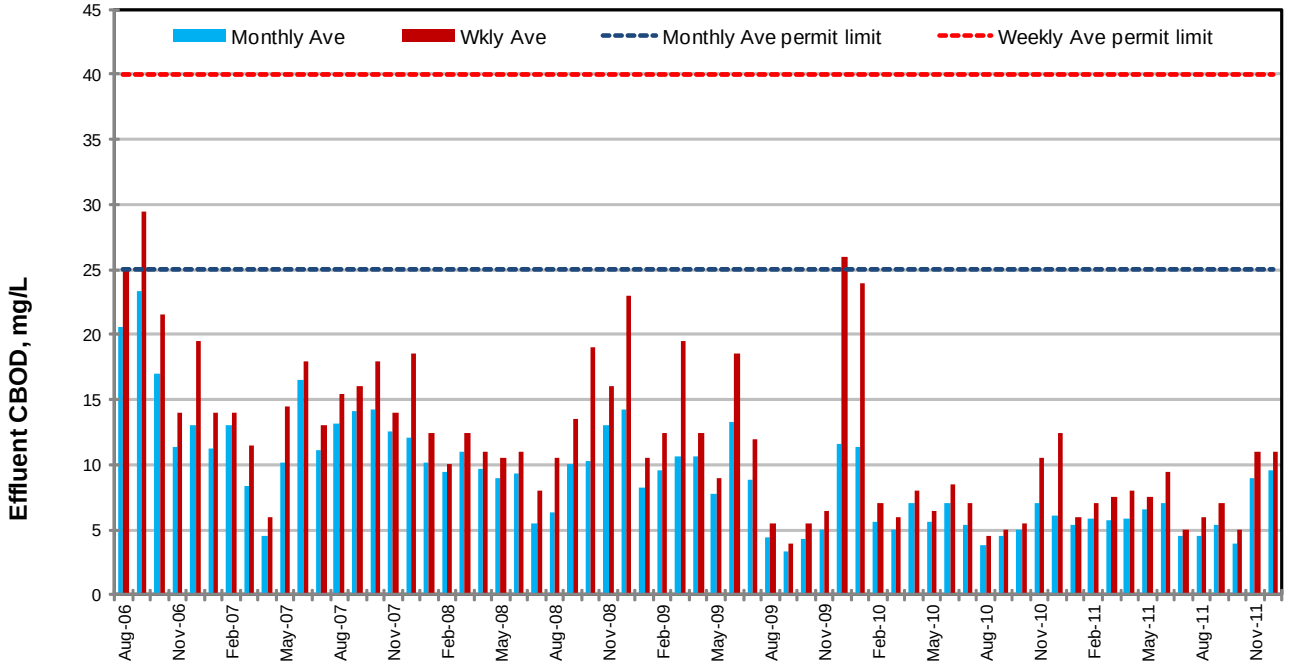
Snohomish WWTP
Permit #WA0029548

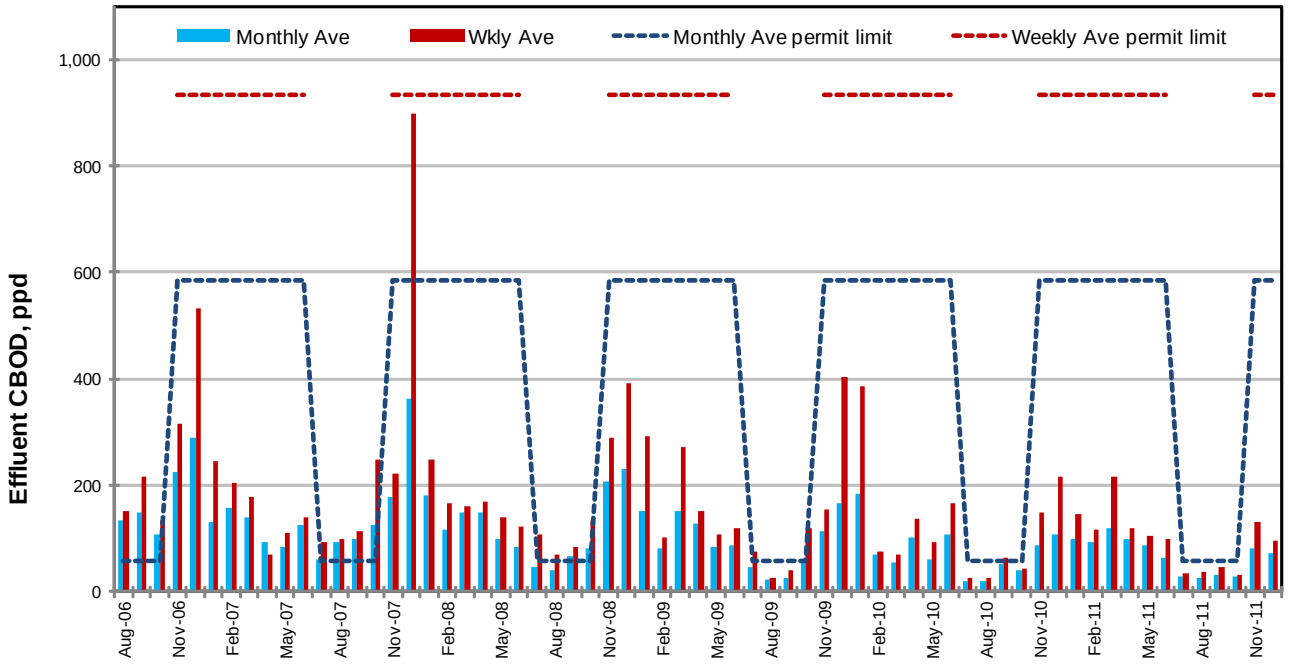




Discharge Monitoring Data, Effluent CBOD, 2006-2011

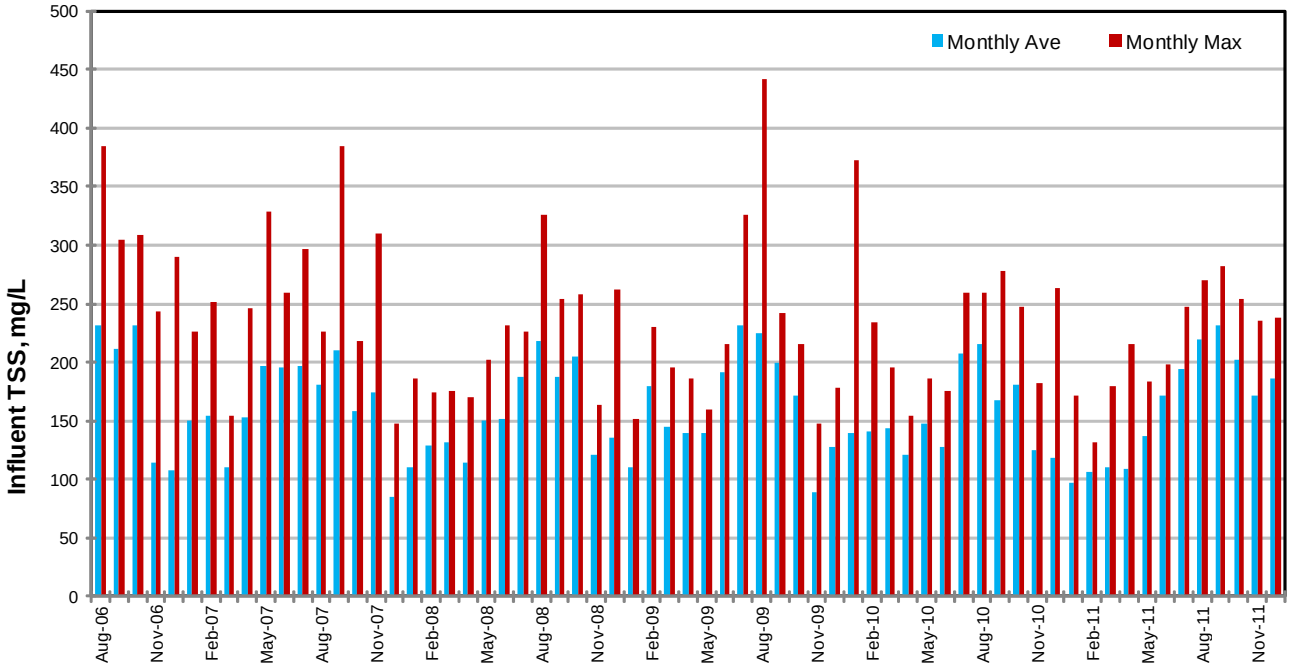
Snohomish WWTP
Permit #WA0029548

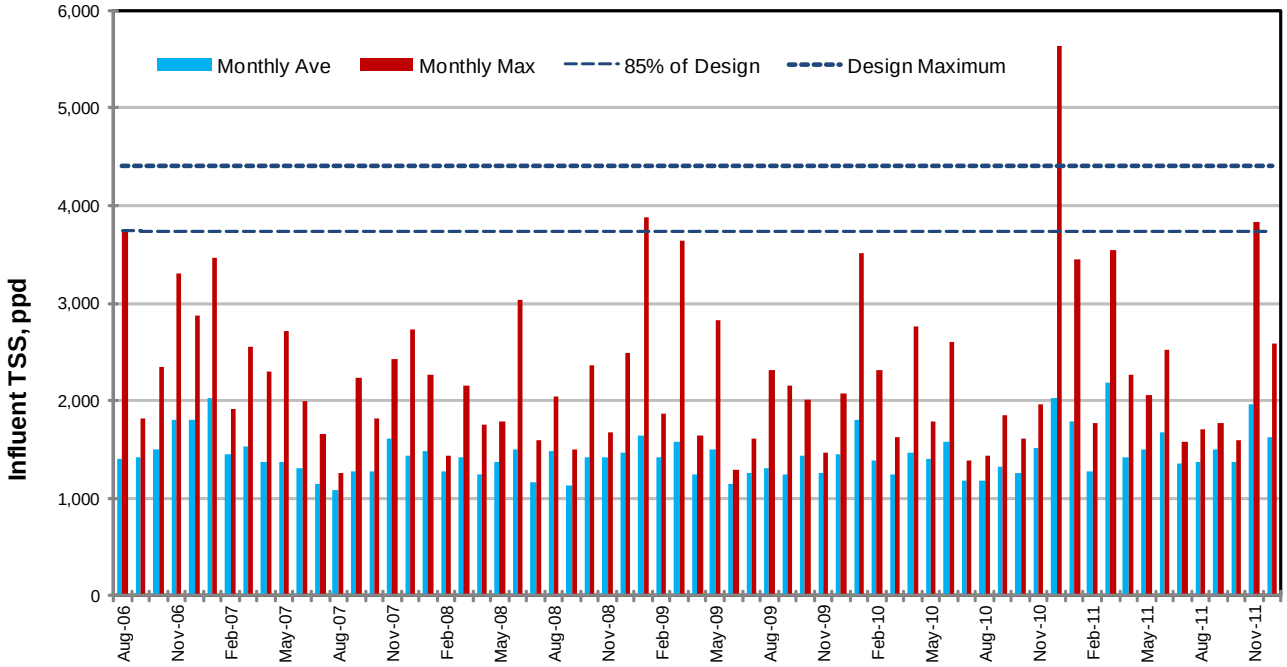




Discharge Monitoring Data, Influent TSS, 2006-2011

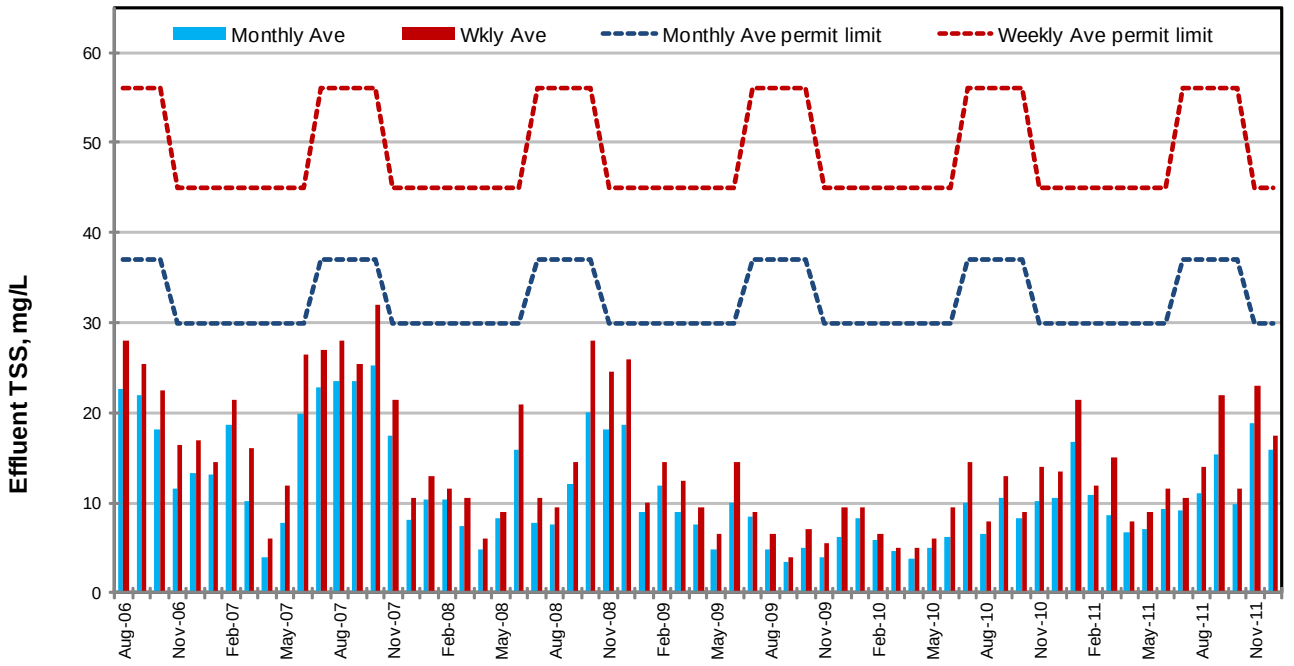
Snohomish WWTP
Permit #WA0029548

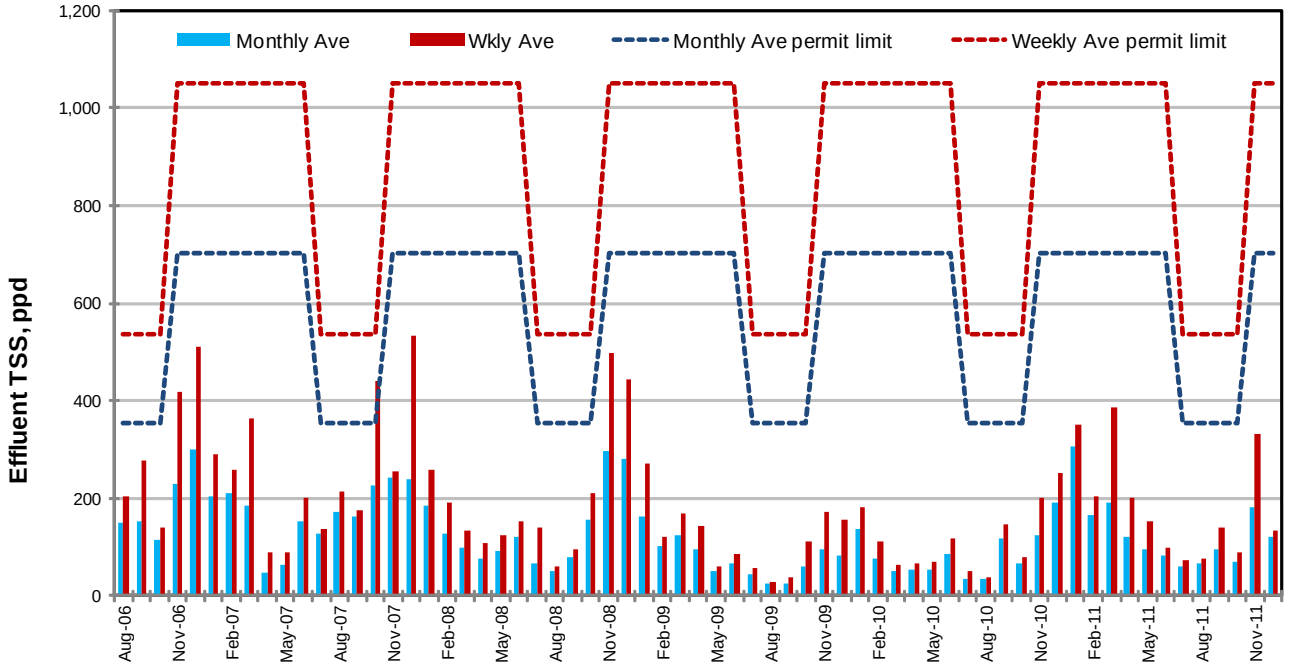




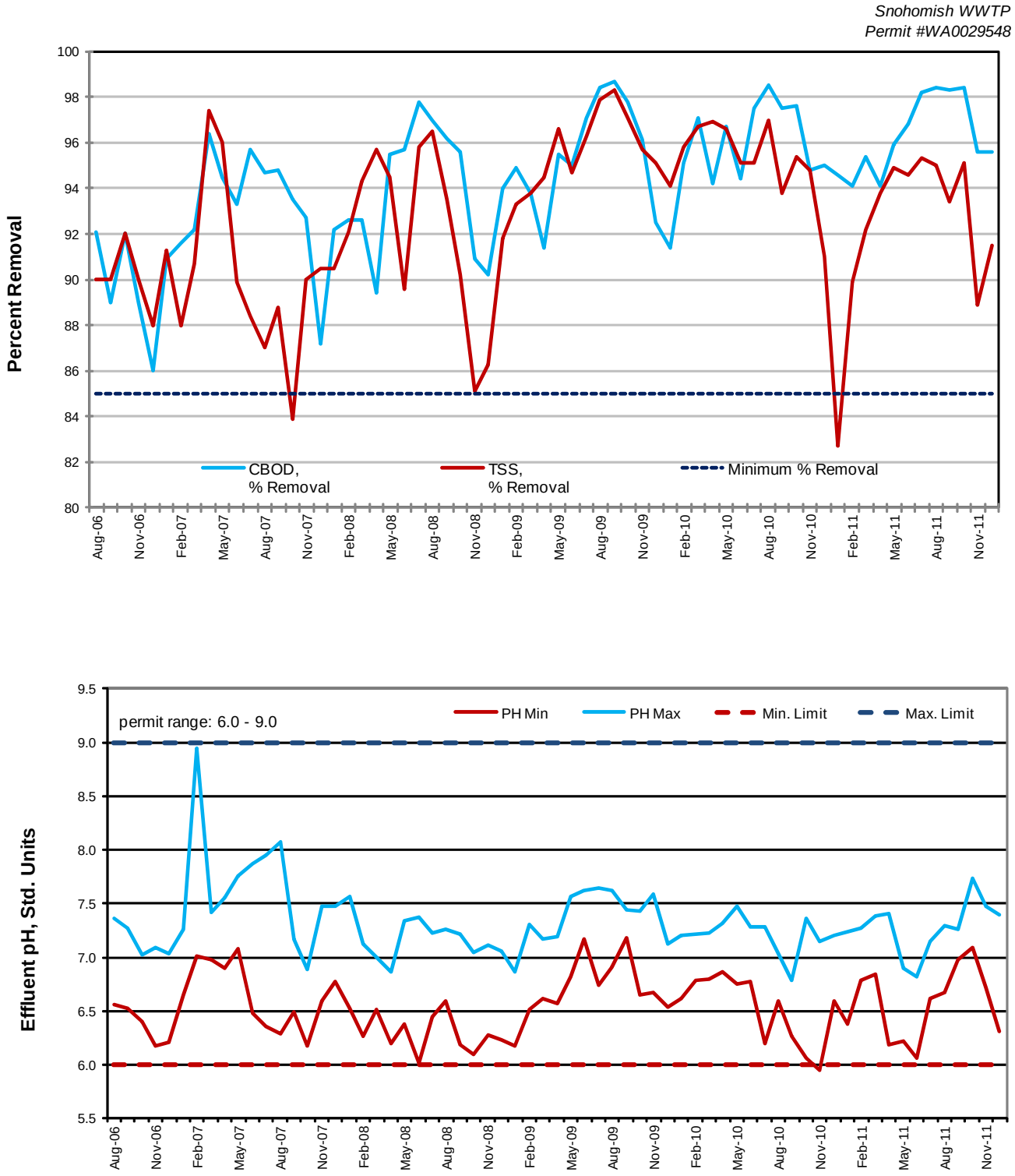
Discharge Monitoring Data, Effluent TSS, 2006-2011

Snohomish WWTP
Permit #WA0029548

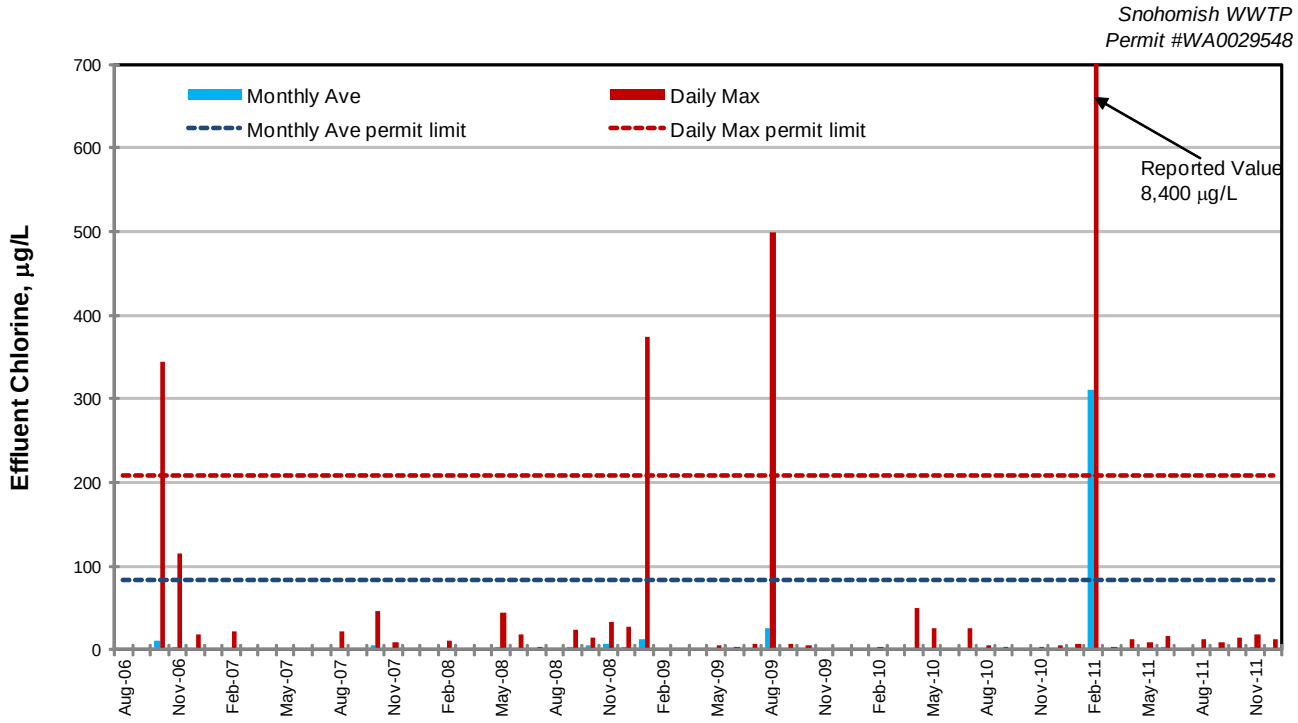


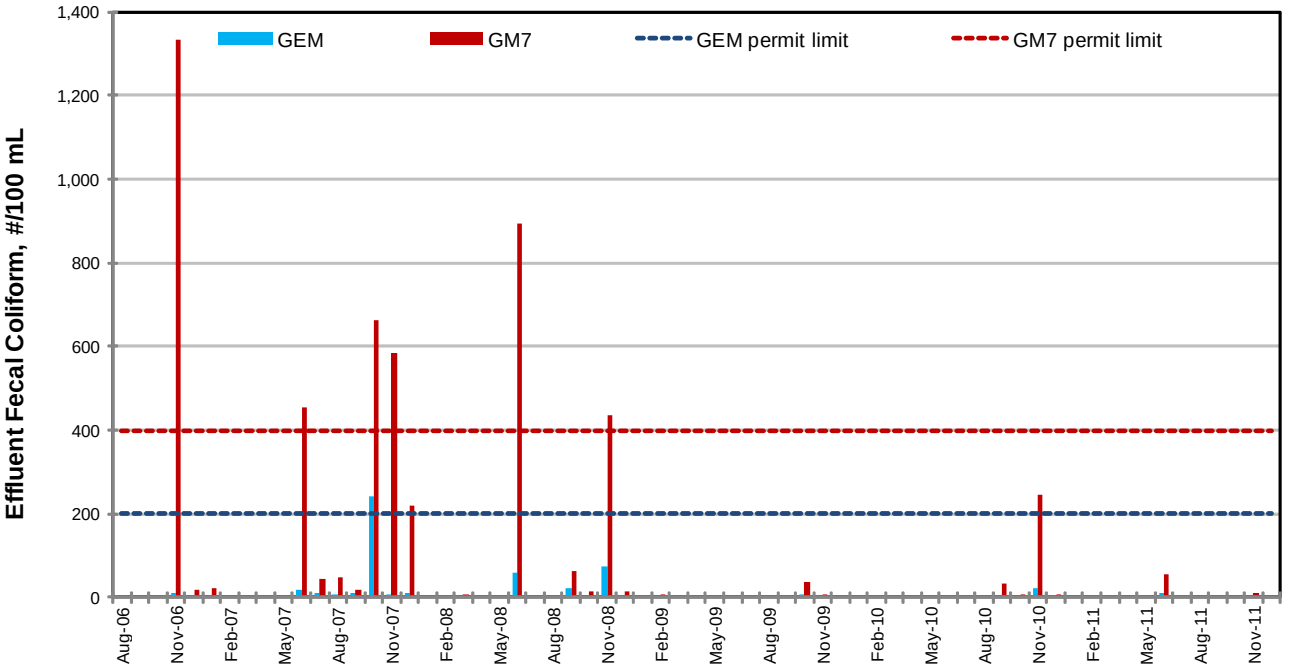


Discharge Monitoring Data, CBOD/TSS % Removal and Effluent Fecal Coliform, 2006-2011



Discharge Monitoring Data, Effluent Residual Chlorine, 2006-2011





Facility: Snohomish WWTP
Permit No: WA0029548

	Metals Monitoring		
Month	Copper µg/L	Silver µg/L	Zinc µg/L
October-06	7	1	26.81
January-07	6	<5	17
April-07	6	<5	*<13*
July-07	8	<5	34
October-07	11.8	<0.5	50
January-08	8.8	0.5	23
April-08	9.3	0.8	28
July-08	11.2	0.5	26
October-08	11.4	0.5	31
January-09	7.6	0.5	18
April-09	8.7	0.5	20
July-09	7.7	0.5	19
October-09	8.3	0.5	26
January-10	14.2	<0.5	26
April-10	13.5	0.7	30
July-10	10	0.5	24
October-10	11.8	0.6	44
January-11	6.87	<0.5	24.56
April-11	4	0.5	16
July-11	10.6	0.5	39
October-11	14.1	0.6	64
Count	21	15	20
Average	9.374762	0.497059	29.3185
Standard Deviation	2.802566	0.145205	12.02515
CV	0.298948	0.292129	0.410156
95th Percentile	14.1	0.7	50.7

Snohomish WWTP Acute WET Test Results as % Survival in 100% Effluent

Test Code	Collected	Start Date	Organism	Endpoint	% Survival
RMAR0261	8/12/2003	8/12/2003	*Ceriodaphnia dubia*	48-hour Survival	85%
RMAR0260	8/12/2003	8/13/2003	fathead minnow	96-hour Survival	85%
RMAR0257	11/18/2003	11/18/2003	*Ceriodaphnia dubia*	48-hour Survival	100%
RMAR0256	11/18/2003	11/18/2003	fathead minnow	96-hour Survival	83%
RMAR1827	1/18/2010	1/18/2010	*Ceriodaphnia dubia*	48-hour Survival	100%
RMAR1826	1/18/2010	1/19/2010	fathead minnow	96-hour Survival	100%
RMAR2234	8/23/2010	8/24/2010	*Ceriodaphnia dubia*	48-hour Survival	100%
RMAR2236	8/23/2010	8/24/2010	fathead minnow	96-hour Survival	93%
				Median	**96%**

The effluent demonstrates reasonable potential for Acute Toxicity when median survival in 100% effluent is less than 80% for a series of tests or if any single test results in less than 65% survival. WAC 173-205-050

Snohomish WWTP Acute WET Test Results as NOEC/LOEC in % Effluent

Test Code	Collected	Start Date	Organism	Endpoint	NOEC	LOEC	PMSD
RMAR0261	8/12/2003	8/12/2003	*Ceriodaphnia dubia*	48-hour Survival	100	> 100	13.69%
RMAR0260	8/12/2003	8/13/2003	fathead minnow	96-hour Survival	100	> 100	13.54%
RMAR0257	11/18/2003	11/18/2003	*Ceriodaphnia dubia*	48-hour Survival	100	> 100	5.00%
RMAR0256	11/18/2003	11/18/2003	fathead minnow	96-hour Survival	100	> 100	17.30%
RMAR1827	1/18/2010	1/18/2010	*Ceriodaphnia dubia*	48-hour Survival	100	> 100	5.00%
RMAR1826	1/18/2010	1/19/2010	fathead minnow	96-hour Survival	100	> 100	4.57%
RMAR2234	8/23/2010	8/24/2010	*Ceriodaphnia dubia*	48-hour Survival	100	> 100	5.00%
RMAR2236	8/23/2010	8/24/2010	fathead minnow	96-hour Survival	100	> 100	11.19%

NOEC = Concentration at which testing showed no observable effects
LOEC = Lowest concentration at which test showed an observable effect
PMSD = Percent minimum significant difference calculated for all tests in sampling event

Snohomish WWTP Chronic WET Test Results as NOEC/LOEC in % Effluent

Test Code	Collected	Start Date	Organism	Endpoint	NOEC	LOEC	PMSD
RMAR0263	8/12/2003	8/12/2003	*Ceriodaphnia dubia*	7-day Survival	50	100	
				Reproduction	9.1	25	28.52%
RMAR0262	8/12/2003	8/12/2003	fathead minnow	7-day Survival	50	100	12.01%
				Biomass	25	50	16.94%
				Weight	25	50	20.40%
RMAR0259	11/18/2003	11/18/2003	*Ceriodaphnia dubia*	7-day Survival	100	> 100	
				Reproduction	9.1	25	11.51%
RMAR0258	11/18/2003	11/18/2003	fathead minnow	7-day Survival	50	100	11.46%
				Biomass	25	50	17.01%
				Weight	50	100	15.09%
RMAR1829	1/18/2010	1/18/2010	*Ceriodaphnia dubia*	7-day Survival	100	> 100	
				Reproduction	100	> 100	24.54%
RMAR1828	1/18/2010	1/19/2010	fathead minnow	7-day Survival	100	> 100	4.57%
				Biomass	anomalous		
				Weight	100	> 100	13.64%
RMAR2238	4/12/2010	4/13/2010	fathead minnow	7-day Survival	100	> 100	11.12%
				Biomass	30	100	16.35%
				Weight	100	> 100	15.13%
RMAR2237	8/23/2010	8/24/2010	*Ceriodaphnia dubia*	7-day Survival	100	> 100	
				Reproduction	100	> 100	31.13%
RMAR2235	8/23/2010	8/24/2010	fathead minnow	7-day Survival	100	> 100	6.45%
				Biomass	100	> 100	16.02%
				Weight	100	> 100	14.51%

NOEC = Concentration at which testing showed no observable effects
LOEC = Lowest concentration at which test showed an observable effect
PMSD = Percent minimum significant difference calculated for all tests in sampling event

Appendix E—Use of State Water Quality Standards in NPDES Permits

Ecology must consider the impact of every proposed discharge to surface waters on the quality of the receiving water and specifically consider how the discharge may affect the use of the receiving water. The following text explains the factors Ecology considers in evaluating a discharge's impact on surface water. Ecology considers the following factors for each permit:

- Numeric criteria for the protection of aquatic life and human health.
- Narrative criteria.
- The State's Antidegradation Policy.
- Authorization for Mixing Zones.

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.

Mixing zones

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

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

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

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most

critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 10 means the effluent is 10% and the receiving water is 90% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

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

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

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

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

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

   Each permit in which Ecology authorizes a mixing zone includes specific descriptions of the size and location of the mixing zone. If the permit authorizes discharges from multiple outfalls, the permit will provide specific mixing zone descriptions for each qualifying outfall.

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

   Chapter 173-221 WAC defines technology-based limits Ecology uses in NPDES permits for domestic wastewater facilities and identifies those limits as "AKART". Ecology requires domestic wastewater facilities to meet "Technology-based effluent limits" as the minimum treatment standard.

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: http://www.ecy.wa.gov/biblio/92109.html.

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.

Some parameters do not require a mixing zone to ensure the discharge complies with water quality standards. As an example, fecal coliform in domestic wastewater treatment plant discharges can meet freshwater primary contact standards without dilution. Ecology developed the water quality criteria for fecal coliform to assure that people swimming (primary contact recreation) in water meeting the criteria would not develop gastro enteric illnesses. Ecology's authorization of a mixing zone for a specific discharge is based on compliance with technology-based effluent limits. The technology-based effluent limit of 200 colony forming units/100mL is the same numeric value as the single-sample criteria for freshwater primary contact recreation. This means the effluent meets the water quality criteria at the point of discharge and doesn't need dilution to meet the water quality criteria.

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 at the twenty year low flow.

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

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

- **Comply with size restrictions.**

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

9. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

Appendix F--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 on Ecology's homepage at http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.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 or changes in turbidity. 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 (MC) is based on the following calculation:

$$MC = \frac{EC + (AC \times DF)}{1 + DF}$$

where:

EC = Effluent Concentration
AC = Ambient Concentration
DF = Dilution Factor

The following tables present results of evaluating changes in fecal coliform bacteria and turbidity using simple mixing.

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	28
Ambient Fecal Coliform, #/100 ml	35
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criteria, #/100 ml	*100*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**48**
Difference between mixed and ambient, #/100 ml	13

Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.

Estimation of Turbidity at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	28
Ambient TSS Concentration, mg/L	13
Effluent TSS Concentration - worst case, mg/L	45
Surface Water Criteria, Maximum NTU increase	*5*
OUTPUT	
TSS at Mixing Zone Boundary, mg/L	14.1
TSS Increase at Mixing Zone Boundary, mg/L	1.1
TSS to Turbidity Conversion Factor[1]	0.4665
Tubidity Increase at Mixing Zone Boundary, NTU	**0.51**

Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for turbidity.

[1]*Factor for converting each mg/L of TSS concentration to an approximate NTU value for turbidity. Factor assums a linear relationship between TSS and Turbidity and is derived from site-specific data.*

Calculation of Water Quality-Based Effluent Limits

Ecology calculates water quality-based effluent limits using the two-value wasteload allocation process 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 = (acute criteria x acute zone dilution factor) - (bkgrnd conc.x (acute zone dilution factor - 1))

   WLA_c = (chronic criteria x chronic zone dilution factor) - (bkgrnd conc. x (chronic zone dilution factor -1))

2. 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 = coefficient of variation = std. dev./mean

   $LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$ where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$

   $z = 2.326$

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

   Maximum Daily Limit = MDL

   $$MDL = LTAxe^{(Z\sigma - 0.5\sigma^2)}$$

   where:

   $\sigma^2 = \ln[CV^2 + 1]$

   $z = 2.326$ (99^{th} percentile occurrence)

   LTA = Limiting long-term average

   Average Monthly Limit = AML

   $$AML = LTAx\, e^{(Z\sigma_n - 0.5\sigma_n^2)}$$

   where:

   $\sigma^2 = \ln[(CV^2 \div n) + 1]$

   n = number of samples/month

   $z = 1.645$ (95^{th} % occurrence probability)

   LTA = Limiting long-term average

Ecology used this process to calculate chlorine limits carried over from the previous permit. We also used a modification of this method to calculate NBOD+CBOD limits. Since the TMDL establishes a Maximum Daily Limit as the Waste Load Allocation, we use that limit to back calculate the Long Term Average used to determine an appropriate Average Monthly Limit.

NBOD+CBOD Limit Calculations

1. Calculate Daily Maximum Limit based on TMDL Waste Load Allocations (WLAs)			
	Ammonia WLA	99	lbs/day
	CBOD5 WLA, lbs/day	93	lbs/day
	NBOD Exchange Rate	2.1	lbs NBOD per lb of ammonia
	Equivalent NBOD+CBOD WLA	300.9	lbs/day
	(Maximum Daily Limit)		
2. Calculate Long Term Average (LTA) from Maximum Daily Limit (MDL)			
	σ^2	0.231191	
	z_{99}	2.326	
	CV	0.51	
	NBOD+CBOD LTA	110	lbs/day
3. Calculate Average Monthly Limit (AML) from LTA			
	# of Samples	8	per month
	z_{95}	1.645	
	σ_n^2	0.031995	
	CV	0.51	
	NBOD+CBOD AML	145.8	lbs/day

pH Analysis

Ecology uses a spreadsheet tool to calculate the pH of a mixture of two flows using the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. EPA Office of Water, Washington DC). The major form of alkalinity is assumed to be carbonate alkalinity. Also, alkalinity and total inorganic carbon are assumed to be conservative. The following tables present the calculated pH at the edge of the chronic mixing zone for each outfall. Ecology evaluated resultant pH when effluent is at the extremes of the technology standards of 6.0 and 9.0. If the analysis showed a potential to exceed water quality criteria, additional pH values were evaluated to determine appropriate limits.

Calculation of pH of a Mixture of Two Flows

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

INPUT			
1. Dilution Factor at Mixing Zone Boundary	28.000	28.000	28.000
2. Ambient/Upstream/Background Conditions			
Temperature (deg C):	18.30	18.30	18.30
pH:	7.23	7.23	7.23
Alkalinity (mg CaCO3/L):	17.00	17.00	17.00
3. Effluent Characteristics			
Temperature (deg C):	24.60	24.60	24.60
pH:	6.00	6.20	9.00
Alkalinity (mg CaCO3/L):	136.00	136.00	136.00
OUTPUT			
1. Ionization Constants			
Upstream/Background pKa:	6.39	6.39	6.39
Effluent pKa:	6.35	6.35	6.35
2. Ionization Fractions			
Upstream/Background Ionization Fraction:	0.87	0.87	0.87
Effluent Ionization Fraction:	0.31	0.41	1.00
3. Total Inorganic Carbon			
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	19	19	19
Effluent Total Inorganic Carbon (mg CaCO3/L):	442	329	136
4. Condtions at Mixing Zone Boundary			
Temperature (deg C):	18.53	18.53	18.53
Alkalinity (mg CaCO3/L):	21.25	21.25	21.25
Total Inorganic Carbon (mg CaCO3/L):	34.58	30.54	23.65
pKa:	6.39	6.39	6.39
RESULTS			
pH at Mixing Zone Boundary:	**6.60**	**6.75**	**7.34**
Change in pH at Mixing Zone Boundary:	**-0.63**	**-0.48**	**0.11**

Ammonia Criteria Calculation

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information for its long-term monitoring station #07A090 (Snohomish River at Avenue D Bridge) and equations presented in 173-201A-240 WAC. The following table summarizes the calculation.

Freshwater Un-ionized Ammonia Criteria Calculation

Based on Chapter 173-201A WAC, amended November 20, 2006

INPUT	
1. Receiving Water Temperature (deg C):	18.3
2. Receiving Water pH:	7.2
3. Is salmonid habitat an existing or designated use?	Yes
4. Are non-salmonid early life stages present or absent?	Present
OUTPUT	
Unionized ammonia NH3 criteria (mg/L as NH_3)	
Acute:	0.137
Chronic:	0.012
Total ammonia nitrogen criteria (mg/L as N):	
Acute:	19.058
Chronic:	1.667

Reasonable Potential Analysis for Aquatic life and Human Health Toxicity

Ecology's TSDCALC Workbook evaluates whether a reasonable potential exists for a discharge to violate the aquatic life water quality standards or numeric human health-based criteria. If a reasonable potential exists, the workbook calculates an appropriate water quality-based limit using the techniques described earlier under *"Calculation of Water Quality-Based 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).

The following table summarizes the reasonable potential evaluation for this proposed permit.

Reasonable Potential Calculation

Water Body Type	Freshwater

Facility: Snohomish WWTP

Dilution Factors:	Acute	Chronic
Aquatic Life	11	28
Human Health Carcinogenic		28
Human Health Non-Carcinogenic		28

Receiving Water Hardness = 23.4 mg/L

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	CHLORINE (Total Residual) 7782505	COPPER - 744058 6M Hardness dependent	SILVER - 7740224 11M dependent on hardness.	ZINC- 7440666 13M hardness dependent	ANTIMONY (INORGANIC) 744036 1M	ARSENIC (dissolved) 7440382 2M	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	CHLOROFORM 67663 11V	DICHLOROBROMOMETHANE 75274 12V	TOLUENE 108883 25V
Effluent Data	# of Samples (n)		175	30	21	16	21	4	4	4	4	4	4	4	4	4
	Coeff of Variation (Cv)		0.87	0.6	0.3	0.3	0.41	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		9,526	209	14.1	0.8	44.3	0.9	2	1	0.014	3	2.4	2.9	0.5	36
	Calculated 50th percentile Effluent Conc. (when n>10)				8.8											
Receiving Water Data	90th Percentile Conc., ug/L		18	0	1.18	0.01	5.45		0.8	0.191	0.002	0.54				
	Geo Mean, ug/L				0.83			0			0.002	0.36				
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	19,058	19	4.331	0.284	33.43	-	360	12.89	2.1	414.2	-	-	-	-
		Chronic	1,667	11	3.281	-	30.53	-	190	0.502	0.012	46	-	-	-	-
	WQ Criteria for Protection of Human Health, ug/L		-	-	1300	-	-	14	-	-	0.14	610	1.8	5.7	0.27	6800
	Metal Criteria Translator, decimal	Acute	-	-	0.796	0.85	0.796	-	1	0.466	0.85	0.998	-	-	-	-
		Chronic	-	-	0.796	-	0.796	-	1	0.466	-	0.997	-	-	-	-
	Carcinogen?		N	N	N	N	N	N	Y	N	N	N	Y	Y	Y	N

Aquatic Life Reasonable Potential

s		0.751	0.555	0.294	0.294	0.394	0.555	0.555	0.555	0.555		
Pn		0.983	0.905	0.867	0.829	0.867	0.473	0.473	0.473	0.473		
Multiplier		1.00	1.00	1.00	1.23	1.00	2.59	2.59	2.59	2.59		
Max concentration (ug/L) at edge of...	Acute	882	19.000	2.094	0.085	8.161	1.197	0.283	0.004	1.195		
	Chronic	358	7.464	1.539	0.045	6.515	0.956	0.227	0.003	0.797		
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**		

Human Health Reasonable Potential

s	0.294	0.555	0.555	0.555	0.555	0.555	0.555	0.555	0.555	0.555	
Pn	0.867	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473	
Multiplier	0.721	1.038	1.038	1.038	1.038	1.038	1.038	1.038	1.038	1.038	
Dilution Factor	28	28	28	28	28	28	28	28	28	28	
Max Conc. at edge of Chronic Zone, ug/L	1.115	0.033	2E-03	5E-01	9E-02	0.108	0.019	1.335			
Reasonable Potential? Limit Required?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**			

Temperature Reasonable Potential Analysis

Ecology calculates the reasonable potential for a discharge to exceed fresh water temperature standards based on the requirements of WAC 173-201A-200(1)(c)(i)--(ii) and The Water Quality temperature guidance document found at: http://www.ecy.wa.gov/biblio/0610100.html. Ecology evaluates temperature based on the elements described below and uses the following calculations to determine if a discharge has a reasonable potential to exceed water quality standards.

Criteria elements for the Washington State Fresh Water Temperature Standards:

- 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.

Temperature at Chronic Mixing Zone Boundary:

$$T_{chronic} = T_{amb} + [(T_{effluent} - T_{amb}) \div DF]$$

where,

$T_{chronic}$ = Estimated temperature at the edge of the chronic mixing zone.

T_{amb} = Ambient 7DADMax temperature of the receiving water.

$T_{effluent}$ = Effluent 7DADMax temperature.

DF = Chronic Dilution Factor

Maximum Allowable Incremental Temperature Increase:

The water quality standards limit the maximum allowable incremental temperature increase in freshwater systems based on how close the ambient temperature is to the criteria. When ambient temperature is warmer than the criteria or within 0.3 C of the criteria, and no TMDL exists for temperature impairments, no single discharger may increase the temperature at the chronic mixing zone boundary by more than 0.3 C. When ambient temperature is cooler than the criteria, incremental warming (T_i) is limited to the lesser of:

$$T_i = T_{criteria} - T_{amb} \quad \text{or,} \quad T_i = \frac{28}{(T_{amb} + 7)}$$

Freshwater Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)--(ii) and the Water Quality Program Guidance. All data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at: http://www.ecy.wa.gov/biblio/0610100.html

	Core Summer Critera
INPUT	**July 1-Sept 14**
1. Chronic Dilution Factor at Mixing Zone Boundary	28.0
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	18.3 °C
3. 7DADMax Effluent Temperature (95th percentile)	24.4 °C
4. Aquatic Life Temperature WQ Criterion in Fresh Water	17.5 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	18.5 °C
6. Incremental Temperature Increase or decrease:	0.2 °C
7. Maximum Allowable Incremental Temperature Increase:	0.3 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	18.6 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	YES
10. Temperature Limit if Required:	NO LIMIT

Appendix G--Response to Comments

Ecology did not receive comments on this permit and fact sheet during the public comment period.