Fact Sheet for NPDES Permit WA0000922

Port Townsend Paper Corporation

September 16, 2013

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 Port Townsend Paper Corporation (PTPC).

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 Port Townsend Paper Corporation; NPDES permit WA0000922, are available for public review and comment from April 24, 2013 until June 21, 2013. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

Port Townsend Paper Corporation reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, 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 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

Port Townsend Paper Corporation operates a large industrial wastewater treatment plant (WWTP) and a small sanitary WWTP that discharge to Port Townsend Bay near Port Townsend, WA. Ecology issued the existing permit for this facility on September 1, 2004. Changes to the operation of the facility during the permit term include the addition of a wastewater stream and the installation of fine bubble diffusers at the inlet of the wastewater treatment pond.

The effluent limits for biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH specified in the draft permit for the industrial WWTP discharge are generally the same as those specified by the existing permit, except for minor changes to the BOD_5 and TSS loading rates associated with slightly different production rates at the facility. The effluent limits and removal efficiencies for BOD_5 and TSS and the effluent limits for fecal coliform and total residual chlorine for the sanitary WWTP discharge are the same as the existing permit. Significant additions included in the draft permit include the addition of a pH limit for the sanitary WWTP discharge, various studies which Ecology determined to be necessary to further assess any potential impacts to the environment (ground water, receiving water, and sediment quality), a compliance schedule to address sludge build up in the aerated stabilization basin (ASB), and a study of the treatment efficiency of the odor causing pollutants in the ASB.

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I. Introduction

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

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 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)

These rules require any industrial 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 performance 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.

II. Background Information

Table 1 General Facility Information

Facility Information	
Applicant:	Port Townsend Paper Corporation
Facility Name and Address	Port Townsend Paper Corporation 100 Mill Road Port Townsend, WA 98368
Contact at Facility	Name: Roger Hagan Telephone #: 360-385-3170
Responsible Official	Name: Roger Hagan Title: President Address: 100 Mill Road, Port Townsend, WA 98368 Telephone #: 360-385-3170 FAX #: 360-385-0355
Industry Type	Unbleached Kraft Pulp and Paper Mill
Categorical Industry	40 CFR Part 430 Subparts C and J
Type of Treatment	Industrial: Screening, Primary Clarification, and Aeration Sanitary: Secondary Treatment via an activated sludge plant followed by Disinfection
SIC Codes	Pulp Mill SIC #2611 Paper Mill SIC #2621
NAIC Codes	322121
Facility Location (NAD83/WGS84 reference datum)	Latitude: 48.094076 Longitude: -122.796979
Discharge Water Body Name and Location (NAD83/WGS84 reference datum)	Port Townsend Bay Outfall 1 - Latitude: 48.08826 Longitude: -122.79466 Outfall 2 - Latitude: 48.09289 Longitude: -122.79504 Outfall 3 – Latitude: 48.09233 Longitude: -122.79598

Permit Status	
Renewal Date of Previous Permit	September 1, 2004
Application for Permit Renewal Submittal Date	March 6, 2009 with revisions submitted on May 5, 2009 and September 3, 2009
Date of Ecology Acceptance of Application	June 12, 2009

Inspection Status	
Date of Last Sampling Inspection	August 1, 2012
Date of Last Non-sampling Inspection Date	September 12, 2012

Figure 1 Facility Location

A. Facility description

History

National Paper installed the first paper machine at the Port Townsend Pulp and Paper Mill in 1927. A second paper machine was added in 1929. In 1940 the mill was purchased by Crown Zellerbach and then sold to Haindl in 1983. The mill was then acquired by PTPC Acquistion Co. Inc in late 1997. PTPC Acquisition Co. declared bankruptcy in 2007 and Port Townsend Holdings has owned the facility since then (along with other owners during the initial ownership transition period). The mill currently employs approximately 325 people at the Port Townsend mill site. The first NPDES permit for this facility was issued in August 1974 and the facility has been designated as a major facility.

Industrial Processes

Port Townsend Paper Corporation (PTPC) uses the Kraft process to convert wood chips to unbleached pulp. In 1996, PTPC added an old corrugated cardboard (OCC) recycling plant to the facility that also utilizes the Kraft process to convert OCC that is mixed with sawdust to unbleached pulp. The unbleached pulp is then either sold or processed into paper for sale. Between September 2004 and June 2012 the facility produced an average of 625 tons of product per day (tons/day) from the unbleached Kraft process and 276 tons/day from the OCC recycling process, for a total of 901 tons/day. The facility does not anticipate any increase or decrease in production in the next five years.

The majority of the wastewater created by the facility is generated from the Kraft process. This includes wastewater generated by the manufacturing of pulp and paper products as well as the recovery of chemicals for reuse within the process. Wastewater is also generated by some of the air pollution control technologies associated with the facility. Finally, stormwater that is generated at the site is collected and piped to the wastewater treatment system through the process sewer system. Between September 2004 and June 2012, the facility produced an average of 12 million gallons per day (MGD) of process wastewater.

One new wastewater stream was added during the previous permitting cycle. In 1998 the EPA passed a rule called the Pulp and Paper Cluster Rule. This rule established new air pollution control standards for certain pollutants and allowed the option of using biological treatment to meet the standards. In 2006, PTPC began treating their foul condensate wastewater stream in the ASB to comply with this rule.

The facility has proposed to upgrade their power boiler #10 into a cogeneration unit that will burn primarily wood fuel to produce steam and power, but it is unknown when these upgrades will be completed. Based on the information provided by the facility, these upgrades will not affect the production capacity of the plant and are not anticipated to change the ASB treatment capacity or introduce new pollutants to the effluent discharge. One proposed change, the dry electrostatic precipitator (ESP), will reduce the amount of some of the pollutants currently sent to the ASB. The upgrades will have the potential to introduce additional nitrogen/ammonia into the system; however, ammonia is currently being added to the ASB process influent to maintain an optimal nutrient level for biological treatment in the ASB. The additional ammonia will reduce the need to add ammonia to the ASB process influent. Finally, there is the potential for the addition of a caustic solution to the scrubber

liquid, which will affect the pH of that wastewater stream. The facility currently monitors the pH of the effluent from the primary clarifier and adjusts the pH as necessary. If the addition of caustic solution to the scrubber liquid affects the pH of the influent into the ASB, the facility has the ability to and will control it appropriately.

Sanitary wastewater is generated on-site at an average of 6,125 gallons per day (GPD). The sanitary wastewater streams are treated separately in a package wastewater treatment plant and then discharged to the Outfall 001 pipe downstream of the industrial WWTP.

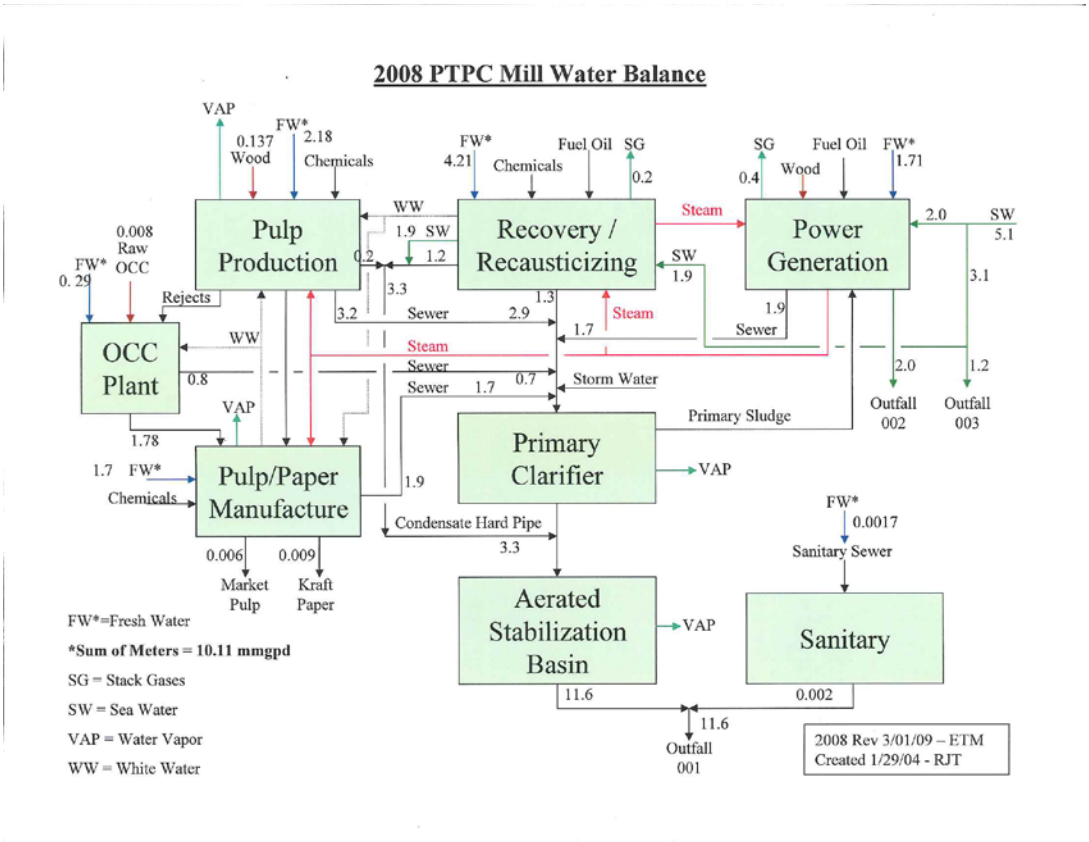
There are two additional wastewater streams generated by the industrial process. One is the non-contact cooling water used to cool an existing turbine condenser associated with the industrial process. The second is overflow water from the sea chest that is used to furnish the cooling water for the turbine condenser. These wastewater streams do not contact potential sources of contamination and are discharged through separate outfalls, Outfall 002 and Outfall 003, respectively.

Wastewater Treatment processes

A general wastewater flow diagram for PTPC is provided below. The majority of the wastewater generated at the facility is associated with the pulp and paper manufacturing processes and is treated by the process wastewater treatment system. The process wastewater treatment system consists of a collection system, two pump stations, screens, a primary clarifier, and an aerated stabilization basin (ASB). The process wastewater is screened to remove large solids and then treated in a primary clarifier to remove the settleable solids. After the primary clarifier, the clarified stream is combined with the condensates from the evaporators and digesters and piped to the ASB. The facility constructed the 33-acre ASB in 1978 that further treats the wastewater through biological treatment and additional settling. Aeration is provided to the initial treatment zone to promote biological treatment of organic matter by supplying the required oxygen to the metabolizing microorganisms and providing mixing so the microorganisms come into contact with the organic matter. Additional aeration was added to the ASB in 2006 by installing fine bubble diffusers in the first run. The diffusers were installed to ensure that the new foul condensate wastewater stream is treated to the standards required by the Cluster Rule. In addition to the fine bubble diffusers, the facility uses thirteen original surface aerators to provide aeration to a portion of the ASB. The final portion of the ASB provides a quiescent zone where the activated sludge can settle.

The sanitary wastewater stream is treated via an activated sludge package plant followed by disinfection with sodium hypochlorite. The activated sludge plant consists of three tanks – an aeration basin, a settling basin, and a chlorine contact basin. The sodium hypochlorite solution used to chlorinate the effluent is generated on-site using a tablet chlorination system. The facility installed a total residual chlorine analyzer on the effluent line in 2008 to provide better control of the chlorine residual in the wastewater treatment plant effluent. The analyzer continuously monitors the total chlorine residual in the sanitary WWTP effluent and adjusts the chlorine feed as necessary to maintain the residual within the permit range of 0.1 to 5.0 parts per million (ppm).

Figure 2 PTPC Wastewater Flow Diagram



Solids Management

Solids are generated by the screens, primary clarifier and the ASB associated with the process wastewater treatment plant and from the activated sludge process associated with the sanitary wastewater treatment plant. Screenings are collected and disposed of off-site. Solids from the primary clarifier are pumped to a coil filter and then to a Rietz press for dewatering. The dewatered sludge from the primary clarifier is then used as a fuel for Power Boiler #10. The facility generated approximately 31.8 dry tons per day on average between 2010 and 2012.

Sludge also accumulates in the ASB as part of the treatment process, but at a much slower rate than in the clarifier. Due to the relatively slow accumulation rate, the facility has not removed sludge from the ASB on a routine basis as part of the normal operations and maintenance activities. However, PTPC completed a sludge inventory in August and September 2010 and indicated that sludge removal was necessary to maintain sufficient freeboard in the ASB and ensure adequate treatment of the wastewater. The facility has purchased equipment to remove sludge from the ASB and is investigating different management options for that sludge once it has been removed. It is considering burning the dewatered sludge as fuel, beneficial uses, or disposal of the dewatered sludge in an off-site

landfill. The facility must work with the appropriate authorities to ensure that the sludge is disposed of properly.

Waste activated sludge removed from the activated sludge package plant is sent to the city of Port Townsend's wastewater treatment plant.

Discharge outfall

Port Townsend Paper Corporation has three outfalls that all discharge to Port Townsend Bay: Outfall 001, Outfall 002, and Outfall 003. The facility also has one internal outfall, Outfall 005, that discharges treated effluent from the sanitary wastewater treatment plant to Outfall 001. Outfall 001 discharges both the treated sanitary wastewater stream and the treated process wastewater stream into Glen Cove within Port Townsend Bay. The outfall extends about 1200 feet from the shore and discharges into 45 feet of water through diffuser ports at the end of the discharge pipe. See Figure 1 for the location of the outfalls. An average of 12 MGD continuously discharges from this outfall whenever the plant is operational.

Noncontact cooling water from the turbine condenser is discharged through Outfall 002 at an average rate of 2.0 MGD. Unused salt water from a sea chest used to supply water for cooling of the turbine condenser overflows through Outfall 003 at an unknown flow rate. The turbine condenser cooling water and the saltwater overflow do not come into contact with any potential sources of contamination and are considered to be uncontaminated discharges. The turbine condenser cooling water does become heated prior to discharge and it is regulated for temperature. Both of these outfalls discharge into Glen Cove within Port Townsend Bay.

B. Description of the receiving water

All three outfalls (Outfall 001, 002 and 003) discharge to Port Townsend Bay. Table 612 of WAC 173-201A-612 specifies the following uses for the Bay: excellent aquatic life uses, shellfish harvesting, primary contact recreational uses, wildlife habitat, harvesting, commerce and navigation, boating and aesthetic values. These designated uses must be protected.

Other nearby point source outfalls include the New Day Fisheries Inc., the Naval Facility on Indian Island, and two boatyards permitted under the boatyard general permit. Significant nearby non-point sources of pollutants include boat mooring, farming, and untreated storm water.

The ambient background data used for this permit was obtained from the Department of Ecology's Environmental Assessment Program (EAP) and the document entitled "Chemical Analysis of August 1988 Port Townsend Bay Seawater Samples" (Ecology, 1989). Ecology, through its ambient monitoring program, has collected water quality data, including temperature, pH, dissolved oxygen, and salinity, at five foot intervals from the surface down to approximately 25 meters below the water surface in Port Townsend Bay since 1977 (with the exception of 1988, 1989, 1990, 2003, and 2004). The name of the monitoring station is Port Townsend Harbor – Walan Point (PTH005). All of the samples from the monitoring station are discrete samples and were collected approximately once per month. For the parameters associated with the ambient monitoring station, the maximum and minimum values listed below are the maximum and minimum values of the discrete samples from the

surface down to approximately 14 meters (46 feet) below the surface and the average values are the averages of the results down to the same depth.

The data for the remaining samples was collected in Port Townsend Bay in 1988. The samples were analyzed for the EPA priority pollutants, 61 trace elements, herbicides, and nitrogen- and phosphorous-containing compounds. Only the parameters that were detected are included in Table 2. The ambient data is presented in Table 2 below:

Table 2 Receiving Water Characterization

Parameter	Value Used
Temperature (90th Percentile 1 Day Maximum)	11.9 ^{o}C
pH (Maximum / Minimum)	8.9 standard units 6.4 standard units
Dissolved Oxygen (average)	8.3 mg/L
Salinity (average)	30.5 psu
Silver	0.001 ug/L
Arsenic	1.17 ug/L
Cadmium	0.090 ug/L
Chromium	0.160 ug/L
Copper	0.329 ug/L
Mercury	0.0007 ug/L
Nickel	0.275 ug/L
Lead	0.056 ug/L
Zinc	0.739 ug/L
Selenium	0.023 ug/L

C. Wastewater characterization

There are four main wastewater streams associated with PTPC that are discharged through three outfalls. Wastewater from the industrial process is treated in the process wastewater treatment system and sanitary wastewater is treated in the sanitary wastewater treatment system. The treated wastewater streams are then combined and discharged through Outfall 001. Non-contact cooling water that is used to cool the turbine condenser is discharged through Outfall 002. Overflow from the salt water chest associated with the cooling water

system is discharged through Outfall 003. PTPC has provided information about the pollutants in each of the wastewater streams in the permit renewal application. Wastewater characterization information is also available from the discharge monitoring reports for the parameters monitored as required by the existing permit. Outfall 002 is only monitored for temperature and Outfall 003 is not monitored for any pollutants since this discharge does not come into contact with any potential pollutants prior to discharge. The tabulated data below represents the quality of the wastewater effluent discharged from September 2004 to June 2012. The wastewater effluent is characterized as follows:

Table 3 Effluent Characterization for Outfall 001

Parameter	Units	Average Value	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	**17**	**50**
Total Suspended Solids (TSS)	mg/L	**25**	**60**
Temperature (winter)	^oC	**17**	**22**
Temperature (summer)	^oC	**21**	**25**

Parameter	Units	# of Samples	Measured Value
Chemical Oxygen Demand (COD)	mg/L	3	183
Ammonia (as N)	mg/L	37	10.2
Oil and Grease	mg/L	1	5.2
Phosphorous	ug/L	1	620
Sulfate	mg/L	1	533
Surfactants	ug/L	1	250
Aluminum	ug/L	1	720
Barium	ug/L	1	60
Boron	ug/L	1	640
Iron	ug/L	1	300
Magnesium	mg/L	1	103
Manganese	ug/L	1	300

Parameter	Units	# of Samples	Measured Value
Antimony	ug/L	3	1.1
Arsenic	ug/L	3	15
Cadmium	ug/L	3	0.18
Chromium	ug/L	3	4.0
Copper	ug/L	3	4.2
Lead	ug/L	3	2.7
Mercury	ng/L	3	4.7
Nickel	ug/L	3	4.5
Silver	ug/L	3	0.03
Zinc	ug/L	3	36.6
Phenols	ug/L	1	140

Parameter	Units	# of Samples	Minimum Value	Maximum Value
pH	standard units	366	2.9	9.3

Table 4 Effluent Characterization for Outfall 002

Parameter	Units	Average Value	Maximum Value
Temperature (winter)	^{o}C (^{o}F)	11 (52)	26 (79)
Temperature (summer)	^{o}C (^{o}F)	10 (50)	23 (73)

Table 5 Effluent Characterization for Outfall 005

Parameter	Units	Average Value	Maximum Value
Biochemical Oxygen Demand (BOD_5)	mg/L	3	18
Total Suspended Solids (TSS)	mg/L	10	51
Temperature (winter)	^oC (^oF)	9.7 (50.0)	14.3 (57.7)
Temperature (summer)	^oC (^oF)	16.4 (61.5)	22.0 (71.6)

Parameter	Units	# of Samples	Minimum Value	Maximum Value
pH	standard units	365	5.8	10.2

D. Summary of compliance with previous permit issued on September 1, 2004

The existing permit specifies different effluent limits for each of the outfalls. The table below specifies which parameters have effluent limits for each of the outfalls.

Table 6 Effluent Limit Parameters

Outfall	Parameters
001	Biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH
002	Temperature
005	BOD_5, TSS, BOD and TSS removal efficiency, fecal coliform, and total residual chlorine.

PTPC has generally complied with the effluent limits and permit conditions since the existing permit was issued on September 1, 2004. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and with inspections of the facility. Table 7 includes permit violations by the facility during the existing permit cycle. All of the violations were addressed and penalties were assessed when deemed appropriate.

Table 7 Permit Triggers/Violations

Begin Date	Outfall	Parameter	Statistical Base	Units	Value	Limit Min/Max	Violation
2/1/2008	005	TSS	Weekly Maximum	mg/L	51	NA/45	Numeric effluent violation
5/1/2008	005	Fecal Coliform	Average Monthly	Counts/ 100 mL	>200	NA/200	Numeric effluent violation
10/1/2008	002	Temp	Daily Maximum	Degrees F	79	NA/77	Numeric effluent violation
12/29/2008	001	pH	Instantaneous Maximum	Standard Units	9.1	6/9	Numeric effluent violation
12/30/2008	001	pH	Instantaneous Maximum	Standard Units	9.1	6/9	Numeric effluent violation
1/2/2009	001	pH	Instantaneous Maximum	Standard Units	9.1	6/9	Numeric effluent violation
1/2/2009	001	pH	Instantaneous Minimum	Standard Units	4.1	6/9	Numeric effluent violation
1/3/2009	001	pH	Instantaneous Maximum	Standard Units	9.1	6/9	Numeric effluent violation
1/4/2009	001	pH	Instantaneous Maximum	Standard Units	9.1	6/9	Numeric effluent violation
1/8/2009	001	pH	Instantaneous Minimum	Standard Units	2.9	6/9	Numeric effluent violation
5/1/2009	005	TSS	Average Monthly	Percent	77	85/NA	Numeric effluent violation
11/1/2009	005	TSS	Average Monthly	Percent	77	85/NA	Numeric effluent violation

Begin Date	Outfall	Parameter	Statistical Base	Units	Value	Limit Min/Max	Violation
5/5/2010	001	TSS	Daily Maximum	Lbs/Day	18900	NA/16775	Numeric effluent violation
5/1/2010	001	TSS	Average Monthly	Lbs/Day	8800	NA/8539	Numeric effluent violation
5/4/2010	001	BOD5	Daily Maximum	Lbs/Day	10100	NA/9257	Numeric effluent violation
5/5/2010	001	BOD5	Daily Maximum	Lbs/Day	11000	NA/9257	Numeric effluent violation
5/27/2010	001	BOD5	Daily Maximum	Lbs/Day	10300	NA/9257	Numeric effluent violation
5/1/2010	001	BOD5	Average Monthly	Lbs/Day	5700	NA/4793	Numeric effluent violation

The existing permit issued in September 2004 requires the submittal of multiple documents. The submittals are required to demonstrate compliance with the effluent requirements, ensure that the operational and maintenance manual is updated to address any new permit requirements or operational changes, and to provide information necessary for the permit renewal process. The following table summarizes compliance with the submittal requirements since the permit was issued.

Table 8 Permit Submittals

Permit Section	Required Submittal	Frequency/Due Date	Submittal Date
S3.A	Discharge Monitoring Report	Monthly	Monthly, as required
S4a.	Update treatment system operating plan	180 days after effective date of permit (March 1, 2005)	March 2, 2005
S4b.	Treatment System Efficiency Study and Engineering Report	180 days before permit expiration (March 4, 2009)	March 6, 2009 (amended document re-submitted on May 5, 2009)
S6	Update Solid Waste Control Plan	180 days after effective date of permit (March 1, 2005)	March 2, 2005

Table 8 Permit Submittals

Permit Section	Required Submittal	Frequency/Due Date	Submittal Date
S7	Update Spill Control Plan	180 days after effective date of permit (March 1, 2005)	March 2, 2005
S9	Acute Toxicity Effluent Characterization	2/permit cycle due with permit renewal application (March 4, 2009)	March 5, 2009
S10	Chronic Toxicity Effluent Characterization	2/permit cycle due with permit renewal application (March 4, 2009)	March 5, 2009
S11	Outfall and sewer line evaluation	With permit renewal application (March 4, 2009)	March 5, 2009
S13	Priority Pollutant Scan	3/permit cycle and results submitted with permit renewal application (March 4, 2009)	March 5, 2009
G7	Application for permit renewal	180 days before permit expiration (March 4, 2009)	March 5, 2009 (with additional information submitted on May 5, 2009 and September 3, 2009)

E. State environmental policy act (SEPA) compliance

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

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, or do not have a reasonable potential to cause a water quality violation.

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

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology reviewed the design criteria for this facility's treatment plant presented in the *Wastewater Treatment System Efficiency Study and Engineering Report* dated February 2009 prepared by Todd Williams and reviewed by Robert Hobbs, PE. The primary clarifier has an approximate volume of 2.3 million gallons (MG) which provides a retention time of 5.4 hours during average wastewater flows of 10 MGD. The maximum monthly design flow for the clarifier is 18.7 MGD, for a minimum retention time of three hours. The ASB treats an average of 12 MGD and has an original average monthly design flow rate of 14.5 MGD. The design loading rate of influent BOD_5 to the ASB is 24,000 to 27,000 lbs/day and the design effluent loading rate is 2,400 lbs/day (83% to 91% removal efficiency). Between 2002 and 2008, the average influent loading of BOD_5 was 24,300 lbs/day with a maximum loading of 94,000 lbs/day in 2005. The average BOD_5 removal efficiency ranged between 92% and 94% with an average of 93% removal. The table below includes design criteria from the referenced report.

Table 9 Design Criteria for the Primary Clarifier and the ASB

Parameter	Design Quantity
Primary Clarifier Maximum Monthly Design Flow	18.7 MGD
ASB Maximum Monthly Design Flow	14.5 MMGD (83 MG Total)

Parameter	Design Quantity
ASB BOD_5 Loading for Average Month	27,000 lb/day

B. Technology-based effluent limits

AKART Evaluation

Ecology must ensure that facilities provide all known, available, and reasonable methods of prevention, control, and treatment (AKART) when it issues a permit.

The existing permit required the facility to submit a "Wastewater Treatment System Efficiency Study and Engineering Report" addressing the process wastewater treatment system with the permit renewal application so that Ecology could conduct an AKART evaluation for conventional pollutants during the renewal process. The process wastewater treatment system consists of both primary and secondary treatment with a primary clarifier and ASB. The report included the results from two studies, one conducted during the wet season and one during the dry season, to assess BOD, Chemical Oxygen Demand (COD), and TSS removal efficiencies of the treatment system. The dry season study samples were collected in September and October of 2008 and the wet season study samples were collected in November 2008 and February 2009. The table below shows the percent removal of BOD, COD, and TSS in both the clarifier and the ASB as well as the estimated combined percent total removal from both forms of treatment.

Table 10 Wastewater Treatment System Efficiency

BOD Removal	**Wet Season**	**Dry Season**	**Average**
Clarifier	24%	26%	25%
ASB	90%	93%	92%
System Performance	**92%**	**95%**	**94%**
COD Removal	**Wet Season**	**Dry Season**	**Average**
Clarifier	56%	74%	65%
ASB	65%	73%	69%
System Performance	**85%**	**93%**	**89%**
TSS Removal	**Wet Season**	**Dry Season**	**Average**
Clarifier	91%	96%	94%
ASB	31%	71%	51%

TSS Removal	Wet Season	Dry Season	Average
System Performance	94%	98%	97%

According to the EPA Wastewater Technology Fact Sheet for Aerated, Partial Mix Lagoons, BOD removal from the treatment system can range up to 95% and the effluent concentration of TSS can range from 20 to 60 mg/L. Based on the removal efficiencies presented in Table 10 above, it appears that the treatment system is performing near the highest BOD5 removal efficiency expected for this system. The effluent concentration of TSS ranged between 7 and 83 mg/L and averaged 47 mg/L, with the highest concentrations occurring during the wet season. Additional treatment added to the system has the potential to increase the removal efficiencies by only a few percentage points. Therefore, it appears that AKART is being met regarding the process wastewater treatment system at PTPC.

The sanitary wastewater generated at the facility is treated by a separate wastewater system that consists of an activated sludge package plant that provides secondary treatment followed by chlorination. Federal and state regulations define technology-based effluent limits for domestic wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for municipal wastewater. Between September 2004 and June 2012, the treatment plant had an average removal efficiency of 98% of the influent BOD with an average monthly effluent quality of 3.7 mg/L and 94% of the influent TSS with an average monthly effluent quality of 10.4 mg/L. The treatment system is meeting AKART standard as defined in state regulation.

Derivation of Technology Based Effluent Limits

Outfall 001

The EPA has established technology-based limits for a number of industrial categories, including the pulp, paper and paperboard industry. These limits are specified in 40 CFR Part 43. The applicable federal effluent guidelines for the unbleached Kraft subcategory (Subpart A) and secondary fiber non-deink (Subpart E) were first proposed on November 18, 1982. Revisions to the regulations associated with the pulp and paper industrial category were then proposed on December 17, 1993 as part of the “Cluster Rules”. Under the “Cluster Rules”, revisions to the pulp and paper mill regulations will occur in three phases. The first phase reorganized and consolidated the subcategories associated with the original rule and revised the guidelines for pulp and paper mills that used bleach in their pulping processes (Subpart B and Subpart E). Following extensive review and public comments, the proposed revisions were promulgated by EPA on April 15, 1998. As PTPC is an unbleached Kraft process, the only change affecting the facility is that they have been reclassified into the Subpart C (Unbleached Kraft) and Subpart J (Secondary Fiber Non-Deink) subcategories. It is

unknown when EPA will propose the second and third phase of the "Cluster Rules" addressing the remaining subcategories. The effluent guidelines for the unbleached Kraft subcategory contain effluent limits based on the degree of effluent reduction attainable by the following: application of the best practicable control technology currently available (BPT), application of the best conventional pollutant control technology (BCT), and the application of the best available technology economically achievable (BAT). Also, new source performance standards (NSPS) apply to sources constructed after the promulgation of the NSPS, which occurred on November 18, 1982 for the unbleached Kraft and secondary fiber non-deink subcategories.

The effluent guidelines for both Subpart C and Subpart J are based on a long term average of production rates associated with the specific process of that subcategory. The following table presents the production data that has been presented for PTPC. The previous permit used the production data reported on the monthly discharge monitoring reports submitted between January 2002 and December 2003 to determine the long term average production rates. The permit renewal application that was submitted by PTPC contained an average production rate that appears to be the production rate during December 2007. Finally, the production rates submitted with the monthly discharge monitoring reports between June 2010 and June 2012 were averaged to determine the average production rate during the previous two years as this is considered to be representative for the next permit cycle. The average production rate from each of the sources is summarized in Table 11 below.

Table 11 PTPC Production Rates

Source of Production Data	Kraft Process (average dry tons/day)	OCC Process (average dry tons/day)
Discharge Monitoring Reports from January 2002 to December 2003 (existing permit limits)	626	315
Application – December 2007 Production Rates	664	289
Discharge Monthly Reports from June 2010 to June 2012	611	282

BCT and BPT: A reasonable estimate of the long term average is required to determine the effluent limits, so the production rates between June 2010 and June 2012 were used to calculate the technology based limits for the draft permit.

BAT: PTPC certified in a letter to Ecology dated April 16, 1999 that the slimicides that they use do not contain either pentachlorophenol or trichlorophenol. Therefore the BAT limits do not apply to the PTPC effluent.

NSPS: According to the fact sheet for the permit issued in 1990, the Kraft process at the facility was significantly modified in 1984. New source effluent guidelines were established in November 1982 and these limits are applicable to the additional production capacity provided by that modification. The 1990 fact sheet indicates that the production prior to

1984 was 450 tons per day. The OCC was constructed in 1996 and therefore must also meet the new source effluent guidelines.

Table 12 Technology Based Loading Limits for BOD_5

Industrial Process	Production Rate (tons/day)	Effluent Guidelines		Permitted Limit	
		Max Day (lbs/1000 lbs produced/day)	**Monthly Ave** (lbs/1000 lbs produced/day)	**Max Day** (lbs/day)	**Monthly Ave** (lbs/day)
Kraft (BCT)	450	5.6	2.8	5040	2520
Kraft (NSPS)	611-450 = 161	5.0	2.71	1610	873
OCC (NSPS)	282	3.9	2.1	2200	1185
Total	**893**			**8850**	**4578**

Table 13 Technology Based Loading Limits for TSS

Industrial Process	Production Rate (tons/day)	Effluent Guidelines		Permitted Limit	
		Max Day (lbs/1000 lbs produced/day)	**Monthly Ave** (lbs/1000 lbs produced/day)	**Max Day** (lbs/day)	**Monthly Ave** (lbs/day)
Kraft (BCT)	450	12.0	6.0	10800	5400
Kraft (NSPS)	611-450 = 161	9.1	4.8	2930	1546
OCC (NSPS)	282	4.4	2.3	2482	1297
Total	**893**			**16212**	**8243**

Outfall 002

Outfall 002 consists solely of non-contact cooling water. There are no technology based limits established for non-contact cooling water. The only modification to the influent is the addition of heat to the stream, which will be addressed by the water quality criteria.

Outfall 003

Outfall 003 is the overflow of unused salt water from the sea chest associated with the cooling water system. Nothing is added to this stream which originates from Port Townsend Bay and is then returned to the Bay. Since there is no addition of potential pollutants to the wastewater stream, no technology based or water quality based effluent limits are established for this wastewater stream.

Outfall 005

The EPA has not established specific technology based guidelines for privately owned sanitary wastewater treatment plants and best professional judgment (BPJ) would be required

to establish such guidelines. The WAC contains discharge standards for all domestic wastewater facilities, including privately owned facilities. The effluent from the sanitary wastewater treatment plant at PTPC must meet the effluent requirements specified in WAC 173-221-040. The rule also requires minimum removal efficiency for both BOD and TSS of 85% of the influent concentrations. PTPC is generally able to meet this requirement, but occasionally the flow to the plant is very low creating a weak influent, especially during periods of plant shut down, and the removal efficiency is difficult to meet under such circumstances, but the effluent concentration limits are still met.

Table 14 Technology-based Limits

Outfall	Parameter	Average Monthly Limit	Maximum Daily Limit
001	Biochemical oxygen demand (BOD)	4628	8943
001	Total suspended solids (TSS)	8350	16414
001	**pH**	**(1)**	**(1)**
Outfall	**Parameter**	**Average Monthly Concentration**	**Average Weekly Concentration**
005	Biological Oxygen Demand (BOD_5)	30 mg/L	45 mg/L
005	Total suspended solids (TSS)	30 mg/L	45 mg/L
005	Fecal Coliform (geometric means)	200 organisms/ 100 mL	400 organisms/ 100 mL
005	BOD Removal Efficiency	85% of Influent Concentration	-
005	TSS Removal Efficiency	85% of Influent Concentration	-
005	pH	(1)	(1)

(1) Within the range of 6.0 standard units and 9.0 standard units at all times

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based

effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

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

Numerical criteria for the protection of human health

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

Narrative criteria

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

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

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

Antidegradation

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

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

- Apply three tiers of protection (described below) for surface waters of the state.

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

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

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

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

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

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

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge ports, 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, aquatic life, 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.

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

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

Ecology has determined that the treatment provided at PTPC meets the requirements of AKART (see "Technology-based Limits" discussion in Section III.B).

3. Ecology must consider critical discharge conditions.

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

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

Dilution modeling was conducted by PTPC in 1994 using the U.S. EPA's Plume dilution model. The results were submitted to Ecology in a report entitled *Port Townsend Paper Corporation Mixing Zone Study* dated December 1994. As required by Ecology's *Permit Writer's Manual*, PTPC used critical conditions in their model. The dilution modeling used the worst case water column density stratification from 27 different density profiles obtained at different times of the year in Port Townsend Bay. The 10th percentile current speed (2.5 cm/sec) was used for modeling acute dilution and the median current speed (4.5 cm/sec) was used for modeling chronic dilution. And PTPC assumed a maximum effluent flow of 22.3 MGD. There have been two changes to the facility since 1994 that would affect the results of the model. Water conservation measures have decreased the flow (the maximum flow during the previous permitting period was 15.9 MGD). The effluent has also changed from a freshwater effluent to a mix of fresh and salt water. The decreased flow will result in greater mixing than the 1994 modeling showed. However, the salt water in the effluent will increase the density of the effluent. The denser water will rise at a slower rate than the fresh water alone, which will result in reduced mixing. These two changes affect the mixing in opposite ways and should result in similar mixing to the original model. Therefore, the results of the model are still considered to be relevant and reasonably conservative.

4. Supporting information must clearly indicate the mixing zone would not:

- Have a reasonable potential to cause the loss of sensitive or important habitat.
- Substantially interfere with the existing or characteristic uses.
- Result in damage to the ecosystem.
- Adversely affect public health.

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

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

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

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

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

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

Ecology conducted a reasonable potential analysis using procedures established by the EPA and by Ecology for each pollutant present at detectable levels in the discharge 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.**

  The December 1994 modeling results demonstrated that acute dilution was attained in less than six minutes during critical conditions.

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

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

- **Comply with size restrictions.**

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

9. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

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

- Aquatic life uses are designated using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.

a. Extraordinary quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

b. Excellent quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

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

d. Fair quality salmonid and other fish migration.

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

Table 15 Marine Aquatic Life Uses and Associated Criteria

Excellent Quality	
Temperature Criteria – Highest 1D MAX	16°C (60.8°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	6.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- To protect shellfish harvesting, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.
- The recreational uses for this receiving water are identified below.

Table 16 Recreational Uses

Recreational Use	**Criteria**
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies /100 mL.

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

E. Water quality impairments

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

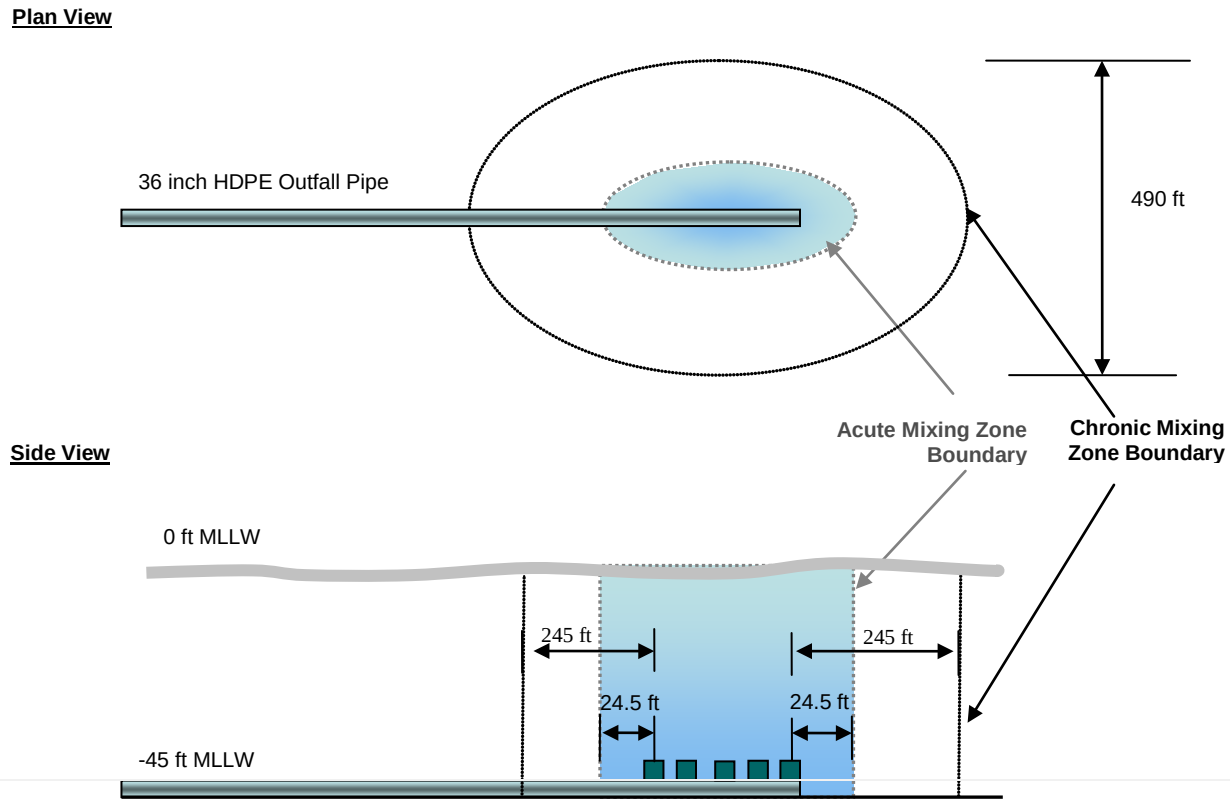
F. Evaluation of surface water quality-based effluent limits for numeric criteria

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

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

As discussed in Section C above, diffusers are often added to the end of outfalls to provide more complete mixing of the effluent with the receiving water body. According to the *Dilution Ratio Study Plan* submitted by PTPC in February 1994, the diffuser attached to Outfall 001 is 350 feet long with a diameter of 36 inches. It contains a total of 36 ports that are 10 feet apart. There are 20 5-inch ports, 15 6-inch ports, and one 8-inch end port. The diffuser depth is approximately 45 feet below the surface and the mean lower low water (MLLW) depth is 45 feet. The figure below is a diagram of the diffuser and mixing zones for PTPC.

Figure 3 Mixing Zone Diagram



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 as measured during MLLW.

The horizontal distance of the chronic mixing zone is 245 feet from the diffuser. 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 oceanic and estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The horizontal distance of the acute mixing zone is 24.5 feet from the diffuser. The mixing zone extends from the top of the discharge ports to the water surface.

Ecology required PTPC to complete a mixing zone study and submit the results, which they submitted in December 1994. The mixing zone study determined the dilution factors that occur within these zones at the critical condition using US EPA's Plume dilution model. As stated discussed previously, the results of the model are considered to be relevant and reasonably conservative. The dilution factors are listed below.

Table 17 Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	64	77
Human Health, Carcinogen		77
Human Health, Non-carcinogen		77

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 the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Dissolved Oxygen--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 in the receiving water.

With technology-based limits, this discharge results in a small amount of BOD_5 loading relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

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

Fecal Coliform – As the sanitary flow is approximately 0.02% of the total flow associated with Outfall 001, no violation of the primary contact recreation water quality criterion for fecal coliform is expected. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

Turbidity— Limited analytical data is available regarding the turbidity of the wastewater and the receiving water. Ecology collected samples of the wastewater during their Class 2 inspections in 2005, 2007, 2008, 2009, 2010 and 2011. All of those samples were analyzed for turbidity and these results were used to determine whether there was reasonable potential for the applicable aquatic life turbidity criteria to be exceeded. The surface water quality criteria allow an increase of 5 NTU over background when the background is 50 NTU or less and a 10 percent increase when the background turbidity is more than 50 NTU. For the analysis, a worst case scenario of an ambient concentration of 50 NTU was assumed. Based on reasonable potential analysis (See **Appendix** D), no effluent limit for turbidity is necessary at this time.

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

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

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. As discussed in Section II.B, this data is available through Ecology's water quality monitoring program. The water quality data from monitoring station PTH005 was used to determine the site-specific acute and chronic criteria and obtain background ammonia data. Using Hampson's model, the pH, temperature and salinity for each data point can be used to convert the acute and chronic water quality standard for unionized ammonia to an acute and chronic water quality standard for total ammonia (as N) at those conditions. This conversion is done to determine whether the total ammonia (as N) in the facility's effluent will have the reasonable potential to exceed the water quality standards when it is discharged into the receiving water. The 90^{th} percentile value for the calculated acute and chronic water quality standards were chosen to represent the critical conditions as recommended by Ecology's Permit Writer's Manual. The 90^{th} percentile value of the total ammonia (as N) concentration was also chosen for the receiving water concentration. The site-specific acute and chronic water quality standards and background ammonia were used in reasonable potential analysis, as described in. Based on the analysis, there is no reasonable potential for PTPC to exceed water quality standards for ammonia at the edge of the dilution zone.

Ambient background data for heavy metals was available from a study performed by Ecology in 1988. The study is titled *Chemical Analysis of August 1988 Port Townsend Bay Seawater Samples* with a date of April 7, 1989. Samples were collected from the west side of Port Townsend Bay at salmon rearing pens maintained by Blue Water Farm, which was near the PTPC outfalls. The samples were analyzed for EPA priority pollutants, 61 trace elements, herbicides, and nitrogen- and phosphorous-containing compounds. Ambient background data was used for the following pollutants listed in Table 2 above: arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards. Ecology determined that none of the pollutants listed above pose a reasonable potential to exceed the water quality criteria at the critical condition using procedures given in the *Technical Support Document for Water Quality-based Toxics Control* (EPA, 1991) (**Appendix D**) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Temperature--The state temperature standards (WAC 173-201A-210 and -612) include multiple elements:

- One day maximum threshold criteria
- Incremental warming restrictions
- Protections against acute effects

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

- One day maximum criteria

Each water body has an annual maximum temperature criterion [WAC 173-201A-210(1)(c),]. These threshold criteria (e.g., 13, 16, 19, 22°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

The threshold criteria apply at the edge of the chronic mixing zone. 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-210(1)(c)(i)-(ii)]. The incremental warming criteria applies 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 for a water body that is warmer than the threshold criterion, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

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

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

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

Reasonable Potential Analysis

Annual summer maximum and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum and the incremental warming criteria at the edge of the chronic mixing zone during critical conditions. The 90th percentile one day maximum temperature of the receiving water is 11.9 °C, which is less than the temperature criteria of 16 °C. Therefore, the discharge must not cause the receiving water to exceed the temperature criteria and any incremental increase resulting from the discharge must not be more than 12/(T-2), where T represents the background temperature as measured at a point unaffected by the discharge and is the highest ambient water temperature in the vicinity of the discharge. No reasonable potential exists that the discharge will cause the temperature in the receiving water to exceed either of these standards. The results of the reasonable potential analysis are included in Appendix D.

The proposed permit does not include a temperature limit for Outfall 001. The permit requires additional monitoring of effluent and ambient temperatures as the ambient temperature data that is available was only collected once per day and it is unknown if it was collected at the time of day when the temperature would be expected to be the maximum temperature. Ecology will reevaluate the reasonable potential during the next permit renewal.

Wastewater discharged from Outfall 002 is non-contact cooling water that is discharged into Port Townsend Bay north of Outfall 001. The same surface water quality standard described above applies to Outfall 002 as well as the same ambient water quality conditions. The

existing permit contains a maximum daily temperature limit of 25 degrees Celsius (77 degrees Fahrenheit). The application reports that 2.0 MGD of wastewater is discharged from Outfall 002, which is approximately 10% of the maximum flow used to establish the dilution factors for Outfall 001. Based on the marine temperature spreadsheet (included in Appendix D), if we apply the dilution factor associated with Outfall 001, the surface water quality criteria for temperature and the incremental rise criteria will not be exceeded if the temperature of the discharge is 25 degrees Celsius or less. This is considered to be a conservative analysis as the dilution factors for Outfall 001 were established for a much higher flow rate of 22 MGD versus 2 MGD from Outfall 002. Therefore, the proposed maximum permitted effluent temperature for Outfall 002 is the same as the existing permit at 25 degrees Celsius (77 degree Fahrenheit).

G. 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.

Ecology determined the effluent may contain chemicals of concern for human health, based on (1) the facility's status as an EPA major discharger and (2) data or information indicating the discharge contains regulated chemicals. 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 spreadsheet showing the results of the human health evaluation is provided in Appendix D. The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards, and an effluent limit is not needed.

Endrin Aldehyde was detected in one of the priority pollutant scans at a concentration of 0.032 ug/L. This concentration is significantly less than the human health criteria of 0.81 ug/L. The measured concentration was entered into the human health reasonable potential analysis spreadsheet and the results indicate that the low concentration has a very minimal effect on the receiving water. Based on this analysis, it does not appear that an effluent limit is necessary at this time.

H. Sediment quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website at http://www.ecy.wa.gov/programs/tcp/smu/sediment.html.

A sediment monitoring study was submitted to Ecology in November 1995. No chemical constituents in the sediment exceeded the Sediment Quality Standards (SQS) at that time and no limits associated with sediment quality are included in the draft permit. As the last sediment monitoring study was conducted more than ten years ago, the proposed permit

requires the facility to do a sediment recharacterization study as described in Section V.H below.

I. Groundwater quality limits

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

PTPC does not directly discharge wastewater to the ground. No permit limits are required to protect the ground water at this time. However, the construction and design standards utilized at the time of installation of the wastewater lagoon (ASB) are unknown and the condition of the lining of the lagoon is also unknown. Without verification of the integrity of the lagoon liner, the potential impacts of any discharge of wastewater from the bottom of the ASB on ground water quality cannot be determined without further investigation. The draft permit requires that the Permittee submit a ground water impact study plan as discussed in Section V.G below.

J. Whole effluent toxicity

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

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.
- *Chronic toxicity tests measure various sublethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

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

permit required that the facility retest the effluent once in the last summer and once in the last winter of the permit term. The results from those WET tests were submitted with the permit renewal application and are summarized below.

Acute Toxicity

The performance standard for acute toxicity is a median of at least 80% survival in 100% effluent with no single test showing less than 65% survival in 100% effluent. The acute WET test results in Table 18 provide the percent survival of the testing organism in 100% effluent. All of the survival rates are greater than 80%; therefore, the proposed permit will not include an acute WET limit.

Table 18 2008 Acute WET Test Results (Percent survival in 100% effluent)

Sample Date	Organism	Endpoint	Percent Survival
March 12, 2008	Inland Silverside	96-Hour Survival	97.5
March 12, 2008	Atlantic Mysid	48-Hour Survival	95
September 16, 2008	Inland Silverside	96-Hour Survival	100
September 16, 2008	Atlantic Mysid	48-Hour Survival	100

Chronic Toxicity

The performance standard for chronic toxicity is no toxicity in a concentration of effluent representing the edge of the acute mixing zone. Based on the mixing zone analysis discussed in Section III.F above, the acute critical effluent concentration (ACEC) is 1.6% and the chronic critical effluent concentration (CCEC) is 1.3%. The chronic WET tests were performed using multiple effluent concentrations (0%, 1.3%, 1.6%,10%, 30% and 100%). Table 19 shows the effluent concentrations for the effluent concentrations that had no observable effects (NOEC) and the lowest concentration that had an effect on the testing organism (LOEC). All of the results show that the NOECs and LOECs are greater than the acute critical effluent concentration; therefore, the draft permit does not include a chronic WET limit.

Table 19 Chronic Bioassay Results (Reported as Percent Effluent)

Sample Date	Organism	Endpoint	NOEC	LOEC
March 12, 2008	Atlantic Mysid	7-day Survival	100	100
		Biomass	30	100
		Weight	30	100

Sample Date	Organism	Endpoint	NOEC	LOEC
March 12, 2008	Topsmelt	7-day Survival	100	100
		Biomass	30	100
		Weight	30	100
March 12, 2008	Mussel	Survival	69.9	100
		Development	10	100
September 16, 2008	Atlantic Mysid	7-day Survival	100	>69.9
		Biomass	100	30
		Weight	30	100
September 16, 2008	Topsmelt	7-day Survival	100	100
		Biomass	100	100
		Weight	100	100
September 17, 2008	Mussel	Survival	63.3	>63.3
		Development	10	30

Port Townsend Paper Corporation 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.
- 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. Port Townsend Paper Corporation may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

K. Comparison of proposed effluent limits with the existing permit issued on September 1, 2004

			Previous Effluent Limits		Proposed Effluent Limits	
Parameter	**Basis of Limit**	**Outfall**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Biochemical Oxygen Demand (5-day) (pounds per day)	Technology	001	4,793	9,257	4,628	8,943
Total Suspended Solids (pounds per day)	Technology	001	8,539	16,775	8,350	16,414
Parameter	**Basis of Limit**	**Outfall**	**Average Monthly**	**Maximum Weekly**	**Average Monthly**	**Maximum Weekly**
Biochemical Oxygen Demand (5-day) (mg/L)	Technology	005	30	45	30	45
Total Suspended Solids (mg/L)	Technology	005	30	45	30	45

Parameter	Basis of Limit	Outfall	Previous Limit	Proposed Limit
pH	Technology	001	6.0 to 9.0	6.0 to 9.0
Temperature (Maximum Daily)	Water Quality	002	77 ^{o}F (25 ^{o}C)	77 ^{o}F (25 ^{o}C)
Removal of influent BOD and TSS	Technology	005	85%	85%
Fecal Coliform Bacteria (Average Monthly)	Technology	005	200/ 100 mL	200/ 100 mL
Total residual Chlorine (mg/L)	Water Quality	005	0.1 to 5.0	0.1 to 5.0
pH	Technology	005	N/A	6.0 to 9.0

IV. Monitoring Requirements

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

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

A. Wastewater monitoring

The proposed permit requires that PTPC monitor the applicable effluent for the parameters listed in Table 16 above to demonstrate compliance with the effluent limits.

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 existing permit specifies a reduced monitoring frequency for BOD_5 and TSS for Outfall 001. The reduced frequency was granted based on two years of monitoring data which indicated that the Long Term Average (LTA) for BOD_5 was 43% of the Average Monthly Limit (AML) and the LTA for TSS was 45% of the AML. Table XIII-1A1 in Chapter XIII of the Ecology *Water Quality Program Permit Writer's Manual* specifies the allowable monitoring frequency based on the ratio of LTA to the AML. Based on Table XIII-1A1, the sampling frequency for BOD_5 was reduced from five times per week to two times per week and TSS was reduced from seven times per week to three times per week. To remain eligible for these reductions, PTPC must not violate effluent limits of the parameters for which Ecology granted reductions were and must not fail to submit DMRs. If these conditions are not met, Ecology may require increased monitoring through an Administrative Order or minor permit modification. Such an Administrative Order was issued to PTPC on August 5, 2010 for violation of the BOD_5 daily maximum and average monthly limits as well as the TSS daily maximum and average monthly limits. The Administrative Order reinstated the previously required monitoring frequencies of five times per week for BOD_5 and seven times per week for TSS. The Administrative Order specified that the minimum sampling frequencies specified in the Order would remain in effect until reduced monitoring allowances were again secured following the procedures described in the Ecology's *Permit Writer's Manual*. As part of the permit renewal process, Ecology reviewed the monitoring data between September 2010 and September 2012 to determine whether it could once again reduce monitoring frequencies for BOD_5 and TSS. The LTA for BOD_5 was 47% of the AML and the LTA for TSS was 33% of the AML. Based on the LTA to AML ratios, Ecology reapplied reductions in the monitoring frequencies for BOD_5 and TSS at Outfall 001. The proposed monitoring frequency for BOD_5 is two times per week and the proposed monitoring frequency for TSS will be three times per week.

The Permittee is also required to monitor the amount of sludge dredged from the ASB each month, the amount of sludge that is recycled back to the influent of the ASB, and the amount of sludge that is disposed of off-site each month (and the disposal site of the sludge).

B. Lab accreditation

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

Table 20 Accredited Parameters

Parameter Name	Analyte Code	Method Description	NELAC Code	Matrix[a]
Biochemical Oxygen Demand (BOD)	1530	SM 5210 B-01	20135006	N
Chlorine (Residual), Total	1940	SM 4500-CL G-00	20081612	N
Dissolved Oxygen	1880	SM 4500-O G-01	20121408	N
pH	1900	Sm 4500-H+ B-00	20105219	N
Solids, Total Suspended	1960	SM 2540 D-97	20051201	N

a. N = non-potable water

The facility uses accredited contract laboratories to test for any additional permit required parameters.

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). Special S3 specifies the reporting requirements for the Permittee and is similar to the current permit, except that the discharge monitoring reports will be required to be submitted electronically. The draft permit allows the Permittee to submit the reports in paper form until July 31, 2014 to allow them time to implement procedures for submitting the reports electronically.

B. Treatment System Operating Plan (operation and maintenance manual)

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations [40 CFR 122.41(e) and WAC 173-220-150 (1)(g)]. Implementation of the procedures in the operation and maintenance manual ensures the facility's compliance with the terms and limits in the permit. The Permittee has an existing operations and maintenance manual (O&M Manual). Special Condition S4.A of the draft permit requires that the Permittee review the O&M manual at least once per year and update it as necessary. The Permittee must submit a notification to Ecology that this review has been completed each year. The manual must include all the information required by conditions b. and c. of S4.A.

The first chapter of the O&M Manual, called the Treatment System Operating Plan, is a concise summary of the specifically defined elements of the O&M Manual. The Permittee is required to submit an updated copy of the Treatment System Operating Plan to Ecology for review within 180 days of permit issuance. In addition to the information required by the existing permit, the Permittee must include sludge management procedures for both the industrial wastewater treatment system and the sanitary wastewater treatment system.

In association with operation of the wastewater treatment plant, Special Condition S4.B specifies the requirements for bypass procedures. The draft permit prohibits bypassing the wastewater treatment plant except under the circumstances specified in Special Condition S4.B. Any bypass must follow the requirements of S4.B.

C. Solids Management plan

PTPC could cause pollution of the waters of the state through inappropriate disposal of solids or through the release of leachate from those solids.

This proposed permit requires this facility to update the approved solids management plan (formerly solid wastes control plan) designed to prevent solids from causing pollution of waters of the state. The solids management plan must address all solids generated by the wastewater treatment process, including, but not limited to, the geobags associated with the *PTPC ASB Operation and Sludge Management Trial* and the sludge removal activities from the ASB. The facility must submit the updated plan to Ecology for approval (RCW 90.48.080). You can obtain an Ecology guidance document, which describes how to develop a Solids Management Plan, at: http://www.ecy.wa.gov/pubs/0710024.pdf

D. Compliance schedule

As discussed in Item B above, Ecology considers proper operation and maintenance of the treatment system to be necessary to ensure continued compliance with the conditions of the NPDES permit. The draft permit includes compliance schedule to address two issues associated with proper operation and maintenance of the ASB.

Accumulation of Sludge in the ASB

The first issue is the accumulation of sludge in the ASB. Sludge accumulation in the ASB occurs as part of the normal operation of the system due to settling of solids contained within the wastewater and the growth of bacterial biomass as part of the treatment process. The majority of the settling occurs in the last run (Run 4) of the basin since aeration is not provided in that run but it also occurs in other areas with limited mixing. The facility must remove accumulated sludge periodically to maintain an adequate residence time within the treatment system and to ensure adequate free board is provided to allow capacity for sudden and large storm events or other upset conditions.

PTPC conducted a sludge management trial between July 2009 and March 2010 to investigate potential sludge removal options. During this trial, the facility placed the removed sludge in geobags which were stored on-site. PTPC conducted a sludge inventory of the ASB in August and September 2010 after completion of the trial. The sludge inventory indicated a significant portion of Run 4 did not have at least 4 feet of clear water,

which PTPC determined was necessary to provide more complete settling of TSS and to accommodate potential upset conditions.

PTPC then submitted a draft "*Long-Term Sludge Management Plan*" dated September 10, 2010 and "*PTPC ASB Sludge Removal and Handling System Project Description and Conceptual Drawings*" dated June 15, 2011. Ecology provided a conditional approval letter to Ms. Annika Wallendahl for the latter submittal on July 22, 2011. Due to a series of delays, sludge removal has not begun. As sludge management is an important component of operations and maintenance of the ASB and is necessary to maintain adequate treatment plant capacity such that the facility is providing AKART, the proposed permit includes a compliance schedule that requires PTPC to initiate the sludge removal process within six months of permit issuance and a second compliance schedule to remove a sufficient amount of sludge to reach the target freeboard of 4 feet within 18 months of permit issuance. The sludge removal process must be in accordance with the aforementioned submittals and the conditions specified in the approval letter dated July 22, 2011.

Additional Corrective Action Items

The second issue addresses two items noted during inspections of the ASB by Ecology. In a letter from Ecology to PTPC dated March 18, 2010, Ecology requested that PTPC investigate the condition of the scum collar/outlet weir and report corrective action. The request was based on observation during the March 18, 2010 inspection of an apparent low area in the scum collar and outlet weir just beyond the walkway area above the Parshall flume. During the following inspection on November 24, 2010, Ecology noted that treated effluent flow appeared to be passing through only 50-60% of the notches in the outlet trough. PTPC indicated that temporary repairs to level the trough were made in July 2010 and that it would make permanent repairs after it has removed sludge accumulation near the outlet trough.

There is also a portion of one of the curtains in the wastewater lagoon that is sagging below the water level allowing the effluent to short circuit a portion of the treatment system. PTPC must repair both of these issues to ensure proper operation of the wastewater treatment system. Therefore, the draft permit includes two additional action items in the compliance schedule. One action item requires that the Permittee submit an assessment of the ASB outlet weir structure and the ASB curtains and propose corrective actions to address the issues discussed above within six months of permit issuance. The final compliance schedule requires the facility to implement the repairs identified in the assessment within one year of permit issuance.

E. Spill plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

PTPC developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the facility to update this plan and submit it to Ecology.

F. Receiving water study

As discussed in Section III above, a reasonable potential analysis is conducted during the permit renewal process to determine whether the discharge has the potential to cause the water body to exceed the water quality standards at the edge of the mixing zones, when allowed. Details about the reasonable potential calculations are provided in Appendix D. In order to perform the analysis, ambient water quality data is necessary to determine if the water quality criteria will be exceeded. Limited ambient water quality data is currently available for Port Townsend Bay where PTPC discharges their treated effluent. The results of water quality sampling from Port Townsend Bay by Ecology in August 1988 were used to perform the reasonable potential analysis for the draft permit, but additional sampling of the receiving water is necessary to more adequately characterize the receiving water. The draft permit requires that PTPC submit a sampling and quality assurance plan for Ecology review and approval no later than one year after permit issuance. PTPC must then collect the samples in accordance with the approved plan and submit the results of the monitoring at least one year prior to the expiration date of the permit (with the permit application).

G. Ground water impact study

The groundwater quality standards (chapter 173-200 WAC) protect beneficial uses of groundwater. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

As discussed in Section III.I above, the construction and design standards utilized at the time of installation of the wastewater lagoon (ASB) are unknown and the current condition of the lagoon liner is unknown. Therefore, Ecology cannot determine the potential impact of seepage from the wastewater lagoon on ground water quality without further investigation. The draft permit requires that PTPC submit a ground water impact study plan to be implemented in the third and fourth year of the permit. The plan must include any as-built drawings and liner specifications for the ASB liner, if available, a sampling plan for the lagoon to determine the concentrations of the constituents in the wastewater for comparison to the Ground Water Quality Standards (WAC 173-200-040), and a hydrogeologic study in accordance with the *Implementation Guidance for the Ground Water Quality Standards* (Pub. #96-02, April 1996, revised October 2005 - https://fortress.wa.gov/ecy/publications/summarypages/9602.html). If this analysis determines that a potential for the effluent to cause an exceedance of the standards in the ground water exists, PTPC will be required to install monitoring wells to investigate any actual effects on the ground water by the lagoon.

H. 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

PTPC submitted a sediment monitoring study to Ecology in November 1995. No chemical constituents in the sediment exceeded the Sediment Quality Standards (SQS) at that time. As

the last sediment monitoring study was conduct more than ten years ago, the draft permit includes a sediment recharacterization study as described in Section III.H. Ecology will review the reported data and will evaluate the results (as specified in the Sediment Management Standards, Part IV: Sediment Source Control, WAC 173-204-400) to determine what or if any source control, monitoring, and/or cleanup actions is required.

The additional sediment monitoring is required towards the end of the permit cycle so that Ecology can evaluate current data during the next permit renewal process.

I. Outfall evaluation

The proposed permit requires PTPC to conduct two outfall inspections during the permit cycle and submit a report detailing the findings of each inspection (Special Condition S.12). The last outfall inspection was conducted in 2008 and the first inspection will be required to be completed in 2013 to ensure that the outfall is inspected at least once every five years. 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 report must include the results of the inspection and a discussion from the Permittee as to whether the results of the report indicate that any actions are necessary to maintain the integrity and operation of the outfall and diffuser pipe.

J. Certified operator

The existing permit classifies the domestic wastewater treatment plant as a Class I treatment plant. However, the current rules (WAC 173-230-140) classify an activated sludge plant with a design flow of less than 1 million gallons per day as a Class II treatment plant. Special Condition S13 requires that the facility must be operated by an operator certified by the state of Washington for at least a Class II plant. Since this is a different classification than required by the existing permit, the Permittee has been granted 180 days to obtain a Class II operator.

K. Acute and Chronic Toxicity

As discussed in Section III.J above, permit limits associated with acute or chronic toxicity are not proposed in the draft permit. While no permit limit has been established, the facility will continue to be required to periodically monitor the acute and chronic toxicity of their effluent. The last acute and chronic toxicity tests were conducted in March and October of 2008. Special Condition S14 requires acute and chronic toxicity testing twice during the permit cycle, once in the last winter and in the last summer prior to submission of the application for permit renewal. The acute and chronic toxicity testing requirements are the same as required by the existing permit.

L. Treatment System Engineering Report

As discussed in Sections III.A and III.B above, flows or waste loadings to a wastewater treatment facility must not exceed approved design criteria and the facility must apply all known available and reasonable methods of prevention, control, and treatment (AKART) for the pollutants placed in the wastewater. The existing permit required PTPC to submit a treatment system efficiency study and engineering report with the permit renewal application such that Ecology could evaluate whether the facility meets AKART. The study and

engineering report were completed and submitted as required. The draft permit requires a similar report such that Ecology can re-evaluate AKART at the time of the next permit renewal.

During the previous permitting period, Ecology received odor complaints from citizens of Port Townsend and other surrounding areas. While it can be difficult to identify the source of odors, WAC 173-400-040(5) requires that "any person who shall cause or allow the generation of any odor from any source or activity which may unreasonably interfere with any other property owner's use and enjoyment of his property must use recognized good practice and procedures to reduce these odors to a reasonable minimum." There is a potential for wastewater treatment systems, such as the ASB, to generate odors which may be associated with specific waste streams, operational methods, sludge management practices, or design features.

There is one particular wastewater stream treated by the ASB, the "hard piped" condensates associated with the air pollution control system, which contains total reduced sulfur (TRS) compounds that are a potential source of odors from the ASB. According to a study conducted by the National Council for Air and Stream Improvement entitled "Emissions of Reduced Sulfur Compounds and Methane from Kraft Mill Wastewater Treatment Plants" (Crawford 2008), "aerated stabilization basins where foul condensates were directly introduced via a submerged enclosed pipe were found to be the most significant sources of the three organic reduced sulfur compounds". The four total reduced sulfur compounds included in the study were hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide". The study also stated that "maintaining sufficiently high in-basin pH and dissolved oxygen resulted in efficient sulfide removal, by means other than emissions to atmosphere, even when the sulfide loading increased 12-fold".

After considering the odor complaints in the area and potential odors generated from the ASB, the draft permit requires PTPC evaluate the minimization of odors associated with the ASB. The engineering report must identify all components associated with the ASB that have the potential to cause odor and specify the operational and maintenance procedures to reduce odors. It must first characterize the waste stream and identify the fate of the TRS compounds associated with the hardpipe condensate stream after they enter the treatment system. Once the characterization of the stream has been completed and the fate of the pollutants determined, PTPC must establish optimal operating conditions (i.e. pH, dissolved oxygen levels, temperature, sludge recycling, piping configurations, etc) and maintenance practices required to minimize the amount of TRS that is released to the atmosphere from the ASB. Ecology will review the engineering report during the next permit renewal to determine if the generation of odors is being sufficiently minimized.

M. Stormwater pollution prevention plan (SWPPP)

A stormwater analysis plan for the PTPC industrial site was completed and approved in 1991. The plan indicated that all the stormwater generated at the site is directed to the process wastewater treatment system. In accordance with 40 CFR 122.44(k) and 40 CFR 122.44 (s), the proposed permit includes a requirement to develop and implement a SWPPP to ensure continued management of the stormwater in a manner that prevents or minimizes pollutants from entering the waters of the state. The SWPPP must identify potential sources

of stormwater contamination from industrial activities and identify how those sources of contamination are properly managed to prevent or minimize contamination of surface waters. PTPC must continuously review and revise the SWPPP as necessary to assure that stormwater discharges do not degrade water quality. The SWPPP must be kept on-site or within reasonable access to the site and available for review by Ecology.

N. Application for permit renewal or modification for facility changes

In accordance with WAC 173-220-180, any permittee that wishes to continue the permitted activity after the expiration date of the permit must submit an application for replacement to an existing permit or continuation of a discharge beyond the expiration date at least 180 days prior to its expiration. Ecology has determined that more time is generally required to process the permit renewal application and has required that the permit renewal application be submitted one year prior to the expiration date.

A number of studies are required by this permit and the results are required to be submitted with the permit renewal application. The results will be used to determine if additional permit requirements will be necessary during the next permit cycle. As discussed in Section III.C above, the Permittee completed a mixing zone study in 1994. It appears that the study was performed using critical conditions and larger effluent flow than is currently produced. To ensure that the model continues to reflect critical conditions, the Permittee will be required to review the inputs and assumptions that were used in the 1994 model and determine whether they are still valid and appropriate. If there is reason to believe that the discharge or ambient conditions have changed significantly since that time, a new mixing zone study should be submitted with the permit renewal application.

P. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual industrial 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 water, with sediment quality standards, or with water quality standards for groundwater, after obtaining 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 includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

VII. REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

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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.

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

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

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June 2011. *PTPC ASB Sludge Removal and Handling System Project Description and Conceptual Drawings*

September 2010. *Long-Term Sludge Management Plan.*

February 2009. *Wastewater Treatment System Efficiency Study and Engineering Report.* Prepared by Todd Williams and reviewed by Robert Hobbs, PE.

November 1995. *Port Townsend Paper Corporation: Sediment Baseline Study – 1995.* Prepared by Dale B. Bonar, Ph.D., Aquatic Environmental Services.

December 1994. *Port Townsend Paper Corporation: Mixing Zone Study.* Prepared by Cosmopolitan Engineering Group.

Washington State Department of Ecology (Ecology.

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February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees,* Publication Number 07-10-024. http://www.ecy.wa.gov/pubs/0710024.pdf

April 1989. *Chemical Analysis of August 1988 Port Townsend Bay Seawater Samples,* Publication Number 89-e24.

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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 issue a permit to PTPC. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on April 24, 2013 in the PT Leader to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet. Ecology will hold an informal open house on May 14, 2013 at the Port Townsend Community Center and a public meeting followed by a formal hearing on June 4, 2013 at Port Townsend's Elk Lodge #317.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period.
- Explains the next step(s) in the permitting process.

Ecology published a document entitled *Frequently Asked Questions about Effective Public Commenting*, available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html.

You may obtain further information from Ecology by calling (360) 407 - 6355 or by writing to the address listed below.

Stephanie Ogle, P.E.
Department of Ecology
Industrial Section
PO Box 47600
Olympia, WA 98504-7600

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

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

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

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

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

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

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)]. Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient

water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

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

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

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

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

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

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

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

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

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

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

by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

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

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

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

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

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

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

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

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

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

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

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are

controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop

photographic film or paper, and car washes).
Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1,2,or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

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

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

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

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

solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

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

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

Appendix D--Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found 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. 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:

$$MC = [EC + (AC(DF-1))]/DF$$

where:

EC = Effluent Concentration

AC = Ambient Concentration

DF = Dilution Factor

Reasonable Potential Analysis:

The spreadsheets REASPOT.XLS, and LIMIT.XLS in Ecology's TSDCALC Workbook determine reasonable potential (to violate the aquatic life water quality standards) and calculate effluent limits. The spreadsheet HUMAN-H.XLS determines reasonable potential and calculates effluent limits for human health pollutants. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Calculation of Water Quality-Based Effluent Limits:

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

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

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

WLA_a = (acute criteria x DF_a) – [(background conc.x (DF_a - 1)]

WLA_c = (chronic criteria x DF_c) – [(background conc. x (DF_c -1)]

where: DF_a = Acute Dilution Factor

DF_c = Chronic Dilution Factor

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

$MDL = LTA x\, e^{(Z\sigma - 0.5\sigma^2)}$ where: $\sigma^2 = \ln[CV^2 + 1]$

$z = 2.326$ (99th percentile occurrence

LTA = Limiting long term average

Average Monthly Limit = AML

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

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 66. User input columns are shown with red headings. Corrected formulas in col G and H on 598 (GB)

CALCULATIONS

Parameter	Metal Criteria Translator as decimal		Ambient Conc (metals as dissolved)	State Water Quality Standard		Max concentration at edge of...		LIMIT REQ'D?	Effluent percentile value	Pn	Max effluent conc. measured (metals as total)	CV	s	# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
	Acute	Chronic	ug/L	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone										
AMMONIA			30.0000	8420.0000	1270.0000	210.06	179.66	NO	0.95	0.922	10200.00	0.60	0.55	37	1.13	64	77
ARSENIC	1.00		1.1700	69.0000	36.0000	2.48	2.26	NO	0.95	0.368	28.40	0.60	0.55	3	3.00	64	77
CADMIUM	0.99	0.99	0.0900	42.0000	9.3000	0.10	0.10	NO	0.95	0.368	0.30	0.60	0.55	3	3.00	64	77
CHROMIUM(HEX)	0.99	0.99	0.1600	1100.0000	50.0000	0.34	0.31	NO	0.95	0.368	4.00	0.60	0.55	3	3.00	64	77
COPPER	0.83	0.83	0.3290	4.8000	3.1000	0.58	0.53	NO	0.95	0.368	6.50	0.60	0.55	3	3.00	64	77
LEAD	0.95	0.95	0.0560	210.0000	8.1000	0.20	0.17	NO	0.95	0.368	3.20	0.60	0.55	3	3.00	64	77
MERCURY	0.85		0.0007	1.8000	0.0250	0.00	0.00	NO	0.95	0.368	0.00	0.60	0.55	3	3.00	64	77
NICKEL	0.99	0.99	0.2750	74.0000	8.2000	0.55	0.51	NO	0.95	0.368	6.10	0.60	0.55	3	3.00	64	77
SILVER	0.85		0.0010	1.9000	N/A	0.00	0.00	NO	0.95	0.368	0.04	0.60	0.55	3.00	3.00	64	77
ZINC	0.95	0.95	0.7390	90.0000	81.0000	3.41	2.96	NO	0.95	0.368	60.40	0.60	0.55	3.00	3.00	64	77
TURBIDITY			1.7286		6.7286		5.88	NO	0.95	0.607	150.00	0.60	0.55	6.00	2.14	64	77

Water Quality Reasonable Potential Spreadsheet

Revised 3/00	Ambient Concentration (Geometric Mean)	Water Quality Criteria for Protection of Human Health	Max concentration at edge of chronic mixing zone.	LIMIT REQ'D?	Expected Number of Compliance Samples per Month	AVERAGE MONTHLY EFFLUENT LIMIT	MAXIMUM DAILY EFFLUENT LIMIT	Estimated Percentile at 95% Confidence		Max effluent conc. measured	Coeff Variation		# of samples from which # in col. K was taken	Multiplier	Calculated 50th percentile Effluent Conc. (When n>10)	Dilution Factor
Parameter	ug/L	ug/L	ug/L			ug/L	ug/L		Pn	ug/L	CV	S	n			
ANTIMONY (INORGANIC) 7440360 1M	1.90	4300.00	1.91	NO		NONE	NONE	0.50	0.37	2.00	0.60	0.6	3	1.20	0.00	77.00
ENDRIN ALDEHYDE 7421934 15P		0.81	0.001	NO		NONE	NONE	0.50	0.05	0.03	0.60	0.6	1	2.49	0.00	77.00
MANGANESE 7439965	0.0270	100.00	4.72	NO		NONE	NONE	0.50	0.37	300.00	0.60	0.6	3	1.20	0.00	77.00
MERCURY 7439976 8M	0.0007	0.15	0.00	NO		NONE	NONE	0.50	0.37	0.00	0.60	0.6	3	1.20	0.00	77.00
NICKEL - 7440020 9M - Dependent on hardness	0.28	4600.00	0.37	NO		NONE	NONE	0.50	0.37	6.10	0.60	0.6	3	1.20	0.00	77.00

Human Health Reasonable Potential Spreadsheet

Marine T-mix

T-Mix is based on WAC 173-201A-200(1)(c)(i)--(ii) and Water Quality Program Guidance.

All Data inputs must meet WQ guidelines. T = Background 90th percentile, t = allowable temperature rise
The Water Quality temperature guidance document may be found at: http://www.ecy.wa.g

Notes:

INPUT	May-Sep
1. Chronic Dilution Factor at Mixing Zone Boundary	64
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	11.9 °C
3. 1DADMax Effluent Temperature (95th percentile)	25.0 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	12.1 °C
6. Incremental Temperature Increase or decrease:	0.2 °C
7. Incremental Temperature Increase 12/(T-2) if T≤ crit:	1.21 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	13.1 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	NO
10. Temp increase allowed at mixing zone boundary, if required:	---
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) and within 0.3 °C of the criterion	
11. Does temp fall within this incremental temp. range?	NO
12. Temp increase allowed at mixing zone boundary, if required:	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within 12/(T_{amb}-2) of the criterion	
13. Does temp fall within this Incremental temp. range?	NO
14. Temp increase allowed at mixing zone boundary, if required:	---
D. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
15. Does temp fall within this Incremental temp. range?	YES
16. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT
17. Do any of the above cells show a temp increase?	**NO**
18. Temperature Limit if Required?	**NO LIMIT**

Temperature Spreadsheet