



# Fact Sheet

**NPDES Permit Number: WA-002195-4**

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## **The U.S. Environmental Protection Agency (EPA) Plans To Reissue A Wastewater Discharge Permit To:**

**Solo Point Wastewater Treatment Plant  
U.S. Department of Defense  
Department of the Army  
Joint Base Lewis McChord, WA 98433-5000**

**and**

## **The State of Washington Proposes to Certify the Permit and Issue a Consistency Determination**

### **EPA Proposes NPDES Permit Reissuance.**

EPA proposes to reissue a *National Pollutant Discharge Elimination System* (NPDES) Permit to the Solo Point Wastewater Treatment Plant (WWTP) at the Fort Lewis Army Base. The permit sets conditions on the discharge--or release--of pollutants from the Solo Point WWTP to the Puget Sound. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged.

This Fact Sheet includes:

- information on public comment, public hearing, and appeal procedures
- a description of the current discharge and current biosolids practices
- a listing of past and proposed effluent limitations, and other conditions
- a map and description of the discharge location
- detailed technical material supporting the conditions in the permit

### **The State of Washington Proposes Certification and Consistency Determination.**

The Washington State Department of Ecology (Ecology) intends to certify the NPDES permit for the Solo Point WWTP under section 401 of the Clean Water Act.

Permit No.: WA-002195-4  
Fort Lewis - Solo Point WWTP

**Public Comment.**

EPA will consider all substantive comments before issuing the final permit. Those wishing to comment on the draft permit may do so in writing by the expiration date of the Public Notice. A request for public hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. After the Public Notice expires, and all comments have been considered, EPA's regional Director for the Office of Water will make a final decision regarding permit reissuance.

If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the comments and issue the permit. The permit will become effective 30 days after the issuance date, unless a request for an evidentiary hearing is submitted within 30 days.

If no substantive comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance.

Further public involvement information is included in Appendix A. Responses to comments will be included in Appendix G.

**Documents are Available for Review.**

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (See address below). Draft permits, Fact Sheets, and other information can also be found by visiting the Region 10 website at [www.epa.gov/r10earth/offices/water/npdes.htm](http://www.epa.gov/r10earth/offices/water/npdes.htm).

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### I. BACKGROUND INFORMATION

**Table 1. General Facility Information**

Applicant:	Fort Lewis Army Base, U.S. Department of Defense
Facility Name and Facility Address:	Solo Point Wastewater Treatment Plant Building 2012 Fort Lewis, Washington 98433
Mailing Address	Attn: IMWE-LEW-PW, MS 17, Box 339500 Fort Lewis, Washington 98433
Facility Contacts	Joyce Chavez, Water Program Manager, Fort Lewis Public Works. Randall W. Hanna, Deputy Director of Fort Lewis Public Works.
Discharge Location:	Puget Sound Latitude: 47° 8' 10" N Longitude: 122° 38' 17" W
Waterbody ID Number:	#1224819475188



**Figure 1. Facility Location Map**



**Figure 2. Facility and Outfall Aerial View**

## **A. Facility Description**

### **History**

Fort Lewis is a military base that includes, but is not limited to residential housing, administrative facilities, dining/food services, medical facilities (e.g. Madigan Army Medical Center, medical and dental clinics pharmacies, veterinarian facilities), general maintenance, aircraft/vehicle maintenance (motor pools), aircraft/vehicle wash facilities, aircraft deicing, fuel points, defueling facility, coating operations, firefighting activities, sludge dewatering facility, portable latrines, laundry activities and water purification processes.

The Fort Lewis Army Base owns, operates, and maintains the Solo Point WWTP, a trickling filter plant with a “maximum design flow” rate of 15 MGD and an “average design flow” rate of 7 MGD<sup>1</sup>. Over the past few years, the annual average daily flow rate has been 3.77 MGD. The Solo Point WWTP treats wastewater from Fort Lewis, the McChord Air Force Base, Madigan Army Medical Center, the Veteran’s Hospital at American Lake, and the Camp Murray National Guard Station. Figures 1 and 2 show the treatment plant and discharge locations.

<sup>1</sup> "Sewage Treatment Plant Study Final Report Fort Lewis, Washington", dated April 1992, by Gray & Osborne, Inc.

### Treatment Processes

Influent flows through one of two mechanical fine screens and into an aerated grit chamber. Grit pumps deliver the grit to classifiers and the product is shipped off to a landfill. Wastewater then flows into four primary tanks where primary sludge pumps direct dilute sludge to a gravity thickener. The primary effluent is pumped to two 90-ft diameter plastic media trickling filters. After passing through the trickling filters, wastewater flows into two secondary clarifiers and then on through a chlorine injection vault and into the chlorine contact chambers. Sodium thiosulfate is used to dechlorinate prior to the treated effluent passing through the outfall and into the Puget Sound. A process flow diagram is included in Appendix B.

### Discharge Outfall

Outfall #001 extends 500 feet off-shore and contains a diffuser approximately 140 feet in length. Outfall #001 is 24 inches in diameter. The diffuser has a total of fourteen 6-inch diameter ports. The distance between ports is 10 feet. The mean lower low water (MLLW) depth and the diffuser depth is 70 feet. EPA obtained this information from U.S. Army outfall as-built drawings dated May 1969 and from the permit application.

### Solid Wastes

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the primary and secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum, and screenings are drained and disposed of as solid waste at a landfill. Secondary clarifier sludge pumps send dilute sludge from the clarifiers to the gravity thickener. Thickened sludge from the gravity thickener is then pumped to the primary anaerobic digesters, where sludge and supernatant can overflow from one primary digester into a second primary digester in series with the first. Digested sludge can then continue through a secondary anaerobic digester unless it is bypassed directly to the next step in the process, dewatering, which occurs via evaporation in a set of sludge drying beds or by means of a belt filter press. Biosolids are then composted for land application under a permit from the State of Washington (Ecology permit #BA-0021954).

## **B. Permit Status**

The previous NPDES permit for this facility became effective on February 1, 2004.

EPA received the application for permit renewal from Fort Lewis on July 21, 2008. EPA accepted it as complete on September 04, 2008.

## **C. Summary of Compliance with Previous Permit Issued**

Fort Lewis has generally maintained a good compliance record at the Solo Point WWTP in keeping with their effluent limits and permit conditions during the permit cycle beginning on February 1, 2004. EPA assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections conducted by EPA. During the permit cycle, pH fell below the allowable range on four occasions, total residual chlorine exceeded the effluent limit on one occasion, and BOD5 percent removal was less than the

permit requirement once. However, EPA recognized an overall improvement in the compliance record relative to the previous permit cycle. A copy of the facility compliance report and DMR data are included in Appendix C.

#### D. Wastewater Characterization

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. The tabulated data represents the quality of the effluent discharged during the permit cycle beginning in February 2004. The effluent is characterized as follows:

**Table 2. Wastewater Characterization**

Parameter	Units		Previous Permit Limit	5-yr. Average	Minimum	Maximum
<b>Influent</b>						
FLOW	MGD	Monthly Ave.	<b>7.6<sup>1</sup></b>	3.5	--	7.2
<b>Effluent</b>						
BOD <sub>5</sub>	mg/L	Monthly Ave.	<b>30</b>	17	--	23
BOD <sub>5</sub>	mg/L	Weekly Ave.	<b>45</b>	20	--	28
BOD <sub>5</sub>	lbs/day	Monthly Ave.	<b>1902</b>	485	--	922
BOD <sub>5</sub>	lbs/day	Weekly Ave.	<b>2852</b>	570	--	1002
BOD <sub>5</sub> % Removal	percent	Monthly Ave.	<b>80% min.</b>	89	72	93
TSS	mg/L	Monthly Ave.	<b>30</b>	17	--	23
TSS	mg/L	Weekly Ave.	<b>45</b>	21	--	27
TSS	lbs/day	Monthly Ave.	<b>1902</b>	502	--	1108
TSS	lbs/day	Weekly Ave.	<b>2852</b>	603	--	1313
TSS % Removal	percent	Monthly Ave.	<b>80% min.</b>	91	84	96
Total Residual Chlorine	mg/L	Daily Max.	<b>0.5</b>	0.3	--	0.8
Fecal Coliform	#/100 mL	Monthly Ave.	<b>200</b>	11	--	26
Fecal Coliform	#/100 mL	Weekly Ave.	<b>400</b>	28	--	131
pH	Standard Units	Maximum	<b>8.5</b>	--	--	7.5
pH	Standard Units	Minimum	<b>6</b>	--	5.3	--

Note: The permit identifies the design flow as 7.0 MGD instead based on an engineering report prepared for Fort Lewis by Gray & Osborne Engineers in April 1992 titled, Sewage Treatment Plant Study, Part II: Performance and Capacity Study. The report states, "The Fort Lewis Sewage Treatment Plant is a 7.0 MGD secondary treatment facility consisting of the following major processes: primary clarification, trickling filtration, secondary clarification and chlorination."



## II. 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 EPA develops the limit on a case-by-case basis (40 CFR 125.3).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Sediment Quality Standards (chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36).
- EPA 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.). EPA evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. EPA does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Nor does EPA usually develop limits for pollutants that were not reported in the permit application but that may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. If significant changes occur in any constituent of the effluent discharge, the permittee must notify EPA (40 CFR 122.42(a)). The permittee may be in violation of the permit until EPA modifies the permit to reflect additional discharge of pollutants.

### A. Design Criteria

The design criteria for the Solo Point WWTP were obtained from the "Sewage Treatment Plant Study Final Report Fort Lewis, Washington" by Gray & Osborne, Inc (April 1992).

**Table 3. Design Criteria for the Solo Point WWTP at Fort Lewis.**

Parameter	Design Quantity
Maximum Design Flow	15 MGD
Average Design Flow	7 MGD
BOD <sub>5</sub> loading for maximum month	12,300 lb/day <sup>2</sup>
TSS loading for maximum month	12,300 lb/day

### B. Technology-Based Effluent Limits

Federal regulations define technology-based effluent limits for municipal wastewater treatment plants. These effluent limits are given in 40 CFR Part 133:

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<sup>2</sup> Appendix A, pg. A-1 of "Sewage Treatment Plant Study Final Report Fort Lewis, Washington", April 1992, Gray & Osborne, Inc.

**Table 4. Technology-based Limits.**

Parameter	Limit
pH	The pH must measure within the range of 6 to 9 standard units.
BOD <sub>5</sub> (concentration)	Average Monthly Limit = 30 mg/L Average Weekly Limit = 45 mg/L 85% Removal
TSS (concentration)	Average Monthly Limit = 30 mg/L Average Weekly Limit = 45 mg/L 85% Removal

The percent removal requirement for BOD5 and TSS is set to increase from 80% in the previous permit to 85% removal in the new permit. Only under certain circumstances is an exception to the 85% removal requirement allowed. In spite of being an older trickling filter facility, an alternative limit was not given to Solo Point in the new permit because the facility is typically able to exceed 85% removal. The alternative percent removal was therefore calculated to be greater than 85%, whereupon the limit defaulted to that established by the secondary treatment standards in 40 CFR Part 133. Because this is a technology-based limit, EPA cannot set a compliance schedule for its implementation and it will become the new percent removal limit upon issuance of the new permit.

The previous permit also set an effluent limit for chlorine. The previous permit limited total residual chlorine to a daily maximum of 0.5 mg/L. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, *Wastewater Engineering, Treatment, Disposal and Reuse*, Third Edition, 1991.

Under 40 CFR 122.45(f), permits must contain mass-based limitations. The concentration requirements may be converted to mass limits by multiplying the technology-based concentrations times the design flow (7.0 MGD) and a conversion factor of 8.34. The resulting monthly and weekly average loadings are as follows:

$$\text{Monthly effluent mass loadings (lbs/day)} = \text{maximum monthly design flow (7 MGD)} \times \text{Concentration limit (30 mg/L)} \times 8.34 \text{ (conversion factor)} = \text{mass limit, 1,751 lbs./day}$$

$$\text{The weekly average effluent mass loading} = 7 \text{ MGD} \times 45 \text{ mg/L} \times 8.34 = \text{mass limit, 2,627 lbs/day}$$

The effluent mass loadings set by the previous permit for BOD5 and TSS are a monthly average of 1,902 lbs/day and a weekly average of 2,852 lbs/day. The difference is attributable to the maximum monthly design flow, previously stated as 7.6 MGD but confirmed via e-mail from Joyce Chavez, Fort Lewis Water Program Manager, on 11/14/08 as 7.0 MGD (15 MGD being the peak design flow). The new permit includes the mass loadings determined above.

### **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. EPA 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 disease, 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

In setting permit limitations, EPA must consider the State's antidegradation policy. This policy is designed to protect existing water quality when the existing quality is better than that required to meet the standard and to prevent water quality from being degraded below

the standard when existing quality just meets the standard. For high quality waters, antidegradation requires that the State find that allowing lower water quality is necessary to accommodate important economic or social development before any degradation is authorized. This means that, if water quality is better than necessary to meet the water quality standards, increased permit limits can be authorized only if they do not cause degradation of water quality or if the State makes the determination that such degradation is necessary.

The draft permit has effluent limits for biochemical oxygen demand, total suspended solids, fecal coliform, pH, and total residual chlorine from Outfall #001. Because the issuance of this permit places continuing and more restrictive limits on an already existing discharge, the conditions in the permit will improve water quality and therefore will comply with the State's antidegradation requirements.

### Mixing Zones

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

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

Dilution factors (DF) in this permit were obtained from an effluent mixing report titled *Transport and Dilution of Effluent Discharged From the Tatsolo Point Wastewater Treatment Plant and the Chambers Creek Regional Wastewater Treatment Plant Outfalls* (Evans-Hamilton, Inc., 11/20/1996). Dilution factors represent 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. Dilution factors were used with the water quality criteria to calculate reasonable potentials and effluent limits for this permit. 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. EPA has concluded that there is no reasonable potential for the discharge/receiving water mixture to violate water quality criteria outside the boundary of the proposed mixing zone if permit limits are met.

Mixing zones in the State of Washington must be authorized by Ecology. EPA considered the previously-authorized mixing zone in calculations of the reasonable potential for the discharge to exceed water quality criteria. If Ecology does not grant a mixing zone, the

point of compliance must be moved back from the edge of the mixing zone to the point of discharge into the receiving water (end-of-pipe).

**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). Criteria applicable to this facility’s discharge are summarized below in Table 5.

- **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 for this receiving water are identified below.

**Table 5. Aquatic Life Uses and Associated Criteria**

<b>Extraordinary quality</b>	
Temperature Criteria – Highest 1D MAX	13°C (55.4°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	7.0 mg/L
Turbidity Criteria	<ul style="list-style-type: none"> <li>• 5 NTU over background when the background is 50 NTU or less; or</li> <li>• A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.</li> </ul>
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 0.2 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** are primary contact recreation and secondary contact recreation.

The recreational uses for this receiving water are identified below.

**Table 6. 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.

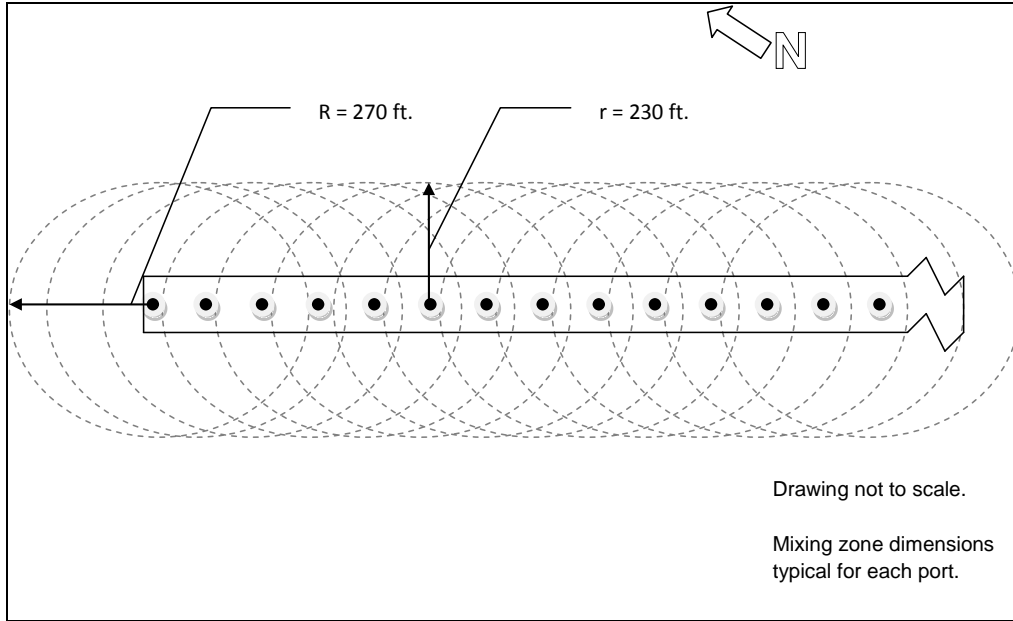
- The **miscellaneous marine water uses** are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

**E. 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.

**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 (70 feet, in this case). The previous permit define the chronic mixing as 300 ft x 230 ft, however WAC 173-201A-400(6) requires that the size of mixing zone be minimized. The permit reduces of the horizontal distance of the chronic mixing zone to the regulatory maximum of 270 feet. To avoid backsliding, the minor axis horizontal extent will remain at 230 feet. The mixing zone extends from the seabed to the top of the water surface. The total mixing zone length along the diffuser is 670 feet [270ft + 270ft + (10ft\*(14 ports - 1 port)) = 670ft]. Figure 3 provides a visual representation of the chronic mixing zone (plan view).



**Figure 3. Chronic Mixing Zone**

**Acute Mixing Zone**

WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The acute mixing zone for Outfall 001 extends between 23 feet and 27 feet from the centers of the discharge ports, depending on the direction.

The dilution factors are listed in Table 7:

**Table 7. Dilution Factors (DF)**

Criteria	Acute	Chronic
Aquatic Life	53	88
Human Health, Carcinogen		88
Human Health, Non-carcinogen		88

EPA determined the impacts of dissolved oxygen deficiency, temperature, pH, fecal coliform, chlorine, ammonia, metals, nutrients and other toxics 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.

**BOD<sub>5</sub>**--With technology-based limits, this discharge results in a small amount of BOD loading relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will help ensure that dissolved oxygen criteria are met in the receiving water. The calculations to determine dissolved oxygen impacts are shown in Appendix D.

Given EPA's special focus on faltering oxygen levels in south Puget Sound, as well as the recurring use of deicing fluids at military facilities discharging to Solo Point, the new permit includes monitoring requirements for nutrients and glycols both of which can impact oxygen levels in receiving waters. The bases for the inclusion of these new parameters in the permit are provided below.

**Nutrients.** Washington State's Puget Sound is a priority watershed for EPA, and as such it has been the site of a number of EPA-funded research activities such as Ecology's South Puget Sound Dissolved Oxygen Study (which was partially funded by a grant from EPA's National Estuary Program). The need for this study became evident when, in their 2008 Water Quality Assessment, Ecology found 24 locations in South Puget Sound that were impaired due to a lack of dissolved oxygen. The South Puget Sound Dissolved Oxygen Study evaluated a number of different sources for nitrogen, as nitrogen is the main pollutant responsible for low dissolved oxygen levels in this environment. The study included Solo Point as one of 29 municipal wastewater treatment plants that discharge nitrogen into South Puget Sound. The early findings of the study include the following: "On an annual basis, rivers and wastewater treatment plants south of the Tacoma Narrows sent roughly equal amounts of nitrogen into the South Sound. However, in September 2007 - a critical period for dissolved oxygen concentrations - wastewater treatment plants south of the Tacoma Narrows contributed four times more nitrogen to South Puget Sound than the rivers. In looking at the entire study area, which reaches to just south of Edmonds, wastewater treatment plants contributed more than ten times more nitrogen than the rivers."

Given these findings, the fact that Fort Lewis is a major discharger in South Puget Sound, and the fact that both nitrogen and phosphorus contribute to a loss of dissolved oxygen in receiving waters, EPA determined that the Fort should be required to conduct monitoring of nutrient species in their effluent to better characterize their loadings throughout the year. Under the authority of Clean Water Act Section 308, this increased monitoring has been included in the draft permit. The frequency corresponds with a similar effort underway at Ecology, which will be requiring Puget Sound dischargers to increase monitoring of nutrients (nitrate and nitrite, total Kjeldahl nitrogen (TKN), ammonia, and total phosphorus) in order to inform future studies that may ultimately lead to a water quality-based effluent limit (WQBEL) or Total Maximum Daily Load (TMDL) if necessary to protect this vital waterway. Based on the above discussion, EPA determined that Ecology's monitoring schedule was prudent under the circumstances and appropriate for Solo Point, as well.

**Glycols (formerly COD).** Chemical Oxygen Demand (COD) is a nonconventional pollutant associated with, among other things, aircraft deicing. The draft permit included COD monitoring as part of the pretreatment monitoring requirements given the potential for residual deicers and related liquids to enter the collection system via airfield operations associated with Fort Lewis (e.g. McChord Air Force Base operations). While BOD monitoring can effectively detect the presence of deicing fluid, EPA had selected COD for regulation and not BOD5 alone for reasons discussed in the Proposed Rule "Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category". Specifically:



- While both of these parameters are good indicators of the glycol-based oxygen demand component of deicing stormwater, COD will also capture the oxygen demand from nitrogen and other organic components of the stormwater that may not be represented in a BOD5 result;
- COD analyses are simple to conduct and can be measured in real time compared to a 5-day test for BOD;
- COD eliminates the need to consider receiving water temperature when evaluating water quality concerns; and
- Toxic ADF additive compounds in deicing stormwater may have a negative and variable affect on the acclimation of the active cultures used in BOD analysis, making the method less robust than COD analysis for these wastewaters.

The COD monitoring in the draft permit was intended to establish a baseline COD concentration and to screen separately for increases above baseline that may indicate the need for further pretreatment controls at the airfield (per CWA Section 308). However in response to a comment received during the public comment period questioning the role of COD monitoring, EPA reconsidered the monitoring protocol in the draft permit and concluded that the impacts of deicing fluids on water quality can more directly be assessed by monitoring the main ingredient of deicer formulations, either ethylene or propylene glycol. This is the same approach used at Seattle-Tacoma International Airport. Consequently, the new permit will require once a week ethylene and propylene glycol monitoring during the winter months (December - February) to monitor active deicing events. This approach will be evaluated during permit cycle, and may be changed to COD monitoring on a different frequency within the next permit. Until then, the new nutrients and glycol monitoring requirements will together provide information about potential dissolved oxygen impacts beyond that which is obtained by monitoring BOD5 alone.

**Temperature**--The state temperature standards (WAC 173-201A-200-210 and 600-612) include multiple elements. Each criterion is evaluated independently to determine reasonable potential and derive permit limits:

- Temperature Chronic Effects

**Annual summer maximum:** Each water body has an annual maximum temperature criterion [WAC 173-201A]. These threshold criteria (13°C = Highest 1-DMax in Marine Waters designated as “extraordinary quality”) 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-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

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

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.

In the absence of a TMDL, standard practice 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.

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

$$(\text{Criterion} + 0.3) > (\text{Criterion} + (T_{\text{effluent}95} - \text{Criterion})/\text{DF}).$$

$$(13 + 0.3) > (13 + (23 - 13)/88).$$

$$(13.3) > (13.11).$$

Given:

Criterion = criterion for waters of Extraordinary Quality (13°C).

$T_{\text{effluent}95}$  = 95<sup>th</sup> percentile 1-Dmax effluent temperature

(the more conservative maximum daily effluent temperature is used in this case)

DF = the chronic dilution factor at the critical condition.

Therefore, the proposed permit does not include a temperature limit. However, effluent temperature monitoring is recommended to demonstrate continuous compliance with water quality criteria for temperature. The permit therefore requires the permittee to monitor effluent temperature during the next permit cycle and to report the results to EPA on a monthly basis (with the monthly DMR). EPA will reevaluate the reasonable potential during the next permit renewal.

- 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 2-seconds after discharge. The upper 99th percentile daily maximum effluent temperature prior to discharge is less than 33°C. Therefore, there is no instantaneous lethality for passing fish.

**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. According to long-term marine water temperature data collected at station

NSQ001 (Nisqually Reach - Nisqually R. Delta), the receiving water conditions during even the warmest months (typically July, August, and September) are less than 15°C at a depth of 0.5 meters. This temperature is less than 23°C, even under these conservative conditions. There is no general lethality for passing fish.

**pH**— EPA’s secondary treatment regulations, found in 40 CFR Part 133.102, identify the minimum level of effluent quality required of secondary treatment facilities. The technology-based effluent limit for pH is within the range of 6.0 to 9.0 standard units. The effluent limits for pH in the new permit have been kept in the range of 6.0 to 8.5 standard units in keeping with the previous permit to avoid backsliding. Meeting these permit limits will continue to assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water.

**Fecal Coliform**—Washington’s water quality standards (WAC 173-221-040) include a technology-based limit for fecal coliform in secondary treated effluent. Fecal coliform is not to exceed a geometric mean of 200 organisms per 100 mL and a weekly mean of 400 organisms per 100 mL.

EPA modeled the numbers of fecal coliform by simple mixing analysis using Washington’s technology-based limit of 400 organisms per 100 ml and a dilution factor of 88.

Under critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. Therefore, the proposed permit includes the Washington State technology-based effluent limits for fecal coliform bacteria. These limits were also required by the previous permit.

**Toxic Pollutants**—EPA must 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 (40 CFR 122.44). Facilities with technology-based effluent limits are not exempt from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge: ammonia, arsenic, bis (2-ethylhexyl) phthalate, cadmium, chlorine (total residual), chloroform, chromium, copper, cyanide, dibenzo(a,h) anthracene, diethyl phthalate, di-n-butyl phthalate, indeno(1,2,3-cd)pyrene, lead, mercury, nickel, phenol, phosphorus (total), selenium, silver, toluene, and zinc. EPA conducted a reasonable potential analysis (see Appendix D) on these parameters to determine whether it would require effluent limits in this permit.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, EPA used the available receiving water information for ambient station NSQ001 (Nisqually Reach - Nisqually R. Delta) and the spreadsheet tools found in Appendix D.

EPA used zero for the background concentrations in the absence of valid ambient data. EPA determined that none of these toxic chemicals pose a reasonable potential to exceed the water quality criteria at the critical condition, with the exception of chlorine.

The Washington State water quality criteria for marine waters of “extraordinary quality” limit total residual chlorine at 13 µg/l as a 1-hour average concentration, not to be exceeded

more than once every three years on the average. It is further limited to 7.5 µg/l as a 4-day average concentration, not to be exceeded more than once every three years on an average. Within the past permit cycle, chlorine in the Solo Point effluent has been reported as high as 0.16 mg/l (160 ug/l) as a daily average and as 0.80 mg/l (800 ug/l) as a daily maximum. The calculations in Appendix D demonstrate a reasonable potential to violate the water quality criteria for chlorine. Appendix D also contains the calculations used to determine the necessary water quality based effluent limits. The permit contains these limits.

#### **F. Whole Effluent Toxicity**

The water quality standards for surface waters forbid discharge of effluent that causes 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. If the effluent itself is freshwater, a freshwater fish and a freshwater invertebrate species are generally used for acute WET testing. Daphnids are the standard freshwater invertebrate acute test organisms. Ceriodaphnia was used in the previous WET tests and is required as the invertebrate test organism in the new permit. Fathead minnows were the sensitive fish acute test organism used in the previous WET tests and are required as the fish test organism in the new permit. EPA developed the freshwater WET testing program around the use of fathead minnows for fish testing, and they are considered more sensitive than rainbow trout as an acute test organism.
- *Chronic toxicity tests measure various sublethal toxic responses*, such as retarded growth or reduced 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. Two common fish and invertebrate chronic WET test species for discharges to saltwater are topsmelt and mysid shrimp. These highly sensitive organisms are the standard test species used to determine chronic toxicity in discharges to marine environments in the State of Washington. These organisms are required as the chronic WET test organisms in the new permit.

The test for acute toxicity is the achievement of a median of at least 80% survival in 100% effluent with no single test showing less than 65% survival in 100% effluent. By this test, acute WET testing conducted during the previous permit cycle showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. A summary of the WET test results is included in Appendix E. The proposed permit will not impose an acute WET limit. The permittee must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in EPA's opinion, increase the potential for effluent toxicity, then EPA may 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, effluent toxicity will be assumed to have increased. The permittee may demonstrate to EPA that effluent toxicity has not increased, by performing additional WET testing after the process or material changes have been made.

The test for chronic toxicity is the achievement of no statistically significant difference in response between the control and the test concentration representing the acute critical effluent concentration (ACEC). The previous permit identified the ACEC as 0.57%. The new permit identifies the ACEC as 1.89%. By this test, chronic WET testing conducted during the previous permit cycle showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not impose a chronic WET limit. The permittee must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in EPA's opinion, increase the potential for effluent toxicity, then EPA may 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, EPA will assume that effluent toxicity has increased. The permittee may demonstrate to EPA that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

## **G. Human Health**

Washington's water quality standards include 91 numeric human health-based criteria that must be considered when writing NPDES permits. These criteria were established in 1992 by 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.

EPA determined the effluent may contain chemicals of concern for human health, based on the facility's status as a major discharger.

EPA 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) to make a reasonable potential determination. The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards, and an effluent limit is not needed.

**H. Comparison of Effluent Limits with the Previous Permit Issued on February 1, 2004**

The permit proposes a new technology-based limit of 10 mg/l for the parameter Total Petroleum Hydrocarbons (TPH). This limit is based on the ability of simple oil/water separator technology to recover free product from water<sup>3</sup>.

The permit presents new effluent limits for total residual chlorine, 0.50 mg/L maximum daily and 0.36 mg/L average monthly, derived according to EPA’s Technical Support Document for Water Quality-based Toxics Control 9 (March 1991).

**Table 8. Comparison of Effluent Limits**

Parameter	Basis of Limit	Units	Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001		
			Average Monthly	Average Weekly	Average Monthly	Average Weekly	
BOD5	Technology	mg/L	30	45	30		45
BOD5	--	lbs/day	1902	2852	1751		2627
BOD5, % removal	--	%	80% removal		85% removal		
Total Suspended Solids	Technology	mg/L	30	45	30		45
Total Suspended Solids	--	lbs/day	1902	2852	1751		2627
TSS, % removal	--	%	80% removal		85% removal		
Fecal Coliform Bacteria	WA State Technology	#/100mL	200	400	200		400
pH	Technology	std. units	6.0 – 8.5		6.0 – 8.5		
TPH	Technology	mg/L	NA		10 mg/L (instantaneous max.)		
Parameter	Basis of Limit	Units	Daily Max		Average Weekly	Average Monthly	Daily Max
Total Residual Chlorine	Water Quality	mg/L	0.5		NA	0.36	0.50

**III. MONITORING REQUIREMENTS**

EPA requires monitoring, recording, and reporting to verify that the treatment process is functioning correctly and that the discharge complies with the permit’s effluent limits. The monitoring schedule is detailed in the proposed permit in *Section I.B - Effluent Limitations and Monitoring*. 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.

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

As a pretreatment facility, Fort Lewis is required to sample influent, final effluent, and sludge for toxic pollutants in order to characterize the industrial input. Sampling is also done to determine if pollutants interfere with the treatment process or pass-through the plant to the sludge or the

<sup>3</sup> “Stormwater Management Manual for Western Washington - Volume V: Runoff Treatment BMPs.” Publication No. 05-10-33. February 2005. Washington State Department of Ecology, Water Quality Program.

receiving water.

#### IV. OTHER PERMIT CONDITIONS

##### A. Pretreatment

The proposed permit requires the implementation of a pretreatment program at Fort Lewis. The objectives of the pretreatment program are: 1) to prevent the introduction of pollutants to the treatment system that will interfere with the plant's operation, that could pass untreated through the system and contribute to water quality problems, or otherwise be incompatible with the treatment plant, and 2) to improve opportunities to reclaim and recycle domestic and industrial wastewater and sludges.

During April and May of 2006, records indicate that at least one sizeable petroleum hydrocarbon slug made its way into the treatment plant, impacting the quality of the biosolids. Fort Lewis subsequently developed a Memorandum of Understanding with Ecology whereby a pretreatment program would be established at Fort Lewis. The permit introduces a total petroleum hydrocarbon (TPH) limit of 10 mg/L, an expanded TPH monitoring program for both wastewater and sludge during the first year of the permit cycle, and ongoing TPH monitoring as part of the new pretreatment program.

As noted in the Army Corps of Engineers' Protocol for the Preparation of Installation Pretreatment Programs, Army installations are not required to have pretreatment programs pending further interpretation of the Federal Facility Compliance Act (FFCA). However, Fort Lewis has taken the initiative to develop, with assistance from Ecology, a pretreatment program consistent with guidelines for POTWs in 40 CFR 403 in order to obtain and maintain compliance with the requirements of Section 108 of the FFCA (FFCA-108).

Under the federal Solid Waste Disposal Act (SWDA), there is an exclusion from the definition of solid waste and therefore the definition of HW for mixtures of domestic sewage and other wastes that discharge to a POTW. EPA further expanded this exclusion (40 CFR 261.4) to include industrial wastewater point source discharges permitted under Section 402 of the Clean Water Act (CWA). FFCA-108 grants conditional HW exclusion for mixtures of HW and domestic sewage discharged to a federally owned treatment works (FOTW) when one of several conditions is met, including the condition that the discharge is subject to a pretreatment standard issued under the CWA and it is in compliance with the standard<sup>4</sup>. Fort Lewis has modeled its pretreatment program procedures on 40 CFR 403, thus meeting the criteria of a pretreatment program as required by the FFCA for the conditional HW exclusion.

In addition to obtaining the conditional HW exclusion for mixtures of HW and domestic sewage discharged to the FOTW, implementing the pretreatment program will help protect the quality of biosolids at the FOTW. Protecting the biosolids with a pretreatment program

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<sup>4</sup> Federal Facilities Compliance Act, SEC. 108.  
[http://www.epa.gov/fedfac/documents/federal\\_facility\\_compliance\\_act.htm#sec108](http://www.epa.gov/fedfac/documents/federal_facility_compliance_act.htm#sec108)

can decrease sludge disposal costs, achieve a higher classification of biosolids, or simply help to maintain compliance with limits set according to the biosolids rule (40 CFR 503).

Furthermore, Army Regulation 200-1<sup>5</sup> requires that discharges to Army treatment plants comply with pretreatment standards.

Army Regulation 200-1. Chapter 4, Section 4-1.e.(4): Wastewater Program Requirements:

- (a) Obtain and comply with NPDES and/or State discharge permits, to include all required plans. (LD: 40 CFR 122);
- (b) Ensure that discharges from industrial activities to Federally-owned Treatment Works (FOTWs) and Publicly-owned Treatment Works (POTWs) comply with the substantive pretreatment requirements applicable to POTWs under the CWA. (LD: 40 CFR 403);
- (c) Develop pretreatment programs as required to ensure FOTWs meet NPDES permit requirements and to improve opportunities for reuse of wastewater effluent and sewage sludge. (LD: 40 CFR 403).

The draft permit requires the permittee to implement a pretreatment program in accordance with the general pretreatment regulations at 40 CFR §403. It incorporates local limits submitted to EPA in January 2009. A draft local sewer use ordinance must be submitted to EPA within 3 months of the effective date of the permit, and must be adopted within 6 months of the effective date of the permit.

Ongoing pretreatment monitoring of influent, effluent, and sludge is required for parameters confirmed present following priority pollutant effluent scans, as well as TPH and other parameters of particular interest.

## **B. Sewage Sludge Management**

Under the Clean Water Act (CWA), facilities which generate sewage sludge are subject to national standards for sewage sludge and to NPDES sludge permitting.

EPA Region 10 separates wastewater and sludge permitting. Under the CWA, EPA has the authority to issue separate sludge-only permits for the purposes of regulating biosolids. EPA will issue a sludge-only permit to this facility at a later date. The NPDES rules call for the facility to submit an application for a sewage sludge permit (Form 2S), and the permit requires the submittal within 6 months of the permit effective date.

Until future issuance of a sludge-only permit, sludge management and disposal activities at the facility continue to be subject to the national sewage sludge standards at 40 CFR Part 503. These regulations are self-implementing; therefore, permittees must comply with them whether or not a permit has been issued.

The permit also contains requirements for sewage sludge monitoring and record keeping. This information will be used update local limits and is required by 40 CFR 503. The focus on TPH monitoring is a response to previous impacts to biosolids by petroleum products that passed through the treatment works at levels of concern to EPA and others (see IV.C. above). The monitoring frequency (quarterly) of parameters of concern was deemed

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<sup>5</sup> *Army Regulation 200-1: Environmental Protection and Enhancement*, US Army. December 2007.  
[http://www.apd.army.mil/pdffiles/r200\\_1.pdf](http://www.apd.army.mil/pdffiles/r200_1.pdf)



appropriate based on the design flow rate of the Solo Point WWTP and guidance provided in 40 CFR 503 and CWA Section 405.

The permittee also maintains a State of Washington biosolids permit (Ecology permit #BA-0021954) that covers composted sewage sludge for land application. The disposal of other solid waste is under the jurisdiction of the Tacoma-Pierce County Health Department.

### **C. Effluent Mixing Study**

EPA estimated the amount of mixing of the discharge with receiving water and the potential for the mixture to violate the water quality standards for surface waters at the edge of the mixing zone. An acute dilution factor of 53 and chronic dilution factor of 88 were obtained from the November 20, 1996 report titled, *Transport and Dilution of Effluent Discharged from the Tatsolo Point Wastewater Treatment Plant* by Evans-Hamilton, Inc. The previous permit used an acute DF of 175 and chronic DF of 975, though there is some uncertainty in the derivation of those numbers. The proposed permit requires the permittee to more accurately determine the mixing characteristics of the discharge (Section II.D). The effluent mixing study must measure or model the characteristics of the discharge under conditions specified in the permit to assess whether the receiving water quality is protected outside the mixing zone boundary. The permit requires submission of a Plan of Study to Ecology for review prior to initiation of the effluent mixing study.

### **D. Outfall Evaluation**

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

### **E. Quality Assurance Plan (QAP)**

Federal regulations at 40 CFR 122.41(e) require permittees to properly operate and maintain their facilities, including “adequate laboratory controls and appropriate quality assurance procedures.” To implement this requirement, the draft permit requires that the permittee develop a Quality Assurance Plan to ensure that monitoring data are accurate and to explain data anomalies if they occur. The permittee is required to implement the plan within 180 days of the effective date of the draft permit. The Quality Assurance Plan must include standard operating procedures the permittee must follow for collecting, handling, storing and transporting samples, laboratory analysis, and data reporting.

Special consideration should be given in the QAP to the proper sampling and analysis of TPH in wastewater and biosolids as it is a new parameter with unique analytical requirements. The Region 10 environmental laboratory, Manchester Lab, is able to provide guidance on TPH monitoring and analysis, and can be contracted do these analyses for Solo Point if asked to do so by the permittee.

There are a number of test methods that can be used in the analysis of organics as present in wastewater and biosolids. Manchester Lab verbally enumerated the pros and cons of the different methods during the preparation of the new permit. Their conclusion was that the Northwest Total Petroleum Hydrocarbon (NWTPH) methods were the most accurate

methods to use if the samples are run with a sulfuric acid rinse and silica gel cleanup. The lab indicated that this analytical protocol would eliminate up to 95% of biogenic interference in the results, a critical consideration when dealing with sludge and biosolids in particular. The cleanup procedure removes naturally-occurring sources of hydrocarbons (e.g. peat, wood, etc) that co-elute with petroleum-based hydrocarbons. The permit specifies only NWTPH methods for TPH analysis of both wastewater and sludge or biosolids, and it is strongly recommended that the acid rinse and silica gel cleanup prescribed for the NWTPH methods be used routinely for all samples collected and analyzed for petroleum hydrocarbons. Results from individual VOC and SVOC analyses (using methods 8260 and 8270) can also be obtained for a separate measure of total TPH.

The QAP should also include guidance on the proper reporting of biosolids data. For example, percent solids information should be determined wherever possible and should be clearly stated along with biosolids analytical results so that the necessary conversions to a dry-weight basis can be made.

#### **F. Operation and Maintenance (O&M) Plan**

The proposed permit contains Section II.G. to ensure proper operation and regular maintenance of equipment, and to ensure that the permittee takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

#### **G. Infiltration and Inflow (I/I) Report**

The permittee has documented or suspects inflow, infiltration, overflows, and failures in its collection system. The 2006 infiltration and inflow (I/I) report indicated the total amount of I/I for 2006 was 30.6% of total flow. Abnormally high rainfall, up 37.5% over preceding winter seasons according to the report, was thought to have contributed to the high flows during 2006. The 2007 I/I Report indicated the total amount of I/I for 2007 was 23.6% of the total flow. The Army Corps of Engineers continues to manage multimillion dollar new construction projects to upgrade existing sewer lines. The permit requires the continuation of the annual report to support ongoing efforts to control the problem of I/I at Fort Lewis. The annual reports should include a plan and a schedule for identifying and correcting the sources of I/I. Explanations are needed for occasions when the schedule is not met.

#### **H. Feasibility Study and Engineering Report**

The influent BOD design capacity in the previous permit was 24,000 lbs/day. This criteria was based on an old permitted effluent limit of 62 mg/L BOD5. The current permitted effluent limit of 30 mg/L BOD5 reduces the plant influent capacity to approximately 12,300 lbs/day and 35,000 population. Alternatively, an influent capacity of 4,765 lbs/day BOD5 is obtained when weighing current plant loadings and the permit requirement for 85% BOD5 removal. Both of these influent capacities are less than the previous value and indicate that Solo Point is closer to its design capacity than previously thought. Solo Point has also not been able to achieve 85% removal at higher flows. The permit seeks to address these concerns by continuing to focus on I&I repair and reporting (Section II.H.), and by requiring the preparation of a feasibility study and engineering report to help ensure that this aging treatment facility will continue to provide adequate wastewater treatment at higher flows in

the years to come. The effluent mixing study required by Section II.D. will also inform facility planning by quantifying the available dilution.

#### **I. Endangered Species Act**

Section 7 of the Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if a permitted activity could beneficially or adversely affect any threatened or endangered species. EPA obtained a list of threatened and endangered species in the area of the discharge, confirmed the list with NMFS and USFWS, and ultimately determined that the issuance of this permit is not likely to adversely affect the listed species. The Biological Assessment is included in Appendix F. Any additional comments received from the above agencies regarding this determination will be considered prior to issuance of this permit.

#### **J. General Conditions**

The standardized General Conditions are based on state and federal law and regulations.

### **V. PERMIT ISSUANCE PROCEDURES**

#### **A. Permit Modifications**

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

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

#### **B. Proposed Permit Issuance**

This proposed permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. EPA proposes to issue this permit for a term of 5 years.

### **VI. REFERENCES FOR TEXT AND APPENDICES**

Environmental Protection Agency (EPA)

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

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

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

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

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

Permit No.: WA-002195-4  
Fort Lewis - Solo Point WWTP

Washington State Department of Ecology.

2006 Permit Writer's Manual (Publication Number 92-109)  
<http://www.ecy.wa.gov/biblio/92109.html>)

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

Guidance for Conducting Mixing Zone Analyses  
<http://www.ecy.wa.gov/programs/eap/mixzone/mixzone.html>

Water Pollution Control Federation.

1976. *Chlorination of Wastewater.*

## APPENDIX A—PUBLIC INVOLVEMENT INFORMATION

EPA proposes to reissue a permit to the Solo Point WWTP at Fort Lewis. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and EPA's reasons for requiring permit conditions.

### Public Comments on the Draft Permit

Persons wishing to comment on the draft permit or to request a public hearing must do so, in writing, by the expiration date of the public notice. A request for a public hearing must state the nature of the issues to be raised as they relate to the permit, as well as the requester's name, address, and telephone number. All comments and requests for public hearing must be submitted to EPA as described in the Public Comments section of the attached public notice. If no significant comments are received during the public comment period, the proposed conditions in the draft permit will be included in the final permit and will become effective upon reissuance of the permit. Any significant comments will be considered before EPA Region 10's Director of the Office of Water makes a final decision regarding permit issuance. EPA will address significant comments when it issues the permit. In such a case, the permit will become effective 33 days after the reissuance date, unless a request for an appeal is filed with the Environmental Appeals Board within 33 days.

### Public Comment on the State Preliminary 401 Certification

The Washington State Department of Ecology (Ecology) provides the public with the opportunity to review and comment on preliminary 401 certification decisions. Any person may request in writing that Ecology provide that person notice of Ecology's preliminary 401 certification decision, including, where appropriate, the draft certification. Persons wishing to comment on the preliminary 401 certification should submit written comments by the public notice expiration date to the Washington Department of Ecology, Southwest Regional Office P.O. Box 47775, Olympia, WA 98504-7775.

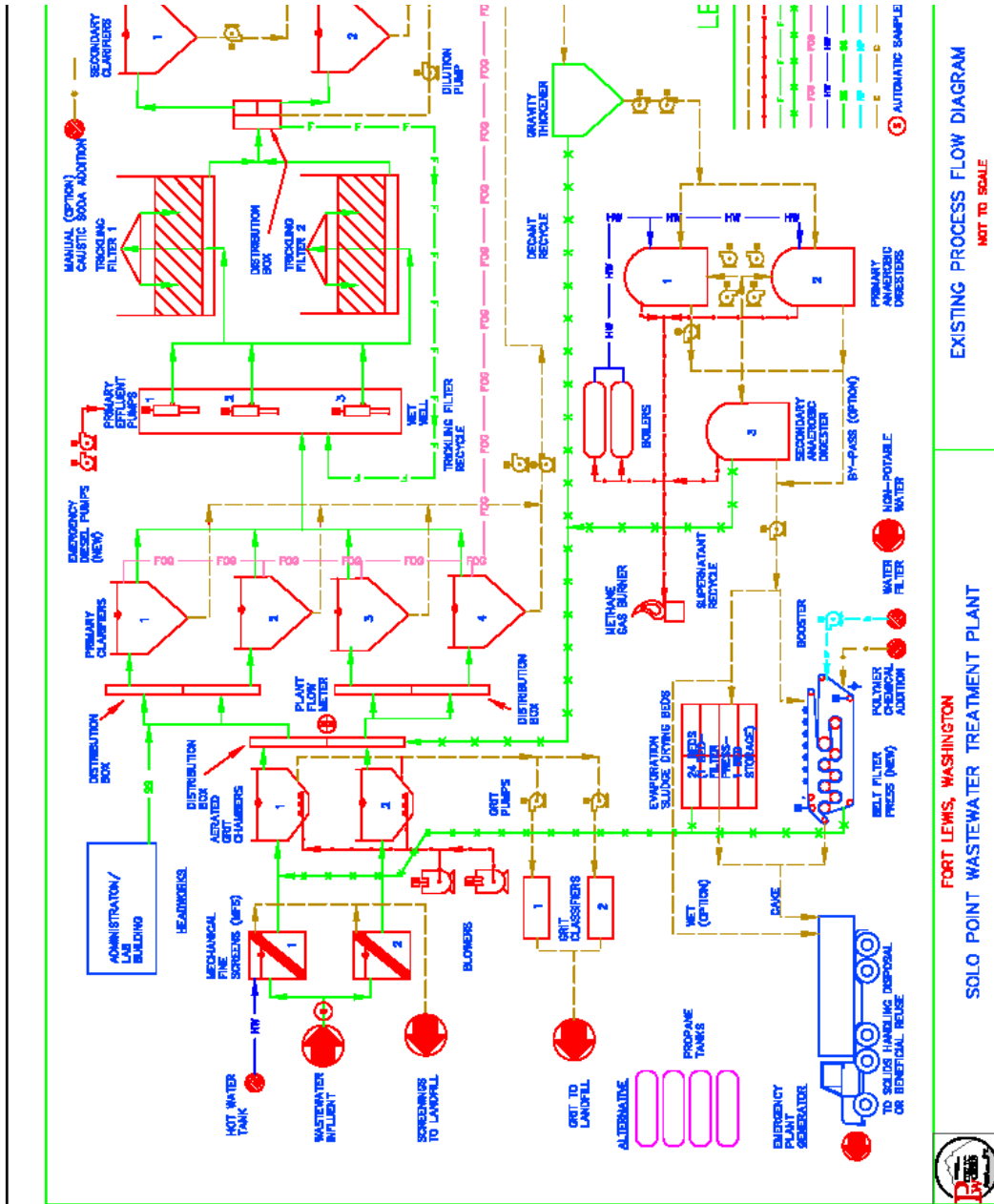
### Documents are Available for Review

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday (see address below).

United States Environmental Protection Agency  
Region 10, OWW-130  
1200 Sixth Avenue, Suite 900  
Seattle, Washington 98101  
(206) 553-0523 or  
1-800-424-4372 x0523 (within Alaska, Idaho, Oregon, and Washington)

The draft permit and fact sheet can also be found by visiting the Region 10 website at <http://www.epa.gov/r10earth.htm>. For technical questions regarding the permit or fact sheet, contact Tonya Lane at [lane.tonya@epa.gov](mailto:lane.tonya@epa.gov).

APPENDIX B—PROCESS FLOW DIAGRAM



EXISTING PROCESS FLOW DIAGRAM

SOLO POINT WASTEWATER TREATMENT PLANT

FORT LEWIS, WASHINGTON



APPENDIX C—DMR DATA

The following tables and graphs summarize data reported to EPA in monthly discharge monitoring reports from February 2004 to June 2008 for discharges from Outfall #001.

RUN DATE: 08/25/08		PCS VIOLATION RECOGNITION REPORT										PAGE 1	
***** VIOLATION RECOGNITION REPORT FOR SELECTED FACILITIES *****													
NPDES NUMBER	DSCH I DRID	L I M END DATE	STORET -LOC -SEA -MOD	VIO EVENT CODE	QTY UNIT	AVG MEAS AVG LIM PCT OVER	MAX MEAS MAX LIM PCT OVER	CONC UNIT	MIN MEAS MIN LIM PCT UNDER	AVG MEAS AVG LIM PCT OVER	MAX MEAS MAX LIM PCT OVER	REPORTED FREQ ANAL SAMP TYPE	DMR REC DATE NO OF EXCUR
DEFENSE, ARMY													
WA0021954	001A	F 04/30/04	00400-1-0-0	E90					SU (12)	5.3	6.0	01/01	05/24/04
										(MINIMUM )	7.4	GRAB	01
											8.5		
DEFENSE, ARMY													
WA0021954	001A	F 04/30/06	00400-1-0-0	E90					SU (12)	5.9	6.0	01/01	05/09/06
										(MINIMUM )	6.9	GRAB	
											8.5		
DEFENSE, ARMY													
WA0021954	001A	F 05/31/06	00400-1-0-0	E90					SU (12)	5.4	6.0	01/01	06/12/06
										(MINIMUM )	6.4	GRAB	
											8.5		
DEFENSE, ARMY													
WA0021954	001A	F 04/30/07	00400-1-0-0	E90					SU (12)	5.8	6.0	01/01	05/10/07
										(MINIMUM )	7.0	GRAB	
											8.5		
DEFENSE, ARMY													
WA0021954	001A	F 11/30/06	50060-1-0-0	E90					MG/L (19)	DELMON	DELMON	01/01	12/08/06
											0.80	GRAB	
											0.5	(DAILY MX)	
DEFENSE, ARMY													
WA0021954	001A	F 01/31/07	81010-K-0-0	E90					PER-CENT (23)	72	80	01/30	02/08/07
										(MN % RMV)	40%	CALCTD	
											DELMON	DELMON	

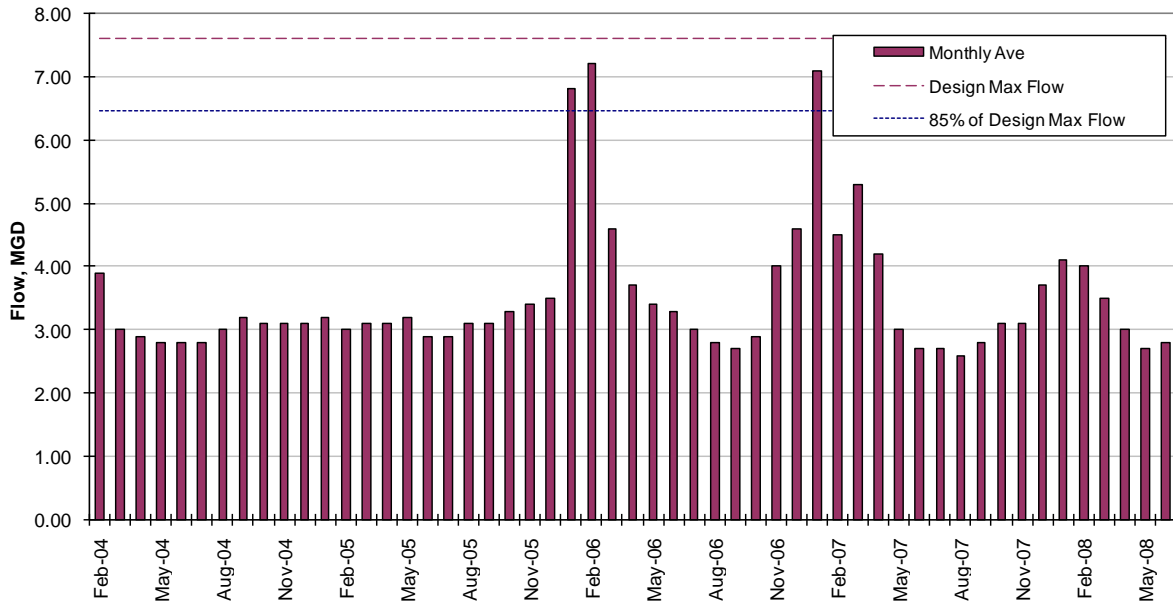
Permit No.: WA-002195-4  
Fort Lewis - Solo Point WWTP

Discharge Monitoring Data																							
		Influent				Effluent																	
Date	BOD, mg/L		TSS, mg/L		Flow, MGD	BOD, mg/L		BOD, mg/L		BOD, mg/L		BOD, % Removal		TSS, mg/L		TSS, % Removal		PH		Fecal Coliform, #/100 ml	Fecal Coliform, #/100 ml	Chlorine, mg/L	
	Monthly Ave	Monthly Ave	Monthly Ave	Monthly Ave		Monthly Ave	Weekly Ave	Monthly Ave	Weekly Ave	Monthly Ave	Weekly Ave	Monthly Ave	Weekly Ave	Monthly Ave	Weekly Ave	Monthly Ave	Weekly Ave	Min	Max				
29-Feb-04	143	4595	169	5445	3.9	16	20	522	644	89	21	26	677	837	88	6.6	6.9	2	3	0.39			
31-Mar-04	154	3849	169	4223	3.0	16	20	389	501	90	17	22	417	551	90	6.4	7.2	7	15	0.23			
30-Apr-04	180	4383	222	5391	2.9	20	24	482	583	89	19	26	466	632	91	5.3	7.4	7	23	0.41			
31-May-04	212	5024	233	5521	2.8	18	20	425	473	92	21	25	500	592	91	6.1	6.9	22	53	0.40			
30-Jun-04	216	5107	272	6432	2.8	19	21	439	497	91	23	26	541	615	92	6.3	7	12	18	0.23			
31-Jul-04	265	6227	286	6725	2.8	19	21	439	493	93	19	25	437	587	91	6.5	6.9	21.6	52.7	0.23			
31-Aug-04	186	4588	251	6186	3.0	15	19	372	469	92	17	20	430	493	93	6.6	7.1	26	131	0.26			
30-Sep-04	170	4566	219	5865	3.2	15	19	399	509	91	15	20	393	536	93	6.8	7.2	14	37	0.39			
31-Oct-04	193	5020	214	5561	3.1	16	18	426	468	92	11	14	288	364	95	6.7	7.2	7	15	0.41			
30-Nov-04			235	6144	3.1					91	18	20	465	524	92	6.5	6.9	7	16	0.30			
31-Dec-04	173	4414	227	5799	3.1	20	25	523	640	88	19	24	481	614	92	6.5	7	6	9	0.27			
31-Jan-05	188	4960	216	5704	3.2	23	28	595	738	88	20	25	525	659	91	6.6	7.5	9.1	26	0.30			
28-Feb-05	203	5031	244	6071	3.0	16	22	398	547	92	19	27	479	671	92	6.3	7	7.5	20	0.21			
31-Mar-05	197	5067	243	6239	3.1	16	19	422	489	92	21	24	548	617	91	6	7.2	11	18	0.24			
30-Apr-05	209	5394	237	6115	3.1	16	18	413	465	92	19	20	479	517	92	6.3	6.9	11	40	0.15			
31-May-05	174	4584	224	5779	3.2	18	25	477	657	90	19	21	506	552	91	6.5	6.9	11	30	0.22			
30-Jun-05	200	4883	254	6213	2.9	18	19	436	465	91	17	21	423	514	93	6.5	7.1	8	16	0.24			
31-Jul-05	185	4535	231	5648	2.9	18	20	443	489	90	18	25	451	611	92	6.5	7	11	20	0.21			
31-Aug-05	179	4580	240	6140	3.1	15	17	377	435	91	13	15	327	384	94	6.5	7	8	17	0.28			
30-Sep-05	186	4755	251	6433	3.1	16	17	414	435	91	16	19	399	486	94	6.6	7	15	33	0.19			
31-Oct-05	172	4787	258	7179	3.3	16	17	450	473	90	16	18	434	501	94	6.4	7	16	32	0.21			
30-Nov-05	185	5311	248	7116	3.4	18	19	502	545	90	18	20	524	573	93	6.3	6.9	8	16	0.35			
31-Dec-05	156	4529	227	6594	3.5	18	21	528	609	88	22	27	649	783	90	6	6.8	4	17	0.28			
31-Jan-06	80	4218	132	7542	6.8	14	16	827	913	80	19	23	1108	1313	84	6.1	7.1	6	13	0.34			
28-Feb-06	67	4022	107	6461	7.2	10	15	615	902	83	15	19	908	1143	85	6.5	7.2	4	11	0.38			
31-Mar-06	122	4721	170	6546	4.6	17	20	671	771	85	19	22	743	848	88	6.3	6.9	7	21	0.36			
30-Apr-06	140	4363	202	6307	3.7	15	17	465	530	89	22	24	673	748	89	5.9	6.9	21	33	0.22			
31-May-06	172	4917	246	7027	3.4	16	17	449	486	91	18	24	526	686	92	5.4	6.4	16	35	0.17			
30-Jun-06	171	4743	244	6776	3.3	20	23	562	638	87	16	18	456	499	93	6.6	7.1	22	55	0.21			
31-Jul-06	183	4618	237	5994	3.0	18	21	447	530	90	16	19	395	480	93	6.6	7.3	17	35	0.31			
31-Aug-06	164	3807	2.5	5797	2.8	14	18	326	418	91	10	16	237	371	96	6.3	7	10	23	0.47			
30-Sep-06	151	3460	221	5066	2.7	15	17	339	390	90	11	13	255	298	95	6.3	7.1	10	19	0.21			
31-Oct-06	186	4456	224	5379	2.9	19	25	452	600	89	13	15	304	360	94	6.4	7.2	6	9	0.34			
30-Nov-06	137	4513	188	6215	4.0	18	24	583	793	86	17	20	572	661	90	6.5	7.2	4	7	0.80			
31-Dec-06	110	4242	148	5730	4.6	17	21	655	812	83	17	19	640	735	87	6.7	7.2	5	8	0.31			
31-Jan-07	68	4013	104	6143	7.1	16	17	922	1002	72	14	16	797	943	85	6.4	7.5	12	23	0.45			
28-Feb-07	116	4402	147	5547	4.5	16	18	616	681	85	17	21	634	795	88	6.4	7.1	3	19	0.41			
31-Mar-07	99	4359	127	5593	5.3	15	16	640	704	84	15	17	681	748	88	6.3	7.1	4	19	0.47			
30-Apr-07	117	4135	159	5626	4.2	16	19	579	671	85	19	21	663	742	87	5.8	7	8	23	0.36			
31-May-07	156	3885	206	5121	3.0	19	20	471	498	87	21	25	512	623	90	6.1	7	19	34	0.22			
30-Jun-07	189	4284	256	5805	2.7	16	21	354	476	84	15	25	349	567	94	6.3	6.9	12	41	0.26			
31-Jul-07	205	4603	274	6158	2.7	21	25	465	561	89	17	21	381	472	94	6.7	7.3	25	69	0.28			
31-Aug-07	222	4839	282	6144	2.6	18	22	398	480	91	16	21	343	458	94	6.8	7.1	15	50	0.27			
30-Sep-07	229	5339	257	5990	2.8	17	22	400	512	92	13	15	308	349	95	6.5	6.9	26	74	0.14			
31-Oct-07	210	5442	250	6487	3.1	17	19	436	493	91	15	16	381	415	94	6.6	7.1	21	74	0.19			
30-Nov-07	237	6108	282	7267	3.1	16	18	424	464	93	15	17	388	438	95	6	7	12	22	0.25			
31-Dec-07	164	5009	215	6552	3.7	16	17	479	519	90	18	19	547	580	91	6.3	6.9	3	4	0.44			
31-Jan-08	161	5475	194	6633	4.1	17	19	572	648	88	19	22	641	750	90	6.3	7.3	4	7	0.46			
29-Feb-08	147	4927	197	6624	4.0	15	17	513	571	88	19	20	627	671	89	6.3	7.1	4	9	0.39			
31-Mar-08	190	5541	231	6463	3.5	16	19	458	555	91	19	22	553	643	92	6.3	6.9	4	5	0.20			
30-Apr-08	215	5450	248	6306	3.0	16	20	412	508	92	16	21	405	533	93	6.4	7.2	3	7	0.46			
31-May-08	222	4972	250	5612	2.7	16	17	357	381	93	17	20	380	448	93	6.1	6.9	5	13	0.42			
30-Jun-08	238	5565	267	6242	2.8	19	22	438	513	92	15	19	359	443	94	6.2	7.1	7	63	0.26			
AVE:	173	4743	216	6107	3.498	17	20	485	570	89	17	21	502	603	91	6.3	7.1	11	28	0.31			
MIN:	67	3460	3	4223	2.600	10	15	326	381	72	10	13	237	298	84	5.3	6.4	2	3	0.14			
MAX:	265	6227	286	7542	7.200	23	28	922	1002	93	23	27	1108	1313	96	6.8	7.5	26	131	0.80			
LIMIT:	20,400				20,400	6,460	30	45	1902	2852	80	30	45	1902	2852	80	6.0	8.5	200	400	0.50		
DESIGN:	24,000				24,000	7,600																	

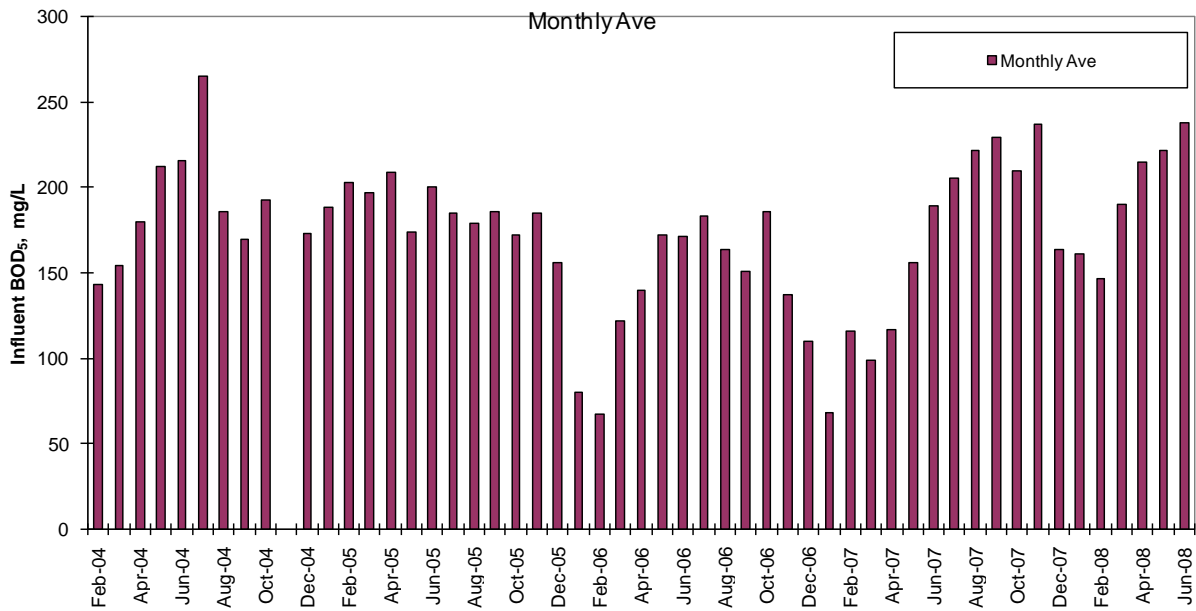
approaching design limits (85%)  
exceeds permit/design limits



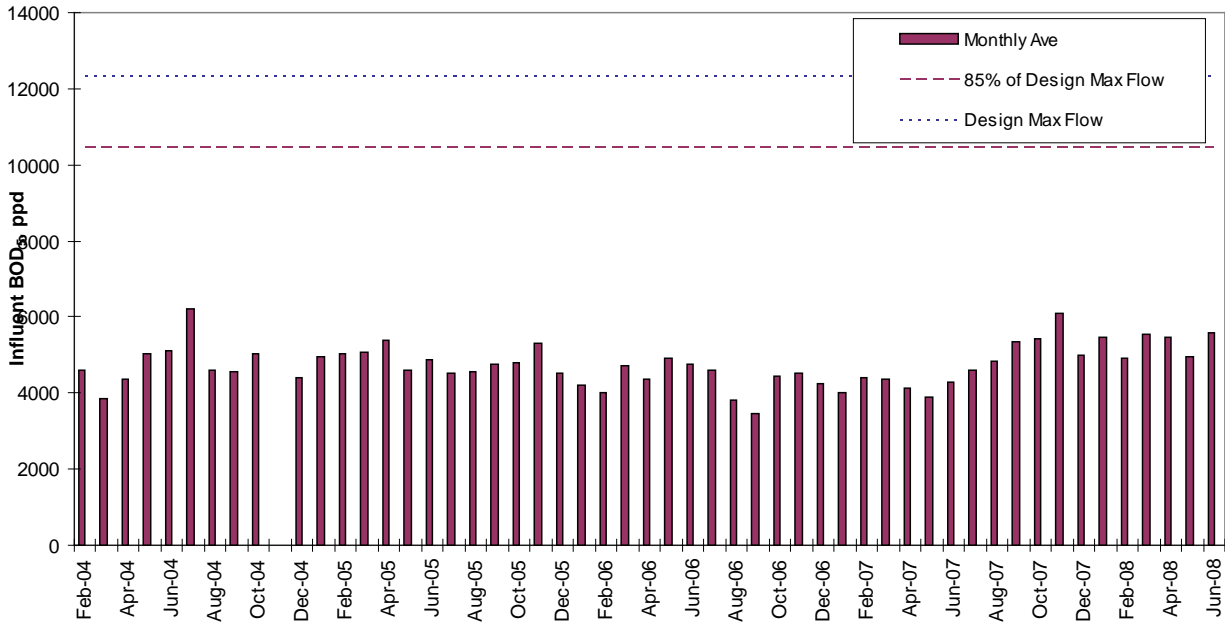
### Influent Flow



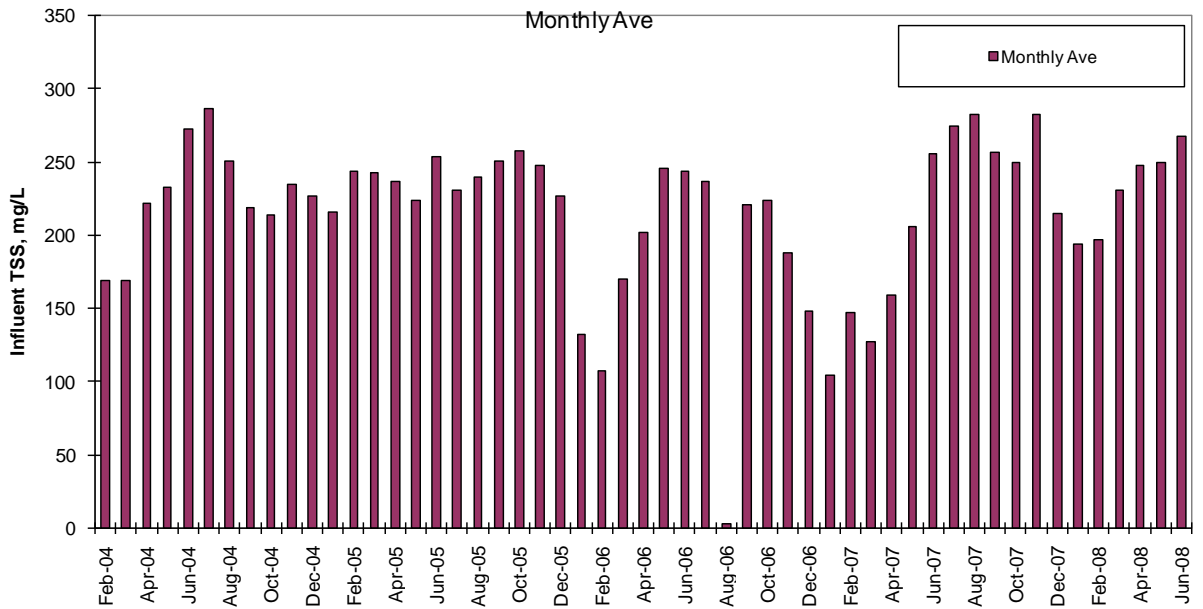
### Influent BOD5 Concentration



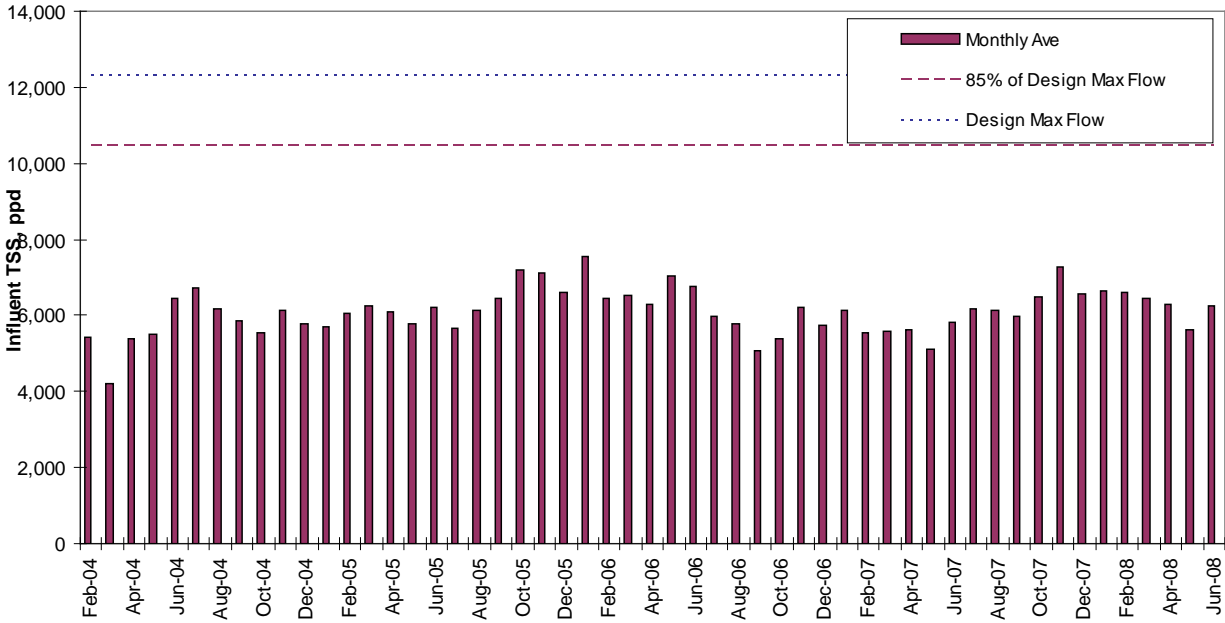
### Influent BOD<sub>5</sub> Mass Loading



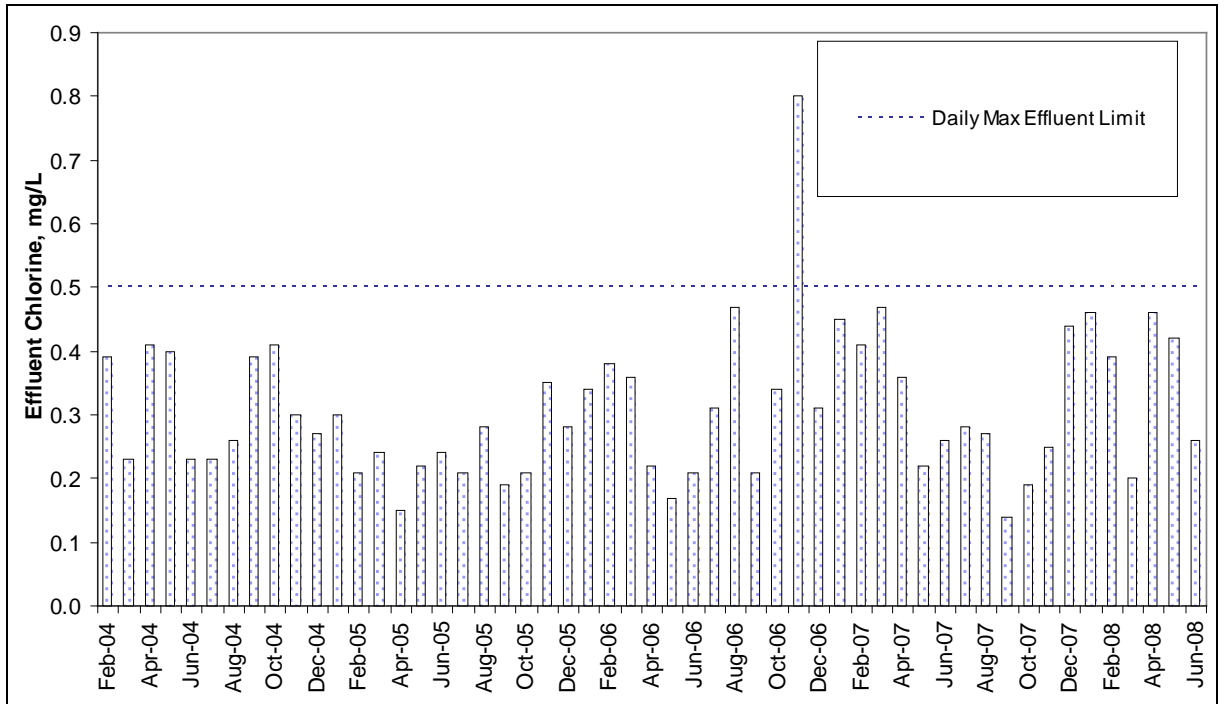
### Influent TSS Concentration



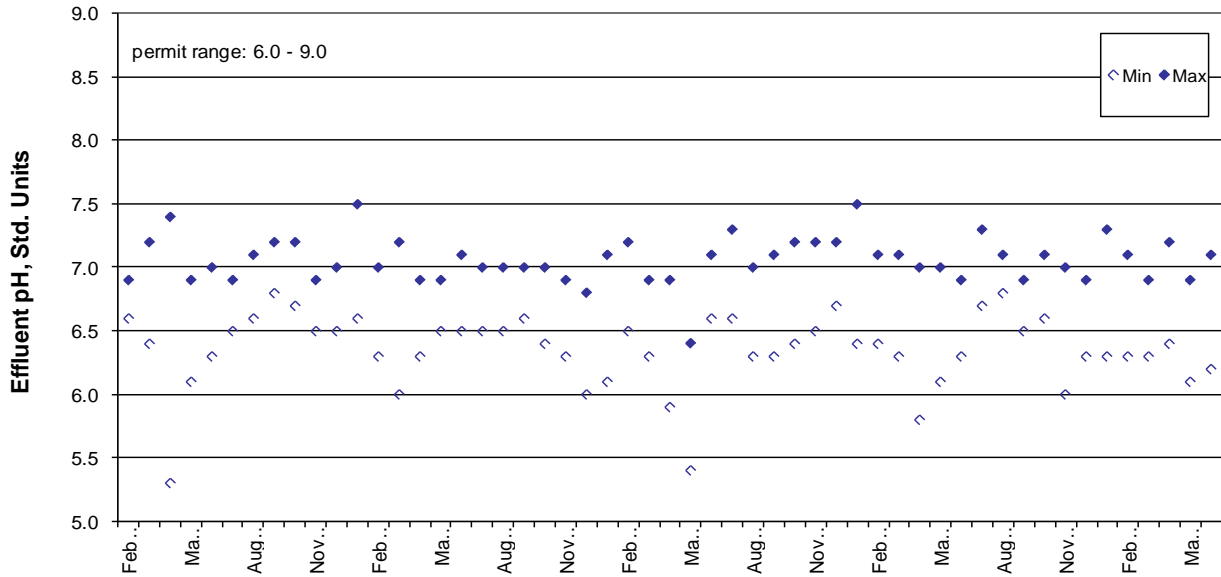
### Influent TSS Mass Loading



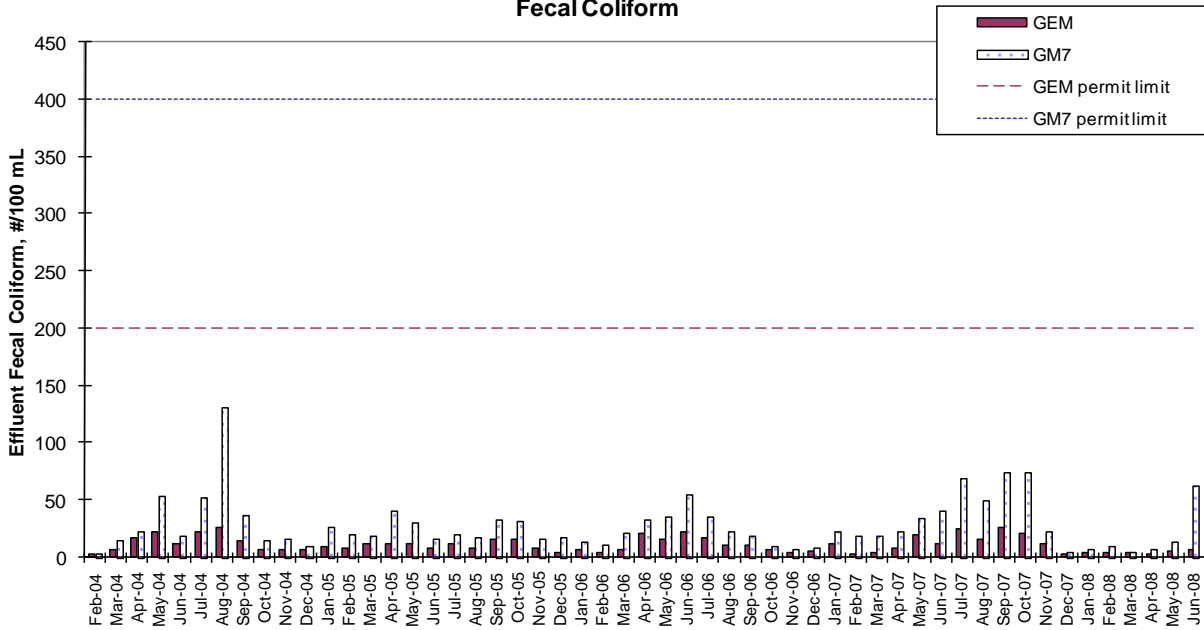
### Effluent Total Residual Chlorine Concentration



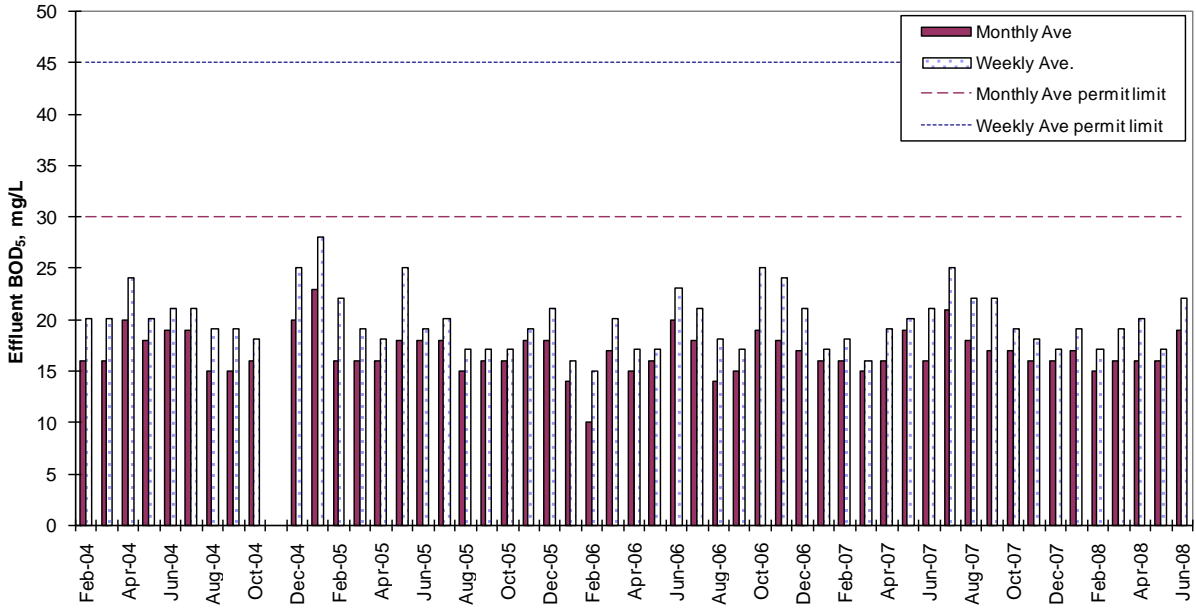
### Effluent pH



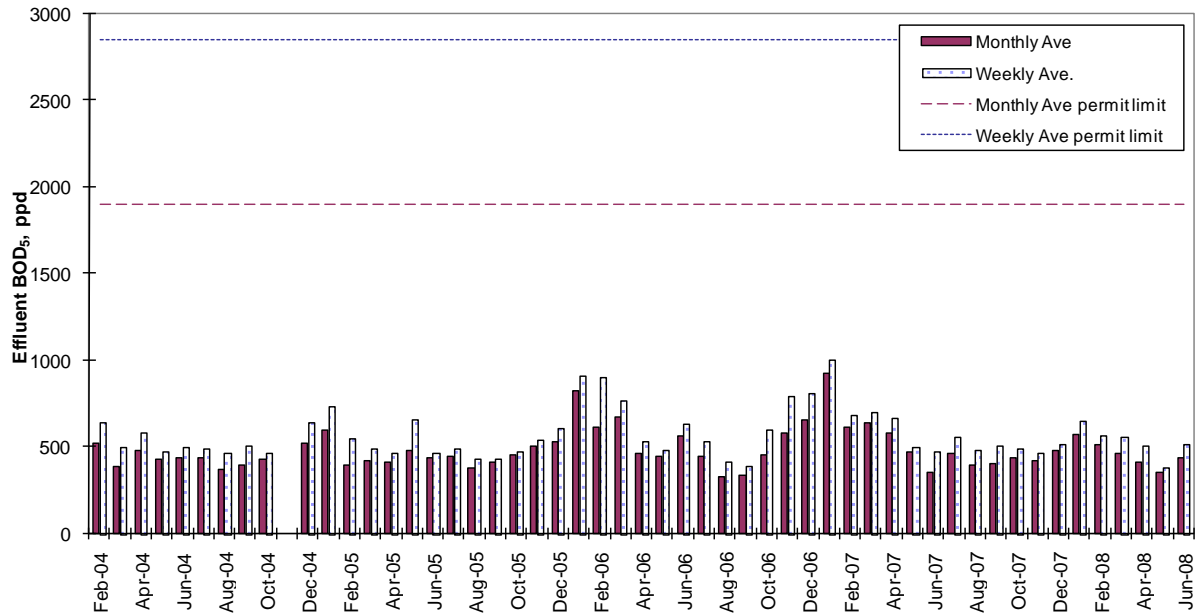
### Fecal Coliform



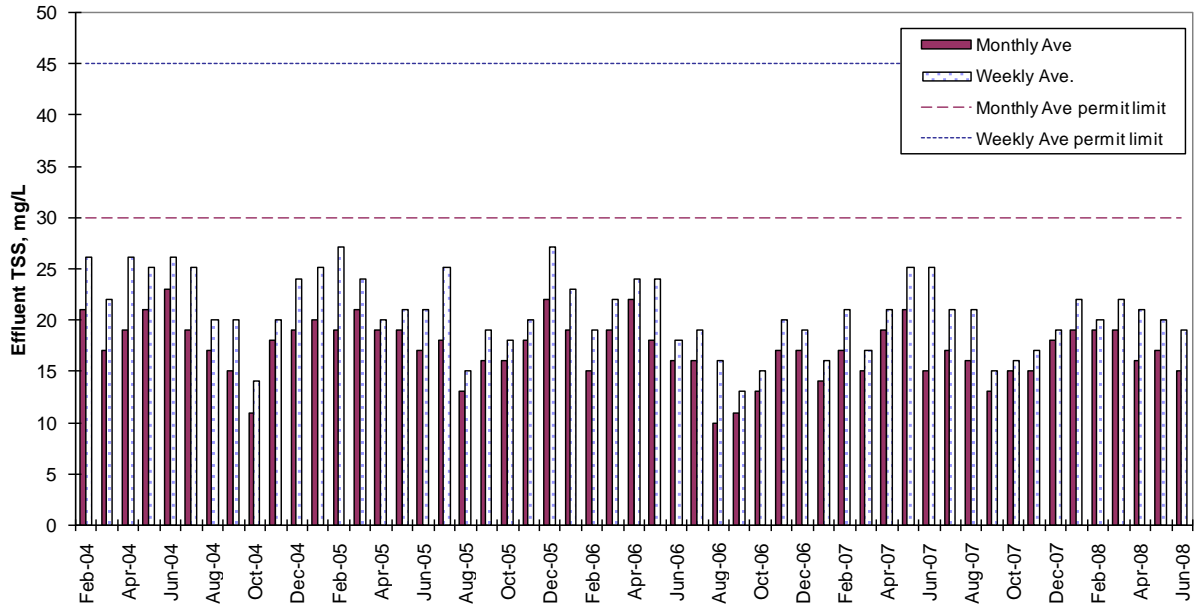
### Effluent BOD5 Concentration



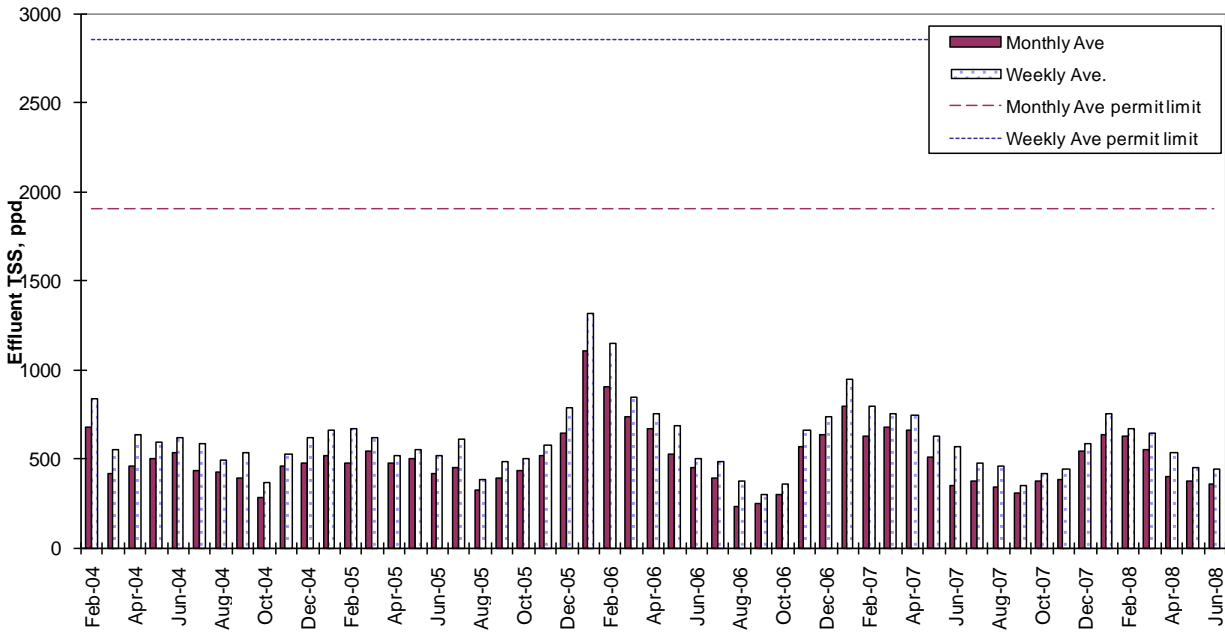
### Effluent BOD5 Mass Loading



### Effluent TSS Concentration



### Effluent TSS Mass Loading



### APPENDIX D—TECHNICAL CALCULATIONS

The water quality impact the wastewater treatment plant’s effluent has on the Puget Sound was analyzed with the aid of several Excel® spreadsheet tools that were developed by the Department of Ecology. These spreadsheets and documentation on their use can be found at Ecology’s website: <http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html>. The assessment of whether water quality-based limits were warranted was based on the results presented in the following tables.

*Temperature and pH:*

The pH and temperature of the receiving water after mixing with the effluent was evaluated with the spreadsheet tool “PHMIX2.WK1.” This spreadsheet calculates the pH of a mixture of two sources based on the temperature, pH, and alkalinity of both sources. The resultant temperature is calculated based on simple mixing within the chronic mixing zone. The following table presents the results of this analysis for the minimum effluent pH level of 5.3 (at the minimum effluent temperature of 15°C), and the maximum pH level of 7.5 (at the maximum effluent temperature of 23°C).

Calculation of pH of a mixture in seawater. Based on the CO2SYS program (Lewis and Wallace, 1998) <a href="http://cdiac.esd.ornl.gov/oceans/co2rprt.html">http://cdiac.esd.ornl.gov/oceans/co2rprt.html</a>	
INPUT	
1. MIXING ZONE BOUNDARY CHARACTERISTICS	
Dilution factor at mixing zone boundary	88.000
Depth at plume trapping level (m)	0.000
2. BACKGROUND RECEIVING WATER CHARACTERISTICS	
Temperature (deg C):	11.92
pH:	8.00
Salinity (psu):	35.00
Total alkalinity (meq/L)	2.39
3. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	23.00
pH:	7.50
Salinity (psu)	0.00
Total alkalinity (meq/L):	1.24
4. CLICK THE 'calculate' BUTTON TO UPDATE OUTPUT RESULTS >>>	
	<input type="button" value="calculate"/>
OUTPUT	
CONDITIONS AT THE MIXING ZONE BOUNDARY	
Temperature (deg C):	12.05
Salinity (psu)	34.60
Density (kg/m^3)	1026.27
Alkalinity (mmol/kg-SW):	2.32
Total Inorganic Carbon (mmol/kg-SW):	2.13
pH at Mixing Zone Boundary:	8.00

INPUT	
1. MIXING ZONE BOUNDARY CHARACTERISTICS	
Dilution factor at mixing zone boundary	88.000
Depth at plume trapping level (m)	0.000
2. BACKGROUND RECEIVING WATER CHARACTERISTICS	
Temperature (deg C):	11.92
pH:	8.00
Salinity (psu):	35.00
Total alkalinity (meq/L)	2.39
3. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	15.00
pH:	5.30
Salinity (psu)	0.00
Total alkalinity (meq/L):	1.24
4. CLICK THE 'calculate' BUTTON TO UPDATE OUTPUT RESULTS >>>	
	<input type="button" value="calculate"/>
OUTPUT	
CONDITIONS AT THE MIXING ZONE BOUNDARY	
Temperature (deg C):	11.96
Salinity (psu)	34.60
Density (kg/m^3)	1026.29
Alkalinity (mmol/kg-SW):	2.32
Total Inorganic Carbon (mmol/kg-SW):	2.21
pH at Mixing Zone Boundary:	7.80

*Toxic Pollutants:*

Evaluating the need for water quality-based discharged limits for toxic pollutants is based on an analysis of the reasonable potential for the effluent to exceed water quality criteria as outlined in EPA's Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90 001, 1991). Criteria used in the analysis were taken from 173-201A WAC. This analysis uses the "TSDCALC.XLS" workbook, which evaluates the reasonable potential for a pollutant to violate water quality standards. If a limit is needed, this workbook will determine the appropriate limit based on statistical probability and available mixing. The following tables were generated from that workbook.

Calculation of seawater fraction of un-ionized ammonia from Hampson (1977). Un-ionized ammonia criteria for salt water are from EPA 440/5-88-004.	
Based on Lotus File NH3SALT.WK1 Revised 19-Oct-93	
INPUT	
1. Temperature (deg C):	11.9
2. pH:	8.0
3. Salinity (g/Kg):	28.6
OUTPUT	
1. Pressure (atm; EPA criteria assumes 1 atm):	1.0
2. Molal Ionic Strength (not valid if >0.85):	0.587
3. pKa8 at 25 deg C (Whitfield model "B"):	9.313
4. Percent of Total Ammonia Present as Unionized:	1.799%
5. Unionized ammonia criteria (mg un-ionized NH3 per liter) from EPA 440/5-88-004	
Acute:	0.233
Chronic:	0.035
6. Total Ammonia Criteria (mg/L as NH3)	
Acute:	12.95
Chronic:	1.95
7. Total Ammonia Criteria (mg/L as NH3-N)	
Acute:	10.64
Chronic:	1.60



**Dissolved Oxygen at the Mixing Zone Boundary**

Dissolved oxygen concentration following initial dilution. References: EPA/600/6-85/002b and EPA/430/9-82-011 Based on Lotus File IDOD2.WK1 Revised 19-Oct-93	
<b>INPUT</b>	<b>INPUT</b>
1. Dilution Factor at Mixing Zone Boundary:	88
2. Ambient Dissolved Oxygen Concentration (mg/L):	8
3. Effluent Dissolved Oxygen Concentration (mg/L):	8.82
4. Effluent Immediate Dissolved Oxygen Demand (mg/L):	49
<b>OUTPUT</b>	<b>OUTPUT</b>
Dissolved Oxygen at Mixing Zone Boundary (mg/L):	7.45
From effluent mixing report titled: <i>Transport and Dilution of Effluent Discharged From the Tatsolo Point Wastewater Treatment Plant and the Chambers Creek Regional Wastewater Treatment Plant Outfalls</i> (Evans-Hamilton, Inc., 11/20/1996). From long-term marine water quality monitoring station #NSQ001 (Ecology Environmental Assessment Program). From application Form 2A. Conservative estimate using maximum daily BOD5 discharge from application Form 2A.	
<b>Water quality dissolved oxygen criteria (lowest 1-day minimum) = 7.0 mg/L. And 7.45 &gt; 7.0, therefore the dissolved oxygen criteria are met in the receiving water.</b>	

### Reasonable Potential (left), Limit Calculation (middle), and Human Health-based Calculations (right)

Parameter	Metal Criteria Translating Factor as a decimal		Metal Criteria Translating Factor as a decimal	Ambient Concentration on mixing at edge of chronic mixing zone		Chronic Concentration		Acute Chronic	Acute Chronic	State Water Quality Standard	Max concentration at edge of...	CALCULATIONS		Effluent Concentration (ug/L)	Chronic LIMIT REQ'D?	Chronic Limiting Zone	Acute Limiting Zone	# of samples	Multipler	Acute Chronic Factor	Chronic Factor	COMMENTS
	Acute	Chronic		Acute	Chronic	Chronic	Acute					CV	CV									
ammonia (as N)	1.00	0.99	1.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	0.50	0.47	23	1.95	53	88	CV determined using DMR data, sample number and concentration data from application				
chloride (total residual)												0.37	0.36	54	1.40	53	88	Default CV; sample number and concentration data from application.				
arsenic	0.99	0.99	0.99	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.60	0.55	12	2.00	53	88	Default CV; sample number and concentration data from application.				
cadmium	0.99	0.99	0.99	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.60	0.55	22	2.23	53	88	Default CV; sample number and concentration data from application.				
chromium	0.99	0.99	0.99	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.68	0.62	22	2.44	53	88	CV determined using DMR data, sample number and concentration data from application				
copper	0.95	0.95	0.95	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	0.19	0.19	22	1.31	53	88	CV determined using DMR data, sample number and concentration data from application				
lead	0.95	0.95	0.95	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.54	0.51	22	2.08	53	88	CV determined using DMR data, sample number and concentration data from application				
mercury	0.99	0.99	0.99	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.92	0.87	22	2.37	53	88	Default CV; sample number and concentration data from application				
selenium	0.99	0.99	0.99	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.60	0.55	22	2.23	53	88	Default CV; sample number and concentration data from application.				
silver	0.85	0.85	0.85	8.10	8.10	8.10	8.10	8.10	8.10	8.10	8.10	0.19	0.19	22	1.31	53	88	CV determined using DMR data, sample number and concentration data from application.				
zinc	0.95	0.95	0.95	2.16	2.16	2.16	2.16	2.16	2.16	2.16	2.16	0.60	0.55	9	3.16	53	88	Default CV; sample number and concentration data from application.				
cyanide												0.60	0.55	9	3.16	53	88	Default CV; sample number and concentration data from application.				

Parameter	Chronic Dil'n Factor	Acute Dil'n Factor	Metal Criteria Translating Factor		Ambient Concentration	Water Quality Standard	Water Quality Standard	Water Quality Standard	Average Monthly Limit (AML)		Maximum Daily Limit (MDL)	WLA Acute		WLA Chronic		Limiting LTA		Statistical variables for permit limit calculation							
			Acute	Chronic					Chronic	Acute		Chronic	Chronic	Acute	Chronic	Chronic	Acute	Chronic	Coef. Var.	Probly Basis	AML Probly Basis	MDL Probly Basis	# of Samples		
Chlorine	53.0	88.00	53.0	88.00	13.00000	7.50000	7.50000	689.0	689.0	689.0	689.0	689.0	689.0	689.0	689.0	689.0	689.0	0.37	0.99	319.3	0.37	0.95	0.99	30.00	1.00

This spreadsheet calculates water quality based permit limits based on the two value steady state mode using the State Water Quality standards contained in WAC 173-201A. 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 99. Last revision date 9/98.

Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.

Parameter	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 Limit (AML)		Maximum Daily Limit (MDL)	WLA Acute		WLA Chronic		Limiting LTA		Ph	Coef. Var.	Probly Basis	LTA Probly Basis	Limiting LTA	Statistical variables for permit limit calculation				
						Chronic	Acute		Chronic	Acute	Chronic	Acute	Chronic	Chronic						Acute	Coef. Var.	Probly Basis	AML Probly Basis	MDL Probly Basis
mercury	0.00	0.15	0.00	NO	0	NONE	NONE	0.79	0.03	0.60	0.60	0.60	0.60	0.63	0.32	0.3	20	0.63	0.63	0.37	0.95	0.99	30.00	1.00
nickel	0.00	4600.00	0.00	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.81	0.81	0.00	0.00	0.00	0.32	0.60	0.60	0.60	0.76	88.0
selenium	0.00	4200.00	0.00	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.81	0.81	0.00	0.00	0.00	0.60	0.60	0.60	0.60	0.61	88.0
cyanide	0.00	2200000.00	0.00	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.60	0.00	0.00	0.00	0.60	0.60	0.60	0.60	0.87	88.0
chloroform	0.00	470.00	0.01	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	1.00	1.00	1.00	0.60	0.60	0.60	0.60	1.05	88.0
toluene	0.00	2000000.00	0.02	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	1.93	1.93	1.93	0.60	0.60	0.60	0.60	1.05	88.0
phenol	0.00	4600000.00	0.06	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	4.64	4.64	4.64	0.60	0.60	0.60	0.60	1.05	88.0
bis (2-ethylhexyl) phthalate	0.00	5.90	0.01	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	6.22	6.22	6.22	0.60	0.60	0.60	0.60	1.05	88.0
di-n-butyl phthalate	0.00	12000.00	0.01	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	1.25	1.25	1.25	0.60	0.60	0.60	0.60	1.05	88.0
dibenz(o,l,h) antiracene	0.00	0.03	0.02	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	1.38	1.38	1.38	0.60	0.60	0.60	0.60	1.55	88.0
diethyl phthalate	0.00	1200000.00	0.02	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	1.59	1.59	1.59	0.60	0.60	0.60	0.60	1.55	88.0
indeno(1,2,3-cd)pyrene	0.00	0.03	0.02	NO	0	NONE	NONE	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	1.34	1.34	1.34	0.60	0.60	0.60	0.60	1.55	88.0

### Chlorine Reasonable Potential Analysis

Effluent Chlorine data (in mg/l): (0.14 . . . 0.80) = 54 data points

Maximum effluent concentration = 0.80 mg/l

Mean = 0.31 mg/l

Standard deviation (SD) = 0.37

Coefficient of variation (CV) = SD/mean = 1.20

Projected Ambient Concentrations:

Reasonable Potential Multiplier (RPM)

The “reasonable potential” multiplier is based on the coefficient of variation of the data and the number of data points. Where there are fewer than 10 data points to calculate a CV, the TSD recommends using 0.6 as a default value. In this case, there were 54 data points, and the CV of the data set is 1.20. Using the equations in section 3.3.2 of the TSD, the “reasonable potential” multiplier is calculated as follows:

$$p_n = (1 - \text{confidence level})_{1/n}$$

where,

$p_n$  = the percentile represented by the highest concentration

$n$  = the number of samples

$$p_n = (1 - 0.99)_{1/54}$$

$$p_n = 0.918$$

This means that the largest value in the data set of 54 data points is greater than the 92<sup>nd</sup> percentile of all expected values in the population.

The RPM is the ratio of the 99<sup>th</sup> percentile to the 91.8<sup>th</sup> percentile, based on the equation:

$$C_p = \exp(z\sigma - 0.5\sigma^2)$$

where CV = coefficient of variation

$$= 1.20$$

$$\sigma^2 = \ln(\text{CV}^2 + 1)$$

$$= \ln(1.20^2 + 1)$$

$$= 0.892$$

$$\sigma = (\sigma^2)^{1/2}$$

$$= 0.944$$

$z$  = normal distribution value

$$= 2.326 \text{ for the } 99^{\text{th}} \text{ percentile}$$

$$= 1.392 \text{ for the } 91.8^{\text{th}} \text{ percentile}$$

$$C_{99} = \exp([2.326 * 0.944] - [0.5 * 0.944 * 0.944]) \\ = 0.978$$

$$C_{91.8} = \exp([1.392 * 0.944] - [0.5 * 0.944 * 0.944]) \\ = 0.585$$

$$\text{RPM} = C_{99}/C_{91.8}$$

$$= 0.978 / 0.585$$

$$= 1.672$$

Reasonable Potential Multiplier = 1.67

Highest expected effluent value =  
(Maximum effluent concentration) x (RP multiplying factor)  
(0.8 mg/l x 1.67) = 1.34 mg/l

Highest Projected Concentrations at edge of mixing zones:  
Dilution Factors were obtained from the report called *Transport and Dilution of Effluent Discharged from the Tatsolo Point Wastewater Treatment Plant and the Chambers Creek Regional Wastewater Treatment Plant Outfalls* (Evans-Hamilton, Inc., November 1996). The dilution factors estimate the minimum dilution to be expected at the boundaries of mixing zones sized according to criteria in the Washington water quality standards (WAC 173-201A-100). The estimated dilution factor is 53 at the boundary of the acute mixing zone and 88 at the boundary of the chronic mixing zones.

The highest projected concentrations at the edge of the mixing zones are calculated by dividing the highest expected effluent value by the dilution ratio.

$$\text{Acute: } (1.34 \text{ mg/l})/53 = 0.025 \text{ mg/l}$$
$$\text{Chronic: } (1.34 \text{ mg/l})/88 = 0.015 \text{ mg/l}$$

#### Comparison with ambient criteria

In order to determine if there is a reasonable potential for this discharge to violate the ambient criteria, the highest projected concentrations at the edge of the mixing zones are compared with the ambient criteria.

Acute:  $0.025 \text{ mg/l} > 0.013 \text{ mg/l}$  (1 hr criteria) – **YES**, there is reasonable potential to violate

Chronic:  $0.015 \text{ mg/l} > 0.0075 \text{ mg/l}$  (4 day criteria) – **YES**, there is reasonable potential to violate

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#### **Calculation of Water Quality Based Effluent Limits for Chlorine**

Wasteload Allocations (WLAs) – The WLA is the concentration at the outfall that would be needed to meet the criteria at the edge of the mixing zone. It is calculated by multiplying the ambient criteria by the dilution ratio:

$$\text{Acute WLA: } 0.013 \text{ mg/l} \times 53 = 0.689 \text{ mg/l}$$
$$\text{Chronic WLA: } 0.0075 \text{ mg/l} \times 88 = 0.66 \text{ mg/l}$$

Long-Term Averages (LTAs) – The LTA concentrations are the average concentrations in the effluent that will assure that 99% of the time the effluent will be at or below the WLA.

Acute LTA:

$$\text{LTA}_a = \text{WLA}_a \times e^{[0.5\sigma^2 - z\sigma]}$$

where  $\sigma^2 = \ln[\text{CV}^2 + 1]$  and  $\text{CV} = 0.37$

$$= \ln(0.37^2 + 1) = 0.128$$
$$\sigma = (\sigma^2)^{1/2} = 0.358$$

$z = 2.326$  for 99th percentile occurrence probability

$$\text{LTA}_a = 0.689 \text{ mg/l} \times 0.463 = 0.319 \text{ mg/l}$$

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Chronic LTA:

$$LTA_c = WLA_c \times e^{[0.5\sigma_4^2 - z\sigma_4]}$$

where  $\sigma_4^2 = \ln[CV^2/4 + 1]$   
 $z = 2.326$  for 99th percentile occurrence probability  
 $CV = 0.37$   
 $LTA_c = 0.66 \text{ mg/l} \times 0.664 = 0.438 \text{ mg/l}$

Choice of limiting LTA

$LTA_a = 0.319 \text{ mg/l}$  – **the limiting LTA**  
 $LTA_c = 0.438 \text{ mg/l}$

Limit Derivation - The limiting LTA calculated above is used to derive both the maximum daily and average monthly limits.

Maximum Daily Limit (MDL):

$$MDL = LTA \times e^{[z\sigma - 0.5\sigma^2]}$$

where  $\sigma^2 = \ln[CV^2 + 1]$   
 $z = 2.326$  for 99th percentile occurrence probability  
 $CV = 0.37$   
 $MDL = 0.319 \text{ mg/l} \times 2.1576 = 0.688 \text{ mg/l}$

Average Monthly Limit (AML):

$$AML = LTA \times e^{[z\sigma_n - 0.5\sigma_n^2]}$$

where  $\sigma_n^2 = \ln[CV^2/n + 1]$   
 $z = 1.645$  for 95th percentile occurrence probability  
 $n =$  numbers of samples/month, i.e. assumed 30 in this case  
 $CV = 0.37$   
 $AML = 0.319 \text{ mg/l} \times 1.11 = 0.356 \text{ mg/l}$

Comparison between Technical & Water Quality Based Chlorine Limit

	Average Monthly	Maximum Daily
Technical Limit	--	0.50 mg/l
Water Quality Limit	0.36 mg/l	0.69 mg/l
<b>Selected Limit:</b>	<b>0.36 mg/l</b>	<b>0.50 mg/l</b>

**Maximum Daily Limit for Total Residual Chlorine: 0.50 mg/l**  
**Average Monthly Limit for Total Residual Chlorine: 0.36 mg/l**

**APPENDIX E—WHOLE EFFLUENT TOXICITY TESTING SUMMARY**

The results of Whole Effluent Toxicity testing conducted during the last permit term are summarized in the following tables.

<u>Test 1</u>						
Sample Collection Dates: 18, 20, 22, 25 June 2007						
Dates of Testing: 19-26 June 2007						
Results:						
Acute	Concentration (%)	Percent Survival	NOEC	LOEC	LC	
Ceriodaphnia	0.0	90	100	>100	>100	
	0.57	100				
	3.0	100				
	10	100				
	30	100				
	100	100				
Fathead minnow	0.0	95.0	100	100	>100	
	0.57	100				
	3.0	95.0				
	10	100				
	30	97.5				
	100	97.5				
Chronic	Endpoint	NOEC	LOEC			
Mysid Shrimp	Survival	100	>100			
	Growth	100	>100			
Topsmelt	Survival	100	>100			
	Growth	100	>100			
<u>Test 2</u>						
Sample Collection Dates: 17, 19, 21 September 2007						
Dates of Testing: 18-25 September 2007						
Results:						
Acute	Concentration (%)	Percent Survival	NOEC	LOEC	LC	
Ceriodaphnia	0.0	100	100	>100	>100	
	0.57	100				
	3.0	100				
	10	95				
	30	100				
	100	90				
Fathead minnow	0.0	100	100	100	>100	
	0.57	100				
	3.0	97.5				
	10	87.5				
	30	87.5				
	100	92.5				
Chronic	Endpoint	NOEC (%)	LOEC (%)			
Mysid Shrimp	Survival	100	>100			
	Growth	100	>100			
Topsmelt	Survival	100	>100			
	Growth	100	>100			

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<u>Test 3</u>						
Sample Collection Dates: 11, 12, 14 December 2007						
Dates of Testing: 11-18 December 2007						
Results:						
Acute	Concentration (%)	Percent Survival	NOEC	LOEC	LC	
Ceriodaphnia	0.0	100	100	>100	>100	
	0.57	100				
	3.0	100				
	10	100				
	30	90				
	100	100				
Fathead minnow	0.0	100	100	100	>100	
	0.57	95				
	3.0	97.5				
	10	100				
	30	95				
	100	100				
Chronic	Endpoint	NOEC (%)	LOEC (%)			
Mysid Shrimp	Survival	100	>100			
	Growth	100	>100			
Topsmelt	Survival	100	>100			
	Growth	100	>100			
<u>Test 4</u>						
Sample Collection Dates: 17, 19, 21 March 2008						
Dates of Testing: 18-25 March 2008						
Results:						
Acute	Concentration (%)	Percent Survival	NOEC	LOEC	LC	
Ceriodaphnia	0.0	100	100	>100	>100	
	0.57	100				
	3.0	90				
	10	90				
	30	100				
	100	100				
Fathead minnow	0.0	100	100	100	>100	
	0.57	100				
	3.0	100				
	10	100				
	30	97.5				
	100	100				
Chronic	Endpoint	NOEC (%)	LOEC (%)			
Mysid Shrimp	Survival	100	>100			
	Growth	30	>100			
Topsmelt	Survival	100	>100			
	Growth	100	>100			

APPENDIX F—BIOLOGICAL EVALUATION

Section 7 of the Endangered Species Act (ESA) requires federal agencies to request a consultation with the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the U.S. Fish and Wildlife Service (FWS) regarding potential effects an action may have on listed endangered species. The listings in the vicinity of Fort Lewis included chinook salmon (and its critical habitat), steelhead trout, southern resident orca (and critical habitat), bulltrout (and critical habitat), and the marbled murrelet. This list was confirmed with Tom Sibley at NOAA (telephone conversation, 10/07/08) and Carolyn Seafidi with the Fish and Wildlife Service (telephone conversation, 10/07/08). The following table summarizes the effects determinations for the Fort Lewis WWTP discharge. The draft Biological Evaluation is currently being reviewed by the Services.

<b>Table 1: Effects Determination Summary for Fort Lewis, WA</b>					
<b>Pollutant</b>	<b>Chinook Salmon</b>	<b>Steelhead Trout</b>	<b>Bull Trout</b>	<b>Marbled Murrelet</b>	<b>Southern Resident Killer Whale</b>
TSS, Sediment and Turbidity	Not likely to adversely affect.	Not likely to adversely affect.	Not likely to adversely affect.	No effect.	Not likely to adversely affect.
Chlorine	“ ”	“ ”	“ ”	“ ”	“ ”
Ammonia	“ ”	“ ”	“ ”	“ ”	“ ”
pH	“ ”	“ ”	“ ”	“ ”	“ ”
BOD <sub>5</sub>	“ ”	“ ”	“ ”	“ ”	“ ”
Temperature	“ ”	“ ”	“ ”	“ ”	“ ”
Metals	“ ”	“ ”	“ ”	“ ”	“ ”
Bacteria	“ ”	“ ”	“ ”	“ ”	“ ”
Overall effects determination	Not likely to adversely affect.	Not likely to adversely affect.	Not likely to adversely affect.	No effect.	Not likely to adversely affect.

Note: The U.S. Fish and Wildlife Service issued a Biological Opinion regarding this action on March 4, 2010. The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service issued a Biological Opinion regarding this action on January 30, 2012.



APPENDIX G—RESPONSE TO COMMENTS