FACT SHEET FOR NPDES PERMIT WA-002405-8

City of Edmonds Wastewater Treatment Plant

October 30, 2009

PURPOSE of this Fact Sheet

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

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

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for the Edmonds WWTP, NPDES permit WA-002405-8**,** were available for public review and comment from August 25, 2009 until September 25, 2009. For more details on preparing and filing comments about these documents, please see *Appendix A—Public Involvement Information*. The Edmonds WWTP reviewed the draft permit and fact sheet for factual accuracy before the public comment period. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water before making the permit available for public comment.

After the public comment period closed, Ecology summarized substantive comments and provided responses to them. *Appendix G—Response to Comments*, contains the comments and Ecology's response. Comments from the City of Edmonds about their outfall design resulted in an increase of the allowable dilution factor compared to the dilution proposed in the draft permit and fact sheet. Ecology revised several areas within the body of this final fact sheet that rely on dilution factors. The administrative file for this permit contains copies of the draft permit and fact sheet that were made available during the public review period. Interested parties wishing to compare document versions may do so by submitting a public records request to Ecology's Northwest Regional Office.

Shawn McKone prepared the permit and this fact sheet.

SUMMARY

The City of Edmonds (Edmonds) owns and operates a conventional activated sludge wastewater treatment plant that serves regional wastewater treatment needs for a portion of southwest Snohomish County and northwest King County. Communities served by the Edmonds WWTP include most of the city of Edmonds, the city of Mountlake Terrace, portions of the cities of Lynnwood and Shoreline, and the town of Woodway. The treatment plant serves collection systems owned and operated by the cities of Edmonds, Lynnwood, Mountlake Terrace, the Olympic View Water and Sewer District, and the Ronald Wastewater District.

Ecology issued the previous permit for the Edmonds WWTP on January 23, 2004, for discharges to the central basin of Puget Sound. Edmonds has maintained very good compliance with the previous

permit, reporting only two permit limit violations over the five-year term of the permit. Edmonds attributed both reported violations to minor equipment malfunctions that it quickly corrected. Ecology presented the Edmonds WWTP with the "Outstanding Treatment Plant Award" in 2006 for perfect compliance with all aspects of their NPDES permit that year.

The proposed permit contains the same effluent limits for Carbonaceous Biochemical Oxygen Demand (CBOD), Total Suspended Solids, Fecal Coliform Bacteria, and pH as the previous permit. The proposed permit contains a lower limit for Residual Chlorine present in the effluent, which is the result of a reassessment of mixing provided by the treatment plant's outfall diffusers. Other changes from the previous permit include:

- Ecology removed references to "Outfall #002" that were in the previous permit. The WWTP has a single discharge line from the facility. Although the line branches and ultimately directs flow to two diffuser lines, both diffuser lines operate simultaneously and receive an equal share of the plant's total effluent flow. This permit authorizes discharge from the facility through a single outfall (#001) and grants an appropriate mixing zone that surrounds the two diffuser lines.
- Ecology reevaluated the dilution factors authorized in the previous permit and conducted a mixing zone evaluation using updated modeling software and Ecology's current guidance for mixing zone analyses. This reassessment resulted in a reduction in the acute and chronic dilution factors used to evaluate water quality impacts of the discharge.
- Ecology removed the requirement for quarterly Acute Whole Effluent Toxicity (WET) Compliance Monitoring. Results of WET monitoring conducted during the previous permit demonstrated that the effluent does not exhibit acute toxicity and that a WET limit was not necessary.
- Ecology replaced the requirement for annually submitting a list of Industrial Users with a one-time requirement for Edmonds to characterize the types of businesses and industries that discharge non-domestic wastewater to the treatment system. The intent of the report is to identify the types of businesses contributing non-domestic wastewater flow and to describe steps Edmonds takes to manage non-domestic wastewater.
- Ecology removed the requirement for sediment sampling. Sediment sampling conducted during the previous permit did not reveal the presence of toxics in excess of Sediment Management Standards.
- Ecology removed the requirement for Edmonds to conduct an outfall inspection. Edmond's inspection during the previous permit did not reveal significant cause for concern with the integrity of the outfall line.
- The permit requires Edmonds to conduct monthly baseline effluent nutrient monitoring. Ecology is adding this nutrient monitoring to all NPDES permits for domestic wastewater treatment plants to aid in assessing nutrient impacts to Puget Sound and other waters of the state.
- Ecology has added effluent temperature as a required routine effluent monitoring parameter.
- The permit requires Edmonds to provide an annual update to Ecology on progress made to correct previously-identified inflow and infiltration problems.

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I. INTRODUCTION

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

The following regulations apply to municipal NPDES permits:

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

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

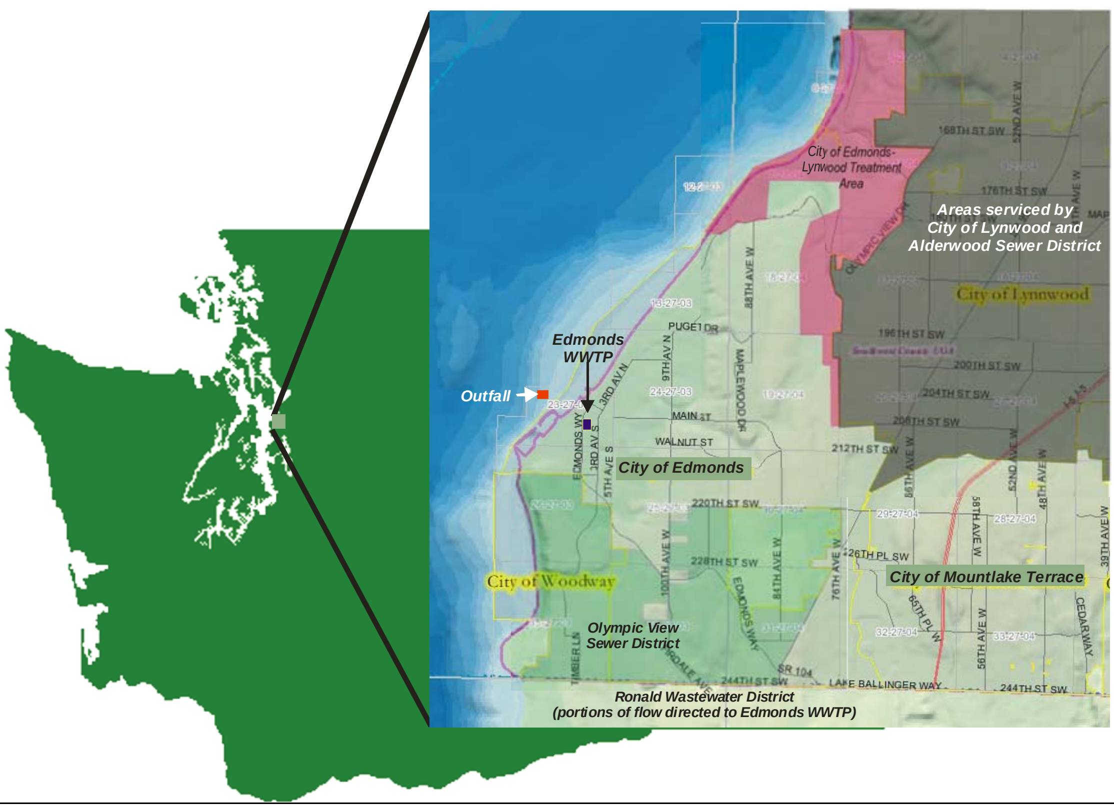
Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty (30) days (WAC 173-220-050) (See *Appendix A—Public Involvement Information* for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit. Ecology will summarize the responses to comments and any changes to the permit in *Appendix G.*

II. BACKGROUND INFORMATION

Table 1. General Facility Information

Applicant:	City of Edmonds
Facility Name and Address:	City of Edmonds WWTP 200 Second Avenue S. Edmonds, WA 98020
Type of Treatment:	Conventional Activated Sludge
Discharge Location: Outfall #001:	Puget Sound Central Basin North Line / South Line Latitude: 47º 48' 47" N / 47º 48' 42" N Longitude: 122º 23' 25" W / 122º 23' 27" W

Figure 1. Facility Location Map



Region served by the City of Edmonds Wastewater Treatment Plant. The treatment plant's service territory includes most of the city of Edmonds, the city of Mountlake Terrace, the city of Woodway, and portions of the city of Shoreline. Edmonds sends flows from basins located generally north of Olympic View Dr. and east of 76th Avenue to the city of Lynnwood WWTP under an inter-local agreement with Lynnwood. Sewer agencies served by the treatment plant include the cities of Edmonds and Mountlake Terrace, Olympic View Water and Sewer District, Ronald Wastewater District (northwestern areas), and King County Metro (a portion of flow routed through the Richmond Beach Pump Station).

A. Facility Description

History

Sewer service for Edmonds started prior to 1920 with a combined sanitary and stormwater collection system that discharged untreated wastewater to Puget Sound. In the early 1950s, Edmonds began expanding the collection system with separate storm and sanitary systems. Edmonds also made efforts to separate stormwater and sanitary flows in their existing combined system.

Edmonds built its first primary treatment plant in 1957 to treat 2.0 million gallons per day (MGD) for a population of 20,000. Edmonds finalized agreements in 1959 with the city of Mountlake Terrace and the Ronald Sewer District to treat wastewater from those service areas. At the same time, Edmonds expanded the primary plant to serve a population of 50,000 and a design flow of 4.0 MGD. It expanded the primary treatment plant a third time in 1967 to a design flow of 7.6 MGD for a service population of 76,000. The third expansion was necessary to accommodate new flows that resulted from a treatment agreement with the Olympic View Water and Sewer District and an expansion of the Ronald Sewer District service area.

Edmonds started planning to convert the treatment system from primary treatment to secondary treatment in 1986. It completed construction of the new secondary plant, which is the current facility, in 1991. The plant has a design capacity of 11.8 MGD. Edmonds constructed the existing facility using the entire available footprint, so options for expanding treatment at the existing site are limited.

Collection System Status

The City of Edmonds manages a 7.4-square-mile service area that serves 9,262 connections within the city's boundaries. The collection system consists of 168 miles of pipe, approximately 3,300 manholes, and 15 lift stations. Edmonds installed more than half of the system pipelines during the 10-year period between 1959 and 1968. Edmonds estimates that roughly half of the system is 40 years old or older and is constructed of materials that have reached the end of their useful life.

While most of the flow from the city's service area is treated at the Edmonds WWTP, flows from the northern portion of the city are treated at the Lynnwood WWTP under a flow-swapping agreement. The agreement provides Edmonds with a reserve capacity of 920,000 gallons per day for treatment at the Lynnwood facility.

The collection system within the city of Edmonds is managed by a separate division within the Edmonds' Public Works Department. Other public utility agencies operate and maintain the collection systems in areas outside of the city of Edmonds that flow to the Edmonds treatment plant. The city's 2006 comprehensive sewer plan identified the need to repair several areas of the collection system to prevent inflow and infiltration and to rehabilitate lift stations. Edmonds anticipates completing projects identified in its Capital Improvement Plan by 2017.

The treatment plant also accepts wastewater from Washington State Ferries via a pump-out station located at the ferry dock a few blocks away. All ferries use fresh water for toilets, so salinity levels from this source are low.

Treatment Processes

The Edmonds WWTP is a conventional secondary treatment plant consisting of headworks screening, primary clarifiers, aeration basins for biological treatment, secondary clarifiers, and chlorine disinfection. Appendix C contains a detailed process flow diagram and plant schematic for the facility. Flow arrives in three separate channels dedicated to different origin sources. The facility dedicates one channel for flows from the City of Edmonds, one for King County Metro flow from the Richmond Beach Lift Station, and one for flows from other regional communities served by the facility. Each flow channel has dedicated flow metering using ultrasonic flow sensors over Parshall flumes. Each channel is also equipped with its own ¼" screen. After flow measurement, the three influent paths combine and flow into two wet wells. A flow-paced proportional sampler draws influent samples from the discharge pipe of the influent pumps.

Two constant-speed and two variable-speed pumps transfer wastewater from the wet wells to primary clarifiers. Primary treated wastewater then flows to completely mixed aeration basins equipped with fine-bubble diffusers for secondary biological treatment. Digested effluent from the aeration basins is then routed to center-feed secondary clarifiers for sludge separation.

Sodium hypochlorite is injected into the flow stream at the overflow weir of the secondary clarifiers. Clarified wastewater overflows to two independent chlorine contact chambers that provide approximately one hour of disinfectant contact time. A sodium bisulfite solution is added to dechlorinate the flow just as the effluent flows over a weir leaving the chlorine contact chambers and drops into an effluent wet well. Final disinfected effluent then collects in an effluent wet well prior to discharge using either gravity feed or pump feed, depending on tide levels in the receiving water. The plant operators collect flow-proportioned samples of final effluent from the effluent wet well.

The Edmonds WWTP is designed with the capability to route flow around the secondary treatment units (aeration basins and secondary clarifiers) when flow rates exceed 21.5 MGD. This internal bypass mechanism can divert a portion of the flow leaving the primary clarifiers and route it to the chlorine contact chambers. If the City of Edmonds used this bypass to divert primary effluent during very high flow periods, the bypassed flow would blend with secondary effluent for disinfection prior to discharge. Although the facility's SCADA system monitors flow and provides an alarm to alert operators to flows that exceed 21.5 MGD, the bypass valve is not automated; operators must manually activate the bypass valve. According to plant staff, Edmonds has never used this bypassing ability and has treated flows up to 26.0 MGD through the secondary processes. The city's policy with respect to this bypass mechanism is to treat it only as a safety release that it will only use to prevent loss of property or life during extreme high flows. The proposed permit acknowledges that this bypassing ability exists, but does not authorize use of blending as a means for managing peak flow. The proposed permit treats any use of this capability as an unpermitted bypass that is subject to specific notification procedures.

Discharge Outfall

Treated and disinfected effluent from the Edmonds WWTP flows into the main basin of Puget Sound through outfall #001. The outfall terminates in the region between the Port of Edmonds Marina and the Washington State Ferry dock. The main effluent line is split into two lines running to two independent diffusers. Each line includes isolation valves that allow the City of Edmonds to direct all of the plant flow to either line or to both lines simultaneously. Under normal operation, Edmonds uses both diffusers at all times. The city only uses a single diffuser during times when they need to perform maintenance on a line or to perform annual operational testing of the valves. Figure 2 below illustrates the configuration of the Edmonds outfall.

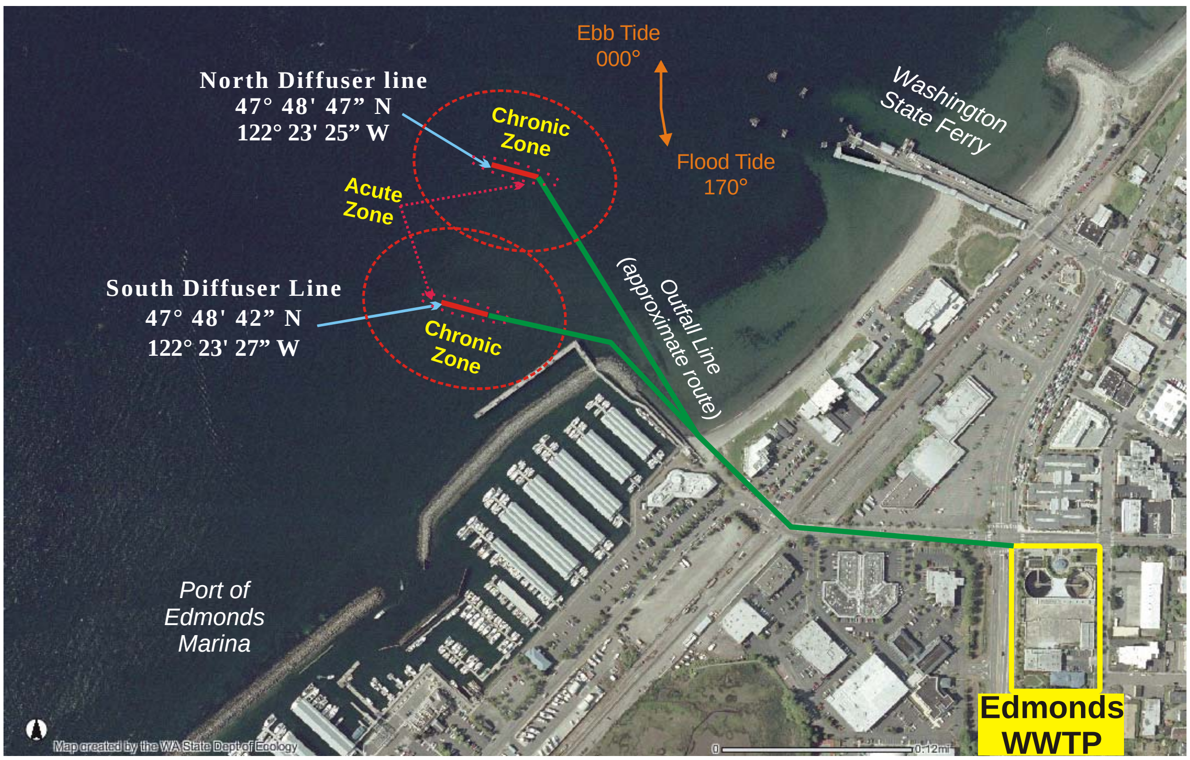


Figure 2: *Edmonds WWTP Outfall #001 Orientation (for illustration purposes only; actual locations may vary to a small degree).*

Each diffuser is 160 feet long and is equipped with seven diffuser ports. The first six diffuser ports are spaced 30 feet apart and discharge in alternating directions. The seventh port is located 7 feet away from the sixth port, on the diffuser's end cap, and discharges in a direction parallel to the diffuser line. The following illustration shows the port configuration of each diffuser line.

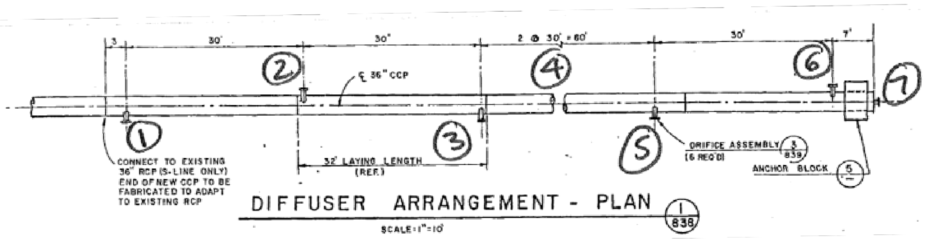


Figure 3: *Outfall diffuser port configuration.*

The diffusers are laid parallel to each other at an approximate bearing of 285° (WNW), separated by a distance of 460 feet. They are laid at a considerable slope along the sea floor such that there is more than a 10-foot difference in elevation between ports at opposite ends of each diffuser. The North Diffuser (closest to the ferry dock) terminates at a depth of approximately 65 feet (MLLW) at the following coordinates: Latitude 47° 48' 47" N, Longitude 122° 23' 25" W. The South Diffuser (closest to the marina) terminates at an approximate depth of 73 feet (MLLW) at the following coordinates: Latitude 47° 48' 42" N, Longitude 122° 23' 27" W.

Solid Wastes

The treatment facilities remove solids during the treatment of the wastewater at the headworks (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. All solids removed at the facility are incinerated on-site in a fluidized-bed incinerator. Solids removed at the headworks are macerated and dewatered prior to incineration. Solids settled in the primary clarifiers and biosolids wasted from the secondary treatment system are concentrated with a filter press before incineration. Ash produced in the combustion process is transferred off-site to a local landfill as a non-regulated solid waste. Air emissions from the incinerator are regulated by the Puget Sound Clean Air Agency.

B. Permit Status

Ecology issued the previous permit for this facility on January 23, 2004. The previous permit placed effluent limits on Carbonaceous Biochemical Oxygen Demand, Total Suspended Solids, Fecal Coliform Bacteria, pH, and Total Residual Chlorine.

The City of Edmonds submitted an application for permit renewal on July 3, 2008. Ecology accepted it as complete on July 15, 2008, and administratively extended the existing permit on January 6, 2009.

C. Summary of Compliance With Previous Permit Issued January 23, 2004

The Edmonds WWTP has complied with the effluent limits and permit conditions throughout the duration of the permit issued on January 23, 2004**.** Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections conducted by Ecology. During the term of the previous permit, Edmonds reported only two permit limit violations. The facility exceeded the daily maximum chlorine limit in May 2007 and failed to meet the required 85% removal efficiency for Total Suspended Solids in February 2009. Both limit violations were associated with temporary treatment process problems that were quickly repaired by plant staff. The Edmonds WWTP has received the "Outstanding Treatment Plant Award" from Ecology five times between 1995 and 2008. The facility last received this award in 2006.

Ecology staff last conducted a sampling compliance inspection on August 19, 2008. The inspection did not reveal any significant areas of concern with the facility's operation, maintenance, and compliance monitoring practices. The inspection report concluded that the facility "appeared well-operated, well-maintained, and staff was helpful and knowledgeable."

The report also noted that the facility routinely meets or exceeds Ecology's expectations for process management and permit compliance.

D. Wastewater Characterization

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. Data presented in Table 2 represents the quality of the effluent discharged from the Edmonds WWTP, based on information supplied in the permit application and on DMR data from 2004-2009.

Table 2. Wastewater Characterization

Parameter	Average Value	Minimum Value	Maximum Value	Sample Size
Monthly Average Daily Flow * (MGD)	4.7 (summer) 9.8 (winter)	3.7	7.0 (summer) 17.7 (winter)	18 18
CBOD (mg/L)	7.7	-	32.3	208
TSS (mg/L)	9.5	-	30	260
Fecal Coliform (#/100 ml)	52	-	541	156
pH (Standard Units)	7.13	6.60	7.60	62
Summer Temperature (°C)	20.3	-	22.5	92
Chlorine (μg/L)	100	-	357 (95^{th} percentile value from DMR data between April 2007 and March 2009)	720
Ammonia (mg/L as N)	23.1	-	27.6	3
Total Phosphorus (mg/L as P)	2.5	-	3.18	3
Copper (μg/L)	14	-	19	3
Zinc (μg/L)	46	-	60	3
Chloroform (μg/L)	1.8	-	2.5	3
Methylene Chloride (μg/L)	2.6	-	2.6	3
Bis(2-ethylhexyl)phthalate (μg/L)	1.6	-	1.9	3

* *Flow values are taken from DMR data for the last 3 years. Summer values include the months of May-October and winter months include the months of November-April. Abnormally high flows from December 2007, which were associated with an extreme storm event, were excluded as an outlier.*

E. Description of the Receiving Water

The Edmonds WWTP discharges to the northern portion of the Main Basin of Puget Sound. Other nearby municipal wastewater outfalls include: The city of Lynnwood's WWTP outfall located approximately 3 miles to the north and the Kingston WWTP outfall located approximately 5 miles west on the opposite side of Puget Sound. Other known point-source discharges in the immediate vicinity of the Edmonds WWTP outfall include discharges of treated stormwater from the Unocal Edmonds Bulk Fuel Farm soil remediation site

(Industrial NPDES Permit No. WA-003215-8) and from the Port of Edmonds' boatyard work area (General NPDES Permit No. WAG-030034). The City of Edmonds is a primary Permittee for non-point stormwater runoff within the city's limits under the Western Washington Phase II Municipal Stormwater Permit (Permit No. WAR-045513A). In addition, Ecology has issued a General Industrial Stormwater Permit to the Washington State Department of Transportation for managing stormwater at the Edmonds Ferry Terminal (Permit # S03-001067).

Ecology used the data from the core marine monitoring station located at the south end of Admiralty Inlet as ambient background data for this permit evaluation. This station is located approximately 6.3 miles northwest of Edmonds (Station ADM003: 47° 52' 45.12", 122° 28' 54.48"). Ecology also used ambient copper and zinc data collected by King County Department of Natural Resources from a location near Point Wells (Station ID: PTWELLS1, 47° 47' 06", 122° 24' 24") Table 3 presents a summary of relevant ambient data based on monitoring records collected between 1990 and 2008.

Table 3. Ambient Background Data

Parameter	Value Used
Winter Temperature, 90^{th} percentile (average for the water column)*	10.27^o C
Summer Temperature, 90^{th} percentile (average for the water column)*	12.46^o C
Summer pH, 90^{th} percentile (average for the water column)*	8.29
Summer Dissolved Oxygen (average for the water column)*	9.5 mg/L
Total Ammonia-N	34 µg/L
Fecal Coliform	1/100 mL dry weather
Average Summer Salinity (average for the water column)*	28.39 psu
Copper**	0.406 µg/L
Zinc**	1.135 µg/L

* *All values except Total Ammonia and Fecal Coliform are based on discrete samples taken in the water column at 5m increments between 1m and 25m depth.*

** *King County data collected between April 1999 and June 2000. Values are 90^{th} percentile of all data collected in the water column.*

F. SEPA Compliance

Regulation exempts reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than state rules and regulations. The exemption applies only to existing discharges, not to new discharges. The City of Edmonds' permit is exempt from the SEPA process since the permit renews discharge authority for an existing facility and the proposed permit will comply with all applicable state rules and regulations.

III. PROPOSED PERMIT LIMITS

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

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

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

Ecology does not 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 non-reported pollutants. If significant changes occur in any constituent of the effluent discharge, the Edmonds WWTP is required to notify Ecology [40 CFR 122.42(a)]. The Edmonds WWTP may be in violation of the permit until Ecology modifies the permit to reflect additional discharge of pollutants.

A. Design Criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology obtained design criteria for this treatment plant from the facility's approved Operation and Maintenance Manual, prepared by HDR Engineering in 1991.

Table 4. Design Criteria for the Edmonds WWTP.

Parameter	Design Quantity
Maximum Monthly Average Daily Design Flow (MMDF)	11.8 MGD
Peak Daily Design Flow (PDDF)	21.5 MGD
Peak Hourly Design Flow (PHDF)	40.0 MGD
BOD_5 loading for maximum month	20,000 lb/day
TSS loading for maximum month	19,200 lb/day

Based on the approved Operation and Maintenance Manual, the Edmonds' facility was designed and constructed with the ability bypass flows in excess of 21.5 MGD around secondary treatment. The design allows Edmonds the capability to route this excess flow from the primary clarifiers and blend with secondary-treated flow prior to disinfection and disposal. Although the facility has this design capability available, plant staff have disabled the automatic controls for this bypass. Staff can manually activate the bypass valves if flows reach a level that pose a hazard to property or health. During the past permit term, Edmonds has not used this bypass ability, even though plant flows exceeded 21.5 MGD on a few occasions.

The proposed permit does not authorize bypass and blending as a strategy for managing peak wet weather flows. Edmonds must notify Ecology within 24-hours of any bypassing of secondary treatment using this built in capability, as is the requirement for all treatment system bypasses.

B. Technology-Based Effluent Limits

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

Chapter 173-221 WAC lists the following technology-based limits for pH, fecal coliform, $CBOD_5$, and TSS:

Table 5. Technology-based Limits.

Parameter	Limit
pH	The pH must measure within the range of 6.0 to 9.0 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
$CBOD_5$ (concentration)	Average Monthly Limit is the most stringent of the following: - 25 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 40 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L

Mass limits for $CBOD_5$ are calculated as:

- Monthly effluent mass loadings (lbs/day) = maximum monthly design flow (11.8 MGD) x Concentration limit (25 mg/L) x 8.34 (conversion factor) = mass limit 2,460 lb/day.
- Weekly effluent mass loadings (lbs/day) = maximum monthly design flow (11.8 MGD) x Concentration limit (40 mg/L) x 8.34 (conversion factor) = mass limit 3,936 lb/day.

Mass limits for TSS are calculated as:

- Monthly effluent mass loadings (lbs/day) = maximum monthly design flow (11.8 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 2,952 lb/day.
- Weekly effluent mass loadings (lbs/day) = maximum monthly design flow (11.8 MGD) x Concentration limit (45 mg/L) x 8.34 (conversion factor) = mass limit 4,429 lb/day.

C. Surface Water Quality-Based Effluent Limits

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

Numerical Criteria for the Protection of Aquatic Life and Recreation

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

Numerical Criteria for the Protection of Human Health

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

Narrative Criteria

Narrative water quality criteria (for example, 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

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

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

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

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

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

This facility must meet Tier I requirements.

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

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

Mixing Zones

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

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

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and use no more than 25% of the available width of the water body for dilution. Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

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

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

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

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

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

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

   The proposed permit specifies the size and location of the allowed mixing zone. The permit specifies the allowable distance from each diffuser line in which mixing applies.

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

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

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

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

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

Ecology used the following critical conditions to model the discharge:

- As described in Appendix E, Ecology evaluated acute mixing for each individual diffuser port based on the assumption that individual plumes do not merge in the acute or critical zones. Water depth at MLLW for the 14 ports range from 56 feet to 73 feet. To minimize the size of the authorized mixing zone, Ecology based mixing zone size on the shallowest port, which is located at 56 feet MLLW. The model also predicts less dilution for shallower diffuser ports.
- Two potentially critical conditions: summer conditions with high stratification and winter conditions with low stratification. The average June density profile with a difference of 1.20 practical salinity units (psu) between 25 meters (82 feet) and the surface represents the "summer" or high-stratification condition. The average December density profile with a difference of 0.35 practical salinity units (psu) between 25 meters (82 feet) and the surface represents the "winter" or low-stratification condition.
- 50th percentile current speeds of 0.5 knots (ebb tide) and 0.1 knots (flood tide) for chronic and human health mixing zones. The same median current speed applies for both June and December conditions.
- Acute mixing analysis assumed June 10th percentile current speed of 0.28 knots (ebb tide) and 0.02 knots (flood tide). December 10th percentile current speeds used were 0.27 knots (ebb) and 0.03 knots (flood). June's 90th percentile current speeds for acute analysis were 0.7 knots (ebb tide) and 0.3 knots (flood tide), and December's 90th percentile current speeds were assumed to be 0.8 knots (ebb tide) and 0.3 knots (flood tide).
- The maximum average monthly summer effluent flow of 4.7 MGD for modeling chronic and human health dilution for the June critical condition. For the December critical condition, Ecology used the maximum average monthly winter flow of 9.8 MGD.
- The highest daily maximum summer effluent flow of 7.0 MGD for modeling acute dilution for the June critical condition. For the December critical condition, Ecology used the highest daily maximum winter flow of 17.7 MGD.
- 1 DAD MAX summer effluent temperature of 22.5 degrees C and 1 DAD MAX winter effluent temperature of 18.6 degrees C.

Ambient data at critical conditions in the vicinity of the outfall was compiled from Ecology's core marine monitoring station located at the south end of Admiralty Inlet, located approximately 6.3 miles northwest of Edmonds (Station ADM003). Current velocities were estimated based on 2009 NOAA tide and current predictions tables for a location 2.7 miles WSW of Edmonds.

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

- **Have a reasonable potential to cause the loss of sensitive or important habitat.**
- **Substantially interfere with the existing or characteristic uses.**

- **Result in damage to the ecosystem.**
- **Adversely affect public health.**

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

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

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

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

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

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

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

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

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

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

As noted above, Ecology minimized the mixing zone size by using the depth of the shallowest diffuser port.

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

7. Maximum size of mixing zone.

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

8. Acute Mixing Zone.

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

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

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

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

- **Comply with size restrictions.**

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

9. Overlap of mixing zones.

The mixing zone for this discharge does not overlap another mixing zone.

D. Designated Uses and Surface Water Quality Criteria

Applicable designated uses and surface water quality criteria are defined in Chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). Criteria applicable to this facility's discharge are summarized below in Table 6.

- **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.

  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.

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

Table 6. Aquatic Life Uses and Associated Criteria

Extraordinary Quality	
Temperature Criteria – Highest 1D MAX	13°C (55.4°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	7.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 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 7. 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.

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

The Edmonds Wastewater Treatment Plant discharges secondary treated effluent through Outfall 001. The outfall consists of a single line that runs from the treatment plant to Puget Sound. At the beach, the main effluent line branches into two lines that run to two diffusers. Each diffuser is 160 feet long and is equipped with seven 5-inch diffuser ports. The first six ports are spaced 30 feet apart and discharge in alternating directions that are perpendicular to the direction of the diffuser line. The seventh port is located 7 feet from the sixth port on the diffuser line’s end cap and discharges in a direction parallel to the diffuser line. The two diffuser lines are laid parallel to each other at an approximate bearing of 285° (WNW), separated by a distance of 460 feet. The North Diffuser line (closest to the ferry dock) terminates at a depth of approximately 65 feet (MLLW) at the following coordinates: Latitude 47° 48’ 47” N, Longitude 122° 23’ 25” W. The South Diffuser line (closest to the marina) terminates at an approximate depth of 73 feet (MLLW) at the following coordinates: Latitude 47° 48’ 42” N, Longitude 122° 23’ 27” W. The following drawing illustrates the configuration of the Edmonds outfall.

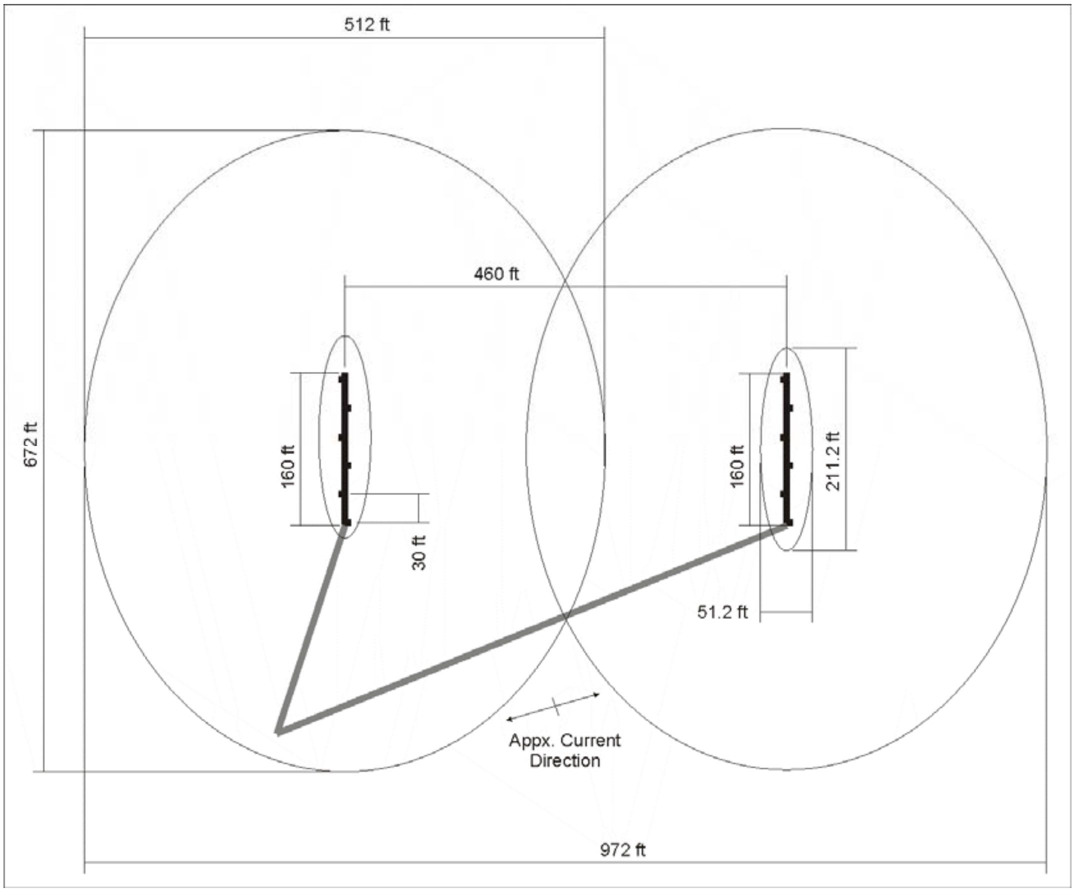


Figure 4. *Authorized mixing zone boundaries for Outfall #001.*

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.

To minimize mixing zone size, Ecology will base the mixing zone size for both diffuser lines on the depth of the port(s) located at the shallowest depth. For the Edmonds WWTP, the shallowest depth of a port on either diffuser line is 56 feet (MLLW). Therefore, the horizontal distance of the chronic mixing zone is 256 feet from any port on either diffuser line. The mixing zone extends from the seabed to the top of the water surface.

Acute Mixing Zone

WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The acute mixing zone for the two diffuser lines of Outfall 001 extends 25.6 feet in any direction from any discharge port.

Ecology determined the dilution factors that occur within these zones at the critical condition using EPA's Visual Plumes modeling software and Ecology's mixing zone analysis protocols.

The dilution factors are listed in Table 8:

Table 8. Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	34	225
Human Health, Carcinogen		225
Human Health, Non-carcinogen		225

Ecology 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_5—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 ensure that dissolved oxygen criteria are met in the receiving water.

Temperature—The state temperature standards (WAC 173-201A-200-210 and 600-612) include multiple elements:

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

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

- Annual summer maximum and supplementary spawning/rearing criteria.

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

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

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

- Incremental warming criteria.

  The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

  At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. That increment (T_i) is defined with the following equation:

  $$T_i = {}^{12}/_{(T_{amb} - 2)}$$

  Based on the maximum ambient temperature (T_{amb}) of 12.46°C for the region around the Edmonds outfall and the equation above, the maximum allowable incremental temperature change is 1.15°C. However, this increment is permitted only to the extent that doing so does not cause temperature to exceed either the annual maximum or supplemental spawning criteria. Since the 1.15°C incremental change would result in receiving water temperatures that exceed established water quality criteria, the allowable incremental change is limited to the difference between current maximum ambient temperature and the criteria, which is 0.54°C.

- 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.

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

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

- Reasonable potential to exceed temperature criteria.

  Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum and the incremental warming criteria at the edge of the chronic mixing zone during critical conditions. No reasonable potential exists when the resulting temperature of ambient water and effluent after mixing in the chronic mixing zone is less than the criteria of 13° C and the incremental change is less than 0.54° C. As shown in the following calculation, Ecology predicts that the Edmonds WWTP discharge will increase temperature in the vicinity of the outfall by 0.04° C to a temperature of 12.50° C ($T_{chronic}$):

$$T_{chronic} = T_{amb} + [(T_{effluent} - T_{amb})/DF].$$
$$= 12.46° C + [(22.5° C - 12.46° C)/225].$$
$$= 12.50° C$$

  Since the resultant temperature is less than the criterion of 13°C and the incremental increase is less than 0.54° C, the proposed permit does not include a temperature limit.

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

Fecal Coliform—Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and a dilution factor of 225.

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

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

Based on information supplied in the NPDES application, the Edmonds WWTP effluent has detectable levels of the following toxic pollutants: chlorine, ammonia, copper, and zinc. Ecology conducted a reasonable potential analysis (See Appendix F) on these parameters to determine whether it would require effluent limits in this permit. Since some chemical toxicity changes based on ambient conditions, the reasonable potential analysis uses techniques to adapt to conditions expected in the vicinity of the outfall. For example, ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia in the vicinity of the outfall depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient station AMD003 and Ecology spreadsheet tools.

Water quality criteria for most metals published in Chapter 173-201A WAC are based on the dissolved fraction of the metal [see footnotes to table WAC 173-201A-240(3); 2006]. The Edmonds WWTP may provide data clearly demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Ecology may adjust metals criteria on a site-specific basis when data is available clearly demonstrating the seasonal partitioning in the ambient water in relation to an effluent discharge. When performing a reasonable potential analysis, Ecology uses generalized metals translator values derived from past Ecology studies or published in the Federal Register when site-specific translators are not available.

Ecology’s calculations also use ambient concentrations of toxics when the data is available. Valid ambient background data was available for ammonia from Ecology’s monitoring station at the south end of Admiralty Inlet. Ecology used an ambient ammonia concentration of 34 μg/L to evaluate the reasonable potential for this discharge to cause a violation of water quality standards. Ambient data was available for copper and zinc from King County Department of Natural Resources. Ecology used an ambient copper concentration of 0.406 μg/L and ambient zinc concentration of 1.135 μg/L based on sampling conducted by King County near Point Wells between 1999 and 2000. Ecology assumed a background concentration of zero for chlorine since ambient data is not routinely available for that parameter.

Ecology determined that existing levels of ammonia, chlorine, copper, and zinc pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

The existing permit includes the following water quality-based limits for chlorine: monthly average limit of 228 µg/L and monthly maximum daily limit of 598 µg/L. The Edmonds WWTP has demonstrated an ability to meet this limit over the previous permit term, with only one reported violation of the maximum daily limit over 5 years. Although the Edmonds WWTP has not demonstrated a reasonable potential to exceed water quality standards based on existing discharge concentrations, Ecology must reevaluate the existing water quality-based limits based on the lower dilution factors authorized for the mixing zone. As a result, the proposed permit includes the following lower chlorine limits: monthly average limit of 191 µg/L and monthly maximum daily limit of 442 µg/L. Ecology calculated these limits based on the Edmonds WWTP collecting 30 samples per month. Ecology also assumed that the treatment plant's lab will continue to achieve a coefficient of variability of 0.5 for chlorine data produced by the lab, as has been the case over the term of the previous permit. Discharge monitoring data for the last two years (Appendix D) indicates that the facility effluent already meets this lower limit 95% of the time.

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.

- *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.

Ecology-accredited WET testing laboratories use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff knows about WET testing and how to calculate an NOEC, LC_{50}, EC_{50}, IC_{25}, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (http://www.ecy.wa.gov/biblio/9580.html), which is referenced in the permit. Ecology recommends that the Edmonds WWTP send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. The proposed permit will not impose an acute WET limit. The Edmonds WWTP must retest the effluent before submitting an application for permit renewal.

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

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

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. The Edmonds WWTP may demonstrate to Ecology 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 Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the effluent may contain chemicals of concern for human health, based on the facility’s status as an EPA major discharger. Priority pollutant testing results submitted by the Edmonds WWTP with their permit application identified that the discharge contains detectable levels of the following compounds that pose human a health risk: chloroform, methylene chloride, and bis (2-ethylhexyl) phthalate.

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

H. Sediment Quality

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

The Edmonds WWTP performed sediment sampling near the outfall in 1995 and 2008. One sample out of six samples collected in 1995 had elevated concentrations of chrysene, fluoranthene, fluorine, and phenanthrene. Follow-up sampling conducted in 2008 revealed that concentrations of these chemicals were substantially lower. In addition, the eight sediment samples from 2008 all met the sediment quality standards for Puget Sound. Based on previous sampling results, Ecology will not require additional sediment monitoring in the proposed permit.

I. Ground Water Quality Limits

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

J. Comparison of Effluent Limits With the Previous Permit Issued on January 23, 2004

Table 9. Comparison of Effluent Limits

	Basis of Limit	Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
		Average Monthly	**Average Weekly**	**Average Monthly**	**Average Weekly**
Carbonaceous Biochemical Oxygen Demand (5-day)	Technology	25 mg/L, 2460 lbs/day	40 mg/L, 3936 lbs/day	25 mg/L, 2460 lbs/day	40 mg/L, 3936 lbs/day
Total Suspended Solids	Technology	30 mg/L, 2952 lbs/day	45 mg/L, 4430 lbs/day	30 mg/L, 2952 lbs/day	45 mg/L, 4430 lbs/day
Fecal Coliform Bacteria	Technology	200 /100 mL	400 /100 mL	200 /100 mL	400 /100 mL
pH	Technology	Shall not be outside the range of 6.0 to 9.0		Daily minimum equal to or greater than 6.0; daily maximum less than or equal to 9.0.	
Parameter		**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Total Residual Chlorine	Water Quality	228 µg/L , 22.4 lbs/day	598 µg/L	191 µg/L	442 µg/L

IV. MONITORING REQUIREMENTS

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

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-09) for a conventional activated sludge facility rated for flows greater than 5.0 MGD.

Monitoring frequencies for TSS, $CBOD_5$, and fecal coliform are consistent with the previous permit, but are less than those recommended for activated sludge facilities with design flows greater than 5.0 MGD. Ecology believes that reduced monitoring is warranted based on the facility's compliance record over the previous permit cycle while using the same monitoring schedule. As shown in the DMR data presented in Appendix D, facility's effluent concentrations average 38% and 32% of the monthly average permit requirements for TSS and $CBOD_5$, respectively (percentages represent [Long Term Average, mg/L] ÷ [Average Monthly Limit, mg/L]). For fecal coliform, the ratio of LTA to AML is 22%. In addition, the facility's monitoring program produces data with relatively low coefficients of variance (COV) for TSS and $CBOD_5$: 0.42 for TSS and 0.38 for CBOD. The low COV indicates that the lab produces consistent results for these parameters. A larger sample size from increased monitoring is not necessary to ensure data reliability. This monitoring reduction decision is consistent with Ecology's and EPA's monitoring reduction policy for exemplary performance.

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.

The proposed permit requires the Edmonds WWTP to perform expanded effluent monitoring for use in the next application for permit renewal. The permit requires the facility to test for Total Kjeldahl Nitrogen, Nitrate+Nitrite Nitrogen, Oil and Grease, Total Dissolved Solids, and toxic metals and organic compounds listed in Appendix A of the proposed permit. In addition, Ecology is requiring all domestic wastewater treatment facilities to provide baseline effluent nutrient data. The proposed permit requires monthly monitoring of Ammonia, Nitrate+Nitrite Nitrogen, Total Kjeldahl Nitrogen, Ortho-phosphate, and Total Phosphorus.

A. Lab Accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories,* to prepare all monitoring data (with the exception of certain parameters). The Edmonds WWTP lab holds accreditation for the following:

Table 10. Lab Accreditation

General Chemistry			
Parameter Name	**Method**	**Reference**	**Matrix ***
Biochemical Oxygen Demand, BOD/CBOD	5210 B	Standard Methods	N
Chlorine Residual, Free	4500-Cl G	Standard Methods	N
Dissolved Oxygen	4500-O G	Standard Methods	N
pH	4500-H	Standard Methods	N
Solids, Total Suspended	2540 D	Standard Methods	N
Microbiology			
Parameter Name	**Method**	**Reference**	**Matrix ***
Fecal Coliform – MF (method typically used at facility)	9222 D	Standard Methods	N
Fecal Coliform – MPN (method is accredited, but not typically used)	9221 E2	Standard Methods	N
* Matrix key: D = drinking water; N = non-potable water; S = solids/chem materials; A = air			

The Edmonds WWTP must use an outside accredited lab for analyses not listed above.

V. OTHER PERMIT CONDITIONS

A. Reporting and Record Keeping

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

B. Prevention of Facility Overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Edmonds WWTP to take the actions detailed in proposed permit requirement S.4 to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4 restricts the amount of flow.

C. Operation and Maintenance (O&M)

The proposed permit contains Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that the Edmonds WWTP takes adequate safeguards to use constructed facilities to their optimum potential in terms of pollutant capture and treatment. Keeping the facility’s approved O&M

Manual up-to-date is an important part of ensuring consistent facility operation and maintenance. The proposed permit requires the Edmonds WWTP to conduct an annual audit of the approved manual to verify that the manual reflects existing plant systems and equipment. The permit also requires the facility to submit substantial modifications to the manual to Ecology for review and approval. Substantial modifications include changes in equipment type, addition or subtraction of process components, or alterations to process management that could potentially change the long-term quality of treatment.

The City of Edmonds has documented that sections of their collection system suffer from high rates of inflow and infiltration (I/I). The city's collection system has also experienced occasional overflows during extreme wet weather events. Edmond's 2006 Comprehensive Sewer Plan identified several collection system pipeline and lift station rehabilitation projects necessary to minimize the impacts of I/I. The proposed permit requires Edmonds to send a letter to Ecology annually to provide an update on the status of I/I rehabilitation projects.

D. Pretreatment

Duty to Enforce Discharge Prohibitions

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

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

  40 CFR Part 403 contains the regulatory basis for these prohibitions, with the exception of the pH provisions which are based on WAC 173-216-060.

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:
  - Cooling water in significant volumes.
  - Stormwater and other direct inflow sources.
  - Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Federal and State Pretreatment Program Requirements

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

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

Routine Identification and Reporting of Industrial Users

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

Requirements for Performing an Industrial User Survey

This POTW has the potential to serve industrial or commercial users. The Edmonds WWTP does not currently serve any significant industrial or commercial users, and land use zoning in the city of Edmonds does not identify areas in which there would be significant opportunity for growth in industrial or commercial users. The proposed permit requires Edmonds to submit a brief report to Ecology that characterizes the types of businesses connected to the city's sewer system. The permit also requires Edmonds to notify Ecology on an as-needed basis when a new significant commercial or industrial user requests connection to the sewer system.

E. Solid Waste Control

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

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

I. Outfall Evaluation

The Edmonds WWTP conducted an outfall inspection during the term of the previous permit. That inspection did not reveal significant areas of concern with respect to outfall integrity. The proposed permit does not require an outfall evaluation, however, Ecology may require further evaluations in future permits.

J. General Conditions

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

VI. PERMIT ISSUANCE PROCEDURES

A. Permit Modifications

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

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

B. Proposed Permit Issuance

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of five (5) years.

VII. REFERENCES FOR TEXT AND APPENDICES

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

Water Pollution Control Federation.

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APPENDIX A—PUBLIC INVOLVEMENT INFORMATION

Ecology proposes to reissue a permit to the City of Edmonds Wastewater Treatment Plant. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on July 16, 2008, and July 23, 2008, in the *Everett Herald* to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology placed a Public Notice of Draft on August 25, 2009, in the *Everett Herald* to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice –

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

Ecology has published a document entitled *Frequently Asked Questions About Effective Public Commenting* which is available on our website at http://www.ecy.wa.gov/biblio/0307023.html.

You may obtain further information from Ecology by telephone, (425) 649-7039, or by writing to the address listed below.

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

The primary author of this permit and fact sheet is Shawn McKone.

APPENDIX B—GLOSSARY

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

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

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

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

Ambient Water Quality—The existing environmental condition of the water in a receiving water body.

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

Annual Average Design Flow (AADF)—The average of the daily flow volumes anticipated to occur over a calendar year.

Average Monthly Discharge Limit—The average of the measured values obtained over a calendar month's time.

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

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

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

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

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

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

Compliance Inspection - Without Sampling—A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

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

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

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

Continuous Monitoring—Uninterrupted, unless otherwise noted in the permit.

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

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

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

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

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

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

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

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

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

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

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

Method Detection Level (MDL)—The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

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

Mixing Zone—An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (Chapter 173-201A WAC).

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

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

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

Peak Instantaneous Design Flow (PIDF)—The maximum anticipated instantaneous flow.

Quantitation Level (QL)—The smallest detectable concentration of analyte greater than the Method Detection Limit (MDL) where the accuracy (precision &bias) achieves the objectives of the intended purpose.

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

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

Technology-based Effluent Limit—A permit limit that is based on the ability of a treatment method to reduce the pollutant.

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

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

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

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

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

Water Quality-based Effluent Limit—A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into receiving waters.

APPENDIX C—TREATMENT PLANT LAYOUT

The following diagrams illustrate the overall layout of the Edmonds WWTP and show the process flow of both liquid and solids waste streams.

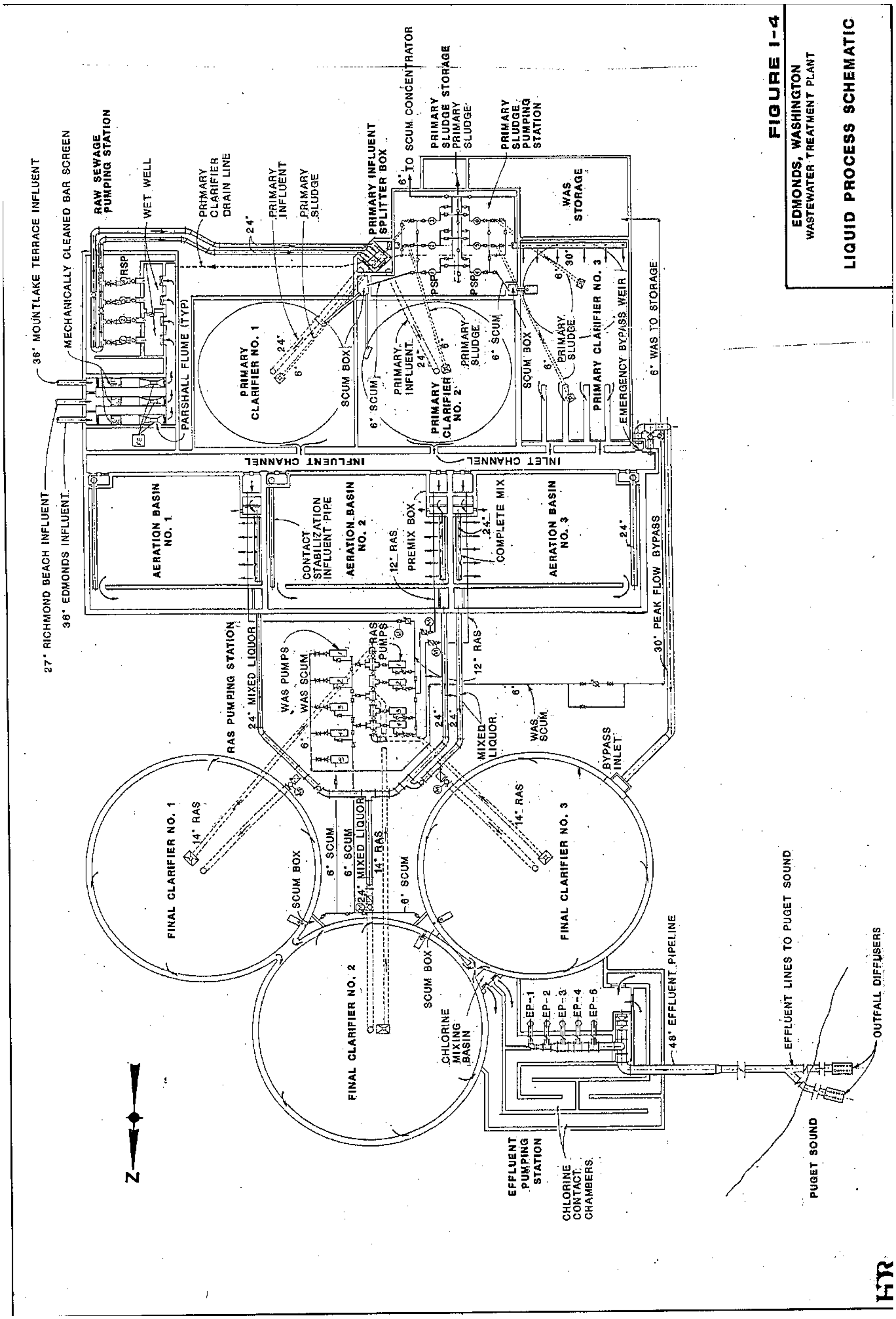


FIGURE 1-4
EDMONDS, WASHINGTON
WASTEWATER TREATMENT PLANT
LIQUID PROCESS SCHEMATIC
36" MOUNTLAKE TERRACE INFLUENT
MECHANICALLY CLEANED BAR SCREEN
RAW SEWAGE PUMPING STATION
WET WELL
PRIMARY CLARIFIER DRAIN LINE
PRIMARY INFLUENT
PRIMARY SLUDGE
PRIMARY INFLUENT SPLITTER BOX
6" TO SCUM CONCENTRATOR
PRIMARY SLUDGE STORAGE
PRIMARY SLUDGE PUMPING STATION
WAS STORAGE
PARSHALL FLUME (TYP)
PRIMARY CLARIFIER NO. 1
PRIMARY CLARIFIER NO. 2
PRIMARY CLARIFIER NO. 3
SCUM BOX
EMERGENCY BYPASS WEIR
6" WAS TO STORAGE
INFLUENT CHANNEL
INLET CHANNEL
27" RICHMOND BEACH INFLUENT
36" EDMONDS INFLUENT
AERATION BASIN NO. 1
AERATION BASIN NO. 2
AERATION BASIN NO. 3
CONTACT STABILIZATION INFLUENT PIPE
PREMIX BOX
COMPLETE MIX
30" PEAK FLOW BYPASS
RAS PUMPING STATION
24" MIXED LIQUOR
WAS PUMPS
WAS SCUM
RAS PUMPS
12" RAS
MIXED LIQUOR
BYPASS INLET
FINAL CLARIFIER NO. 1
FINAL CLARIFIER NO. 2
FINAL CLARIFIER NO. 3
14" RAS
6" SCUM
CHLORINE MIXING BASIN
EFFLUENT PUMPING STATION
CHLORINE CONTACT CHAMBERS
48" EFFLUENT PIPELINE
EFFLUENT LINES TO PUGET SOUND
OUTFALL DIFFUSERS
PUGET SOUND
N

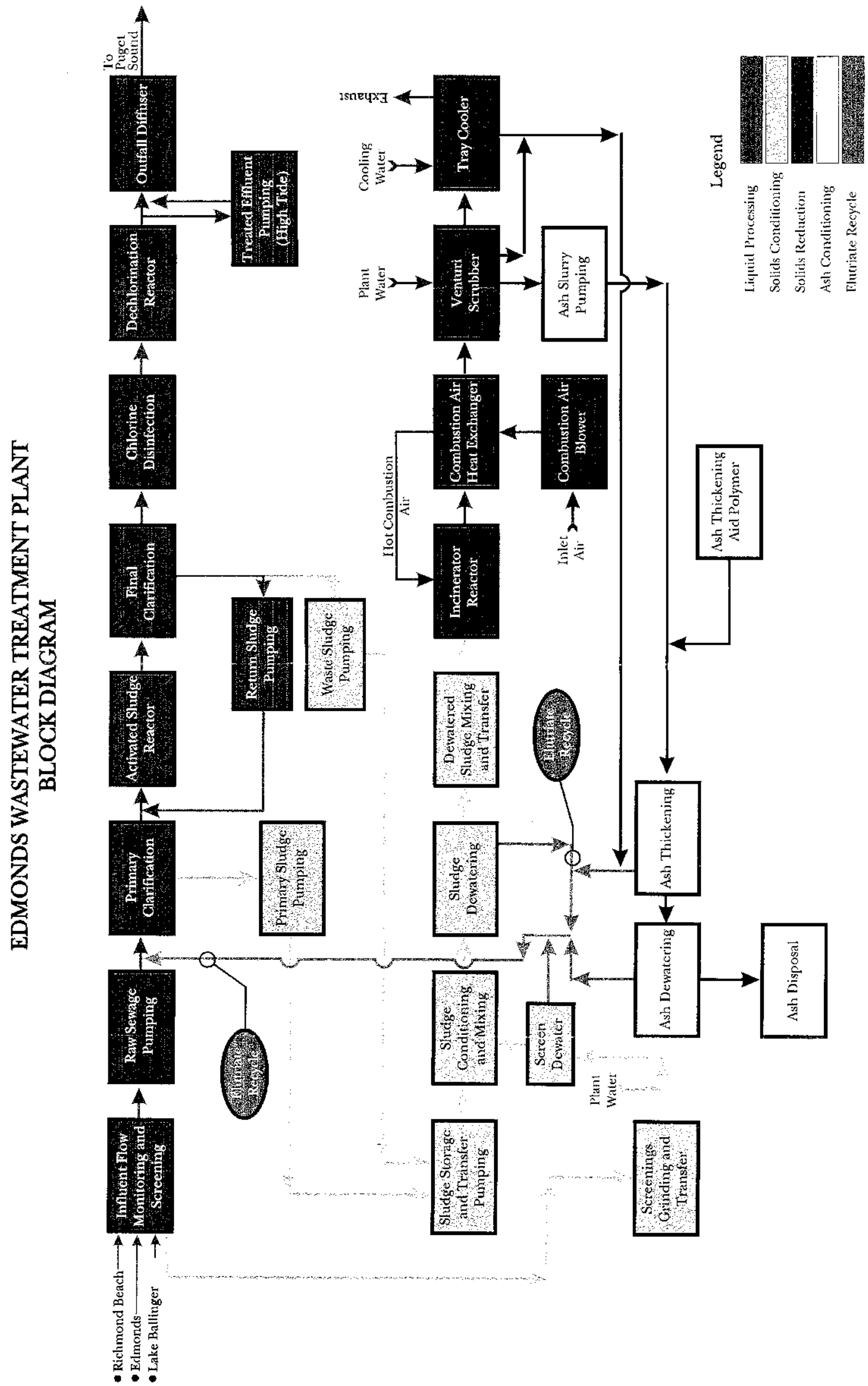


Figure 1.1 Overall Plant

APPENDIX D—DISCHARGE MONITORING DATA

The following appendix contains discharge monitoring data reported by the Edmonds WWTP on monthly Discharge Monitoring Reports for the period between February 2004 and March 2009.

Discharge Monitoring Data, 2004-2009

Facility: Edmonds WWTP
Permit No: WA-0024058

	Influent											
Date	BOD, mg/L Monthly Ave	BOD, mg/L Monthly Max	BOD, ppd Monthly Ave	BOD, ppd Monthly Max	CBOD, mg/L Monthly Ave	CBOD, mg/L Monthly Max	CBOD, ppd Monthly Ave	CBOD, ppd Monthly Max	TSS, mg/L Monthly Ave	TSS, mg/L Monthly Max	TSS, ppd Monthly Ave	TSS, ppd Monthly Max
February-04	197				165.8	205.9	10,825	12,435	189	222	12,635	14,412
March-04	220	288	7,802	15596.2	212.4	312.4	11,944	17,456	258	424	14,540	23,692
April-04	232	248	10,487	10487	212.9	270.6	10,482	13,090	262	400	12,855	19,015
May-04	250	248	9,533	10077	222.3	258.2	8,140	9,601	266	324	9,663	1,228
June-04	250	297	11,158	18081.1	235.4	281.3	8,199	10,319	271	400	9,425	13,344
July-04	218	248	7,344	8852.8	223.9	302.1	7,669	10,078	268	334	9,168	11,142
August-04	264.7	338.9	8,737	11588.4	226.6	298.6	7,521	10,210	270.3	346	8,943	11,831
September-04	205.4	251.3	6,839	8682.03	193.9	263.5	6,482	9,256	259.5	384	8,836	13,427
October-04	261.1	334.7	9,498	10903.2	205.5	268	7,273	9,080	255.4	300	9,076	11,649
November-04	267.4	320.3	12,908	15099.5	208.5	276.2	10,863	13,225	263.6	388	13,789	19,068
December-04	269.8	375	14,408	20255.9	185	221.3	10,239	13,183	215.9	360	12,231	21,446
January-05	228.6	257.4	11,254	13273.8	181.2	236.9	9,278	12,371	215.8	268	11,236	13,305
February-05	249.7	257.4	12,390	14426.7	215.6	305.9	10,665	14,260	259.8	388	12,851	18,087
March-05	338.8	641.4	17,399	38263.9	284.3	733.1	13,827	33,650	368.6	908	18,517	52,856
April-05	296.6	531.3	14,585	20236.1	196.3	324.2	9,937	13,538	275	798	13,947	30,394
May-05	262.4	305.4	9,313	10808.6	202	302.6	7,295	10,710	265.7	410	10,006	15,537
June-05	233.8	259.8	8,171	8677	182.3	237.6	6,527	8,641	261.8	435	9,429	15,425
July-05	214.2	221.2	6,850	7607.65	202.2	327	6,551	10,845	266	326	8,743	10,581
August-05	216.8	243	6,993	7999.27	190.1	233.5	6,144	7,570	260.6	420	8,406	13,241
September-05	251.5	282	7,814	8873.22	206.2	246.7	6,441	7,697	229	280	7,145	8,648
October-05	280.5	334	8,710	10136.4	208.1	259.7	6,500	8,066	254.5	428	7,933	12,989
November-05	268	360.2	13,317	16925.2	206.8	327.1	10,111	15,795	231.9	324	11,385	15,171
December-05	206.3	263.3	12,343	13861.6	167.6	229.6	9,666	11,250	177	220	10,166	13,465
January-06	220.7	255.1	13,685	15919.9	106	178.3	9,478	14,707	114.2	144	10,313	13,381
February-06	167.1	204.7	11,020	11301	137.7	190.9	9,080	10,819	152.8	204	9,874	11,874
March-06	216.3	231.1	11,796	12439.5	185.1	243.1	10,009	12,797	201.7	300	10,965	15,024
April-06	232.6	271.8	11,403	13327.5	197.1	255.7	9,682	12,621	215.8	250	10,613	12,564
May-06	255.2	321.8	8,560	10284.9	217.7	338.6	7,384	12,043	230.3	398	7,807	9,959
June-06	262.6	299.6	9,246	11976.6	207.6	232.6	712,414	9,702	213.3	242	7,300	8,792
July-06	256.6	326	8,487	10295.7	201.7	283	6,658	8,938	248.9	336	8,177	11,349
August-06	268.6	458.4	8,676	14255.4	206.8	283.7	6,627	9,336	237.3	312	7,604	10,341
September-06	217.3	307.4	7,138	10468.9	180.4	255.8	5,862	8,185	226.3	260	7,390	8,661
October-06	171.7	284.6	5,845	10372.5	142.3	245.5	4,755	8,820	245.6	440	8,079	13,787
November-06	129.7	232.1	8,504	17667.5	97	209.2	6,894	21,526	158.4	247	10,412	12,759
December-06	113.2	166.6	9,518	13126.5	105.1	185.8	8,970	21,829	158.1	276	13,074	25,377
January-07	133.4	223.4	8,514	12564.7	115.7	196	7,478	10,502	181.4	356	12,197	21,597
February-07	241.2	323	11,920	14250.9	194.1	308	9,401	13,988	222.5	338	10,752	14,913
March-07	209.3	256.4	11,412	15332.2	175.8	329.6	9,682	20,751	238.2	458	13,162	28,835
April-07	259.1	308.2	10,926	13203.1	184.3	222.5	7,835	9,379	212.9	270	9,085	11,834
May-07	235.6	309.7	7,875	10388.4	184.8	238.4	5,991	7,997	216.3	404	6,995	12,865
June-07	250	316.8	8,675	11388.3	191.4	254	6,484	9,131	220.4	262	7,449	8,798
July-07	231.2	288.4	7,762	9664.08	177.7	218.8	5,899	7,058	219.3	258	7,278	8,799
August-07	250.1	303.7	8,228	10096	202.2	303.6	6,680	10,093	236.1	412	7,749	13,696
September-07	220.6	285.5	7,063	9496.75	192.3	250.9	5,981	7,679	219.8	251	6,812	8,272
October-07	232.1	277.7	7,851	9580.21	187.4	253.2	6,181	8,168	190.7	249	6,328	7,865
November-07	217.7	289.7	10,058	13763.3	166.8	238	7,572	10,470	179.7	294	8,113	12,518
December-07	111.7	189.7	8,117	11989.1	78.4	150.2	5,712	9,493	125.7	220	8,864	13,187
January-08	105.6	181	7,113	12790	91.9	164.2	6,057	11,257	133.1	12	8,765	10,954
February-08	195.7	249.5	10,851	13789.2	155.3	192.7	8,434	10,681	161.7	180	8,809	10,097
March-08	195.7	249.5	10,851	13789.2	155.3	192.7	8,434	10,681	161.7	180	8,809	10,097
April-08	152.1	210.3	9,396	12545	116.5	175.6	6,915	10,142	147.8	200	8,793	11,931
May-08	173.4	283	6,419	10413.1	146	187	5,379	6,881	176.2	228	6,533	8,389
June-08	205.3	290.3	7,962	10947.3	156.2	232.9	6,064	8,398	175.5	248	6,864	9,560
July-08	235.5	309.1	5,278	10589	173.7	224.7	6,057	8,169	200.6	232	7,000	8,438
August-08	221.7	252.7	7,610	8483.54	171.2	210.9	5,872	7,235	190.6	204	6,534	7,701
September-08	214.9	272.1	7,324	9195.94	173.3	228.7	5,851	7,993	193.3	242	6,530	8,141
October-08	252.2	298.8	8,574	10355	228.5	270.8	7,657	9,003	202.2	302	6,768	9,983
November-08	241.4	267.7	12,819	14272.6	209.8	283.2	11,047	13,897	175.4	215	9,222	10,551
December-08	217.2	262.2	10,954	12933.8	183.9	261.6	9,106	12,065	171.6	236	8,636	11,337
January-09	167.6	224.3	9,756	12089.7	144.5	197.9	8,252	10,239	144.1	195	8,280	9,795
February-09	228.1	282.4	11,616	14764.4	184.3	252.4	9,280	13,196	173	220	8,709	10,822
March-09	214.5	278.2	12,179	15744.1	177.4	220.9	10,131	13,370	155.4	211	8,840	11,396
AVE:	222.7	287.7	9,653	12,731	181.3	256.2	19,352	11,477	214.1	312.5	9,458	13,648
MIN:	105.6	166.6	5,278	7,608	78.4	150.2	4,755	6,881	114.2	12.0	6,328	1,228
MAX:	338.8	641.4	17,399	38,264	284.3	733.1	712,414	33,650	368.6	908.0	18,517	52,856
Median	228.4	282.0	9,246	11,989	185.1	248.8	7,614	10,395	216.1	287.0	8,838	11,902
95th Percentile	269.7	375.0	13,685	18,081	226.5	327.1	11,037	20,586	270.2	439.8	13,757	25,293
LIMIT:			16,320								17,000	
DESIGN:			19,200								20,000	

approaching design limits (85%)

exceeds design limits

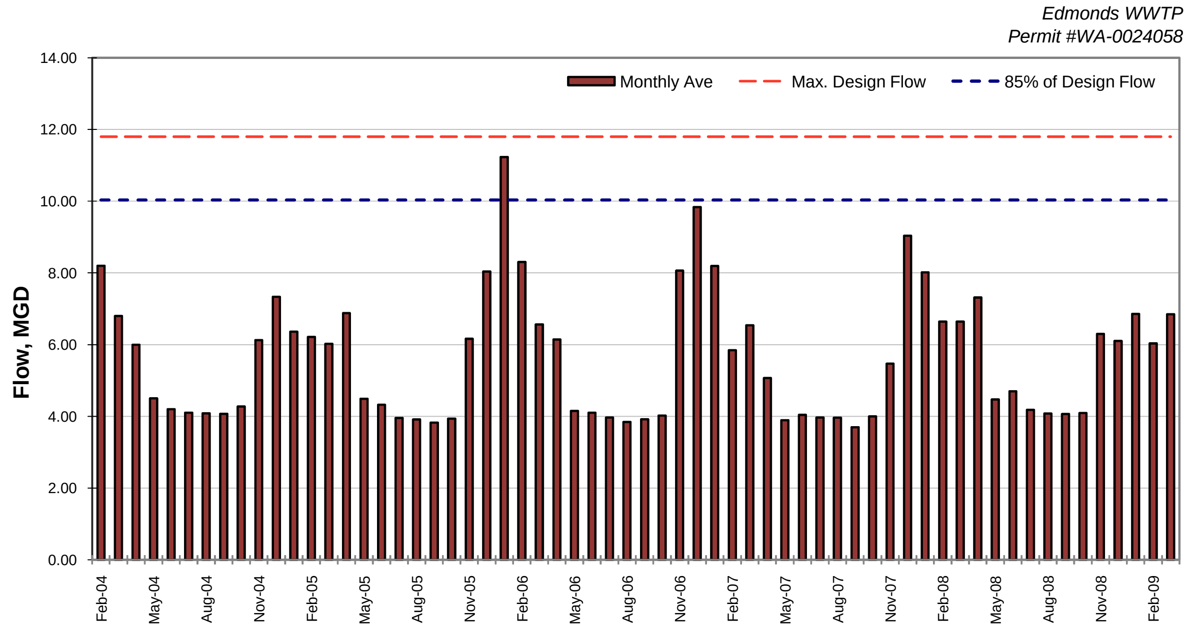
Discharge Monitoring Data, 2004-2009

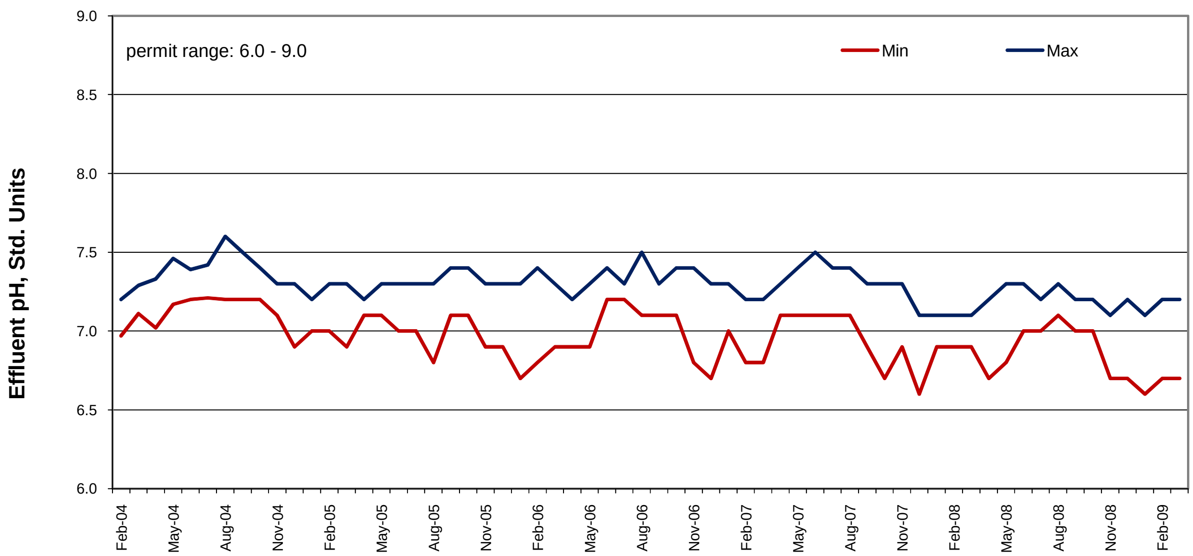
Facility: Edmonds WWTP
Permit No: WA-0024058

	Effluent																		
Date	Flow, MGD	Flow, MGD	CBOD, mg/L	CBOD, mg/L	CBOD, ppd	CBOD, ppd	CBOD, % Removal	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	TSS, % Removal	PH	PH	Fecal Coliform, #/100 ml	Fecal Coliform, #/100 ml	Chlorine, µg/L	Chlorine, µg/L	Chlorine, ppd
	Monthly Ave	Monthly Max	Monthly Ave	Wkly Ave	Monthly Ave	Wkly Ave	Ave	Monthly Ave	Wkly Ave	Monthly Ave	Wkly Ave	Ave	Min	Max	GEM	GM7	Monthly Ave	Daily Max	Monthly Ave
February-04	8.2		5.0	6.0	327	379	96.8	7.0	7.0	464	563	95.9	6.97	7.20	2	3	44	190	
March-04	6.8		5.0	7.0	310	366	97.3	6.0	7.0	366	403	97.3	7.11	7.29	10	218	96	500	5.4
April-04	6.0		5.0	6.0	240	282	97.7	7.0	10.0	348	492	97.1	7.02	7.33	9	14	82	360	4.2
May-04	4.5		8.0	11.0	308	417	96.2	9.0	11.0	355	482	96.2	7.17	7.46	31	177	75	380	2.7
June-04	4.2		8.0	13.0	283	462	96.6	14.0	17.0	470	587	96.1	7.20	7.39	55	336	118	555	4.1
July-04	4.1		8.0	10.0	258	350	96.6	9.0	10.0	309	341	96.3	7.21	7.42	66	239	151	500	5.2
August-04	4.1		5.4	6.0	177	189	97.6	9.4	11.6	321	372	96.4	7.20	7.60	47	255	68	190	2.3
September-04	4.1		4.5	5.3	152	184	97.6	7.8	8.9	265	314	96.7	7.20	7.50	15	64	144	450	4.9
October-04	4.3		5.1	5.3	184	208	97.5	6.7	7.3	241	273	97.4	7.20	7.40	11	29	131	490	4.6
November-04	6.1		7.4	8.8	393	426	96.3	9.7	10.7	504	564	95.8	7.10	7.30	55	170	61	220	3.0
December-04	7.3	12.0	6.5	13.4	360	746	96.5	11.0	21.4	695	1,337	93.8	6.90	7.30	38	49	63	110	3.8
January-05	6.4	8.1	3.8	4.5	196	236	97.9	6.4	6.9	339	424	96.8	7.00	7.20	17	42	65	160	3.5
February-05	6.2	7.8	6.8	9.5	337	447	96.7	9.2	14.2	465	678	96.2	7.00	7.30	98	185	49	110	2.6
March-05	6.0	9.1	8.7	12.7	419	586	96.7	12.6	17.3	620	803	95.6	6.90	7.30	115	272	53	250	2.7
April-05	6.9	9.1	4.2	5.0	221	329	97.7	7.6	10.0	438	596	96.8	7.10	7.20	72	142	53	140	3.0
May-05	4.5	5.4	3.4	4.3	124	175	98.3	5.5	7.1	208	267	98.1	7.10	7.30	62	82	63	200	2.4
June-05	4.3	5.2	4.8	5.4	172	188	97.3	5.7	6.9	203	246	97.8	7.00	7.30	24	270	57	170	2.1
July-05	4.0	4.2	7.1	7.9	230	257	96.5	10.3	14.0	337	462	96.2	7.00	7.30	63	146	57	140	1.9
August-05	3.9	4.1	10.6	12.8	342	423	94.4	20.2	26.1	663	862	91.3	6.80	7.30	35	105	92	260	3.0
September-05	3.8	4.2	8.8	13.1	275	404	95.7	8.9	11.9	286	380	96.3	7.10	7.40	32	110	95	260	3.0
October-05	3.9	4.7	7.0	9.8	219	303	96.6	8.5	8.9	281	290	96.7	7.10	7.40	15	32	142	515	4.6
November-05	6.2	8.5	8.8	14.5	431	693	95.5	10.7	13.3	549	668	94.8	6.90	7.30	39	201	90	500	4.6
December-05	8.0	14.4	7.3	8.2	475	803	95.2	13.2	14.9	888	1,526	91.9	6.90	7.30	51	121	78	320	5.2
January-06	11.2	19.9	6.1	8.4	547	736	94.0	10.7	13.4	969	1,171	90.9	6.70	7.30	47	136	104	450	8.7
February-06	8.3	13.7	4.8	5.2	322	548	96.5	7.5	8.2	505	829	94.4	6.80	7.40	7	220	94	320	5.8
March-06	6.6	7.6	7.8	9.9	427	586	95.6	11.7	15.4	646	798	93.7	6.90	7.30	23	58	149	430	8.1
April-06	6.1	6.9	6.9	9.8	340	489	96.4	12.1	15.1	624	774	94.7	6.90	7.20	11	45	125	360	6.4
May-06	4.2	6.0	8.5	11.2	287	283	96.0	9.7	10.9	336	374	95.4	6.90	7.30	26	33	153	450	5.2
June-06	4.1	5.0	8.9	9.8	307	346	95.6	11.4	12.1	390	425	95.0	7.20	7.40	27	391	161	550	5.5
July-06	4.0	4.2	6.9	10.1	229	343	96.5	8.3	9.7	273	324	96.5	7.20	7.30	36	196	187	550	6.2
August-06	3.8	4.0	14.6	19.1	465	605	93.1	16.2	24.3	520	778	92.8	7.10	7.50	76	358	81	210	2.6
September-06	3.9	4.2	8.3	10.9	270	352	95.1	14.1	15.8	460	517	93.7	7.10	7.30	35	59	115	310	3.7
October-06	4.0	5.5	10.0	12.0	332	401	92.5	19.7	26.0	666	948	92.2	7.10	7.40	61	275	91	300	3.1
November-06	8.1	12.3	7.0	14.2	452	621	92.0	12.3	21.4	813	907	92.3	6.80	7.40	59	97	79	390	4.6
December-06	9.8	17.7	5.3	6.5	456	745	94.1	8.6	10.0	720	1,120	92.5	6.70	7.30	23	65	122	490	9.6
January-07	8.2	11.2	5.0	6.8	349	527	94.7	11.3	18.9	821	1,512	93.3	7.00	7.30	15	24	93	315	6.7
February-07	5.8	6.7	7.6	10.0	370	528	96.0	10.8	14.5	521	767	94.9	6.80	7.20	41	111	68	200	3.4
March-07	6.5	7.5	7.4	7.8	411	447	95.7	11.1	13.0	608	729	94.9	6.80	7.20	111	173	72	170	3.9
April-07	5.1	5.8	8.4	11.5	356	467	95.2	13.3	14.5	567	631	93.8	7.10	7.30	68	117	132	360	5.4
May-07	3.9	4.5	10.1	15.3	324	480	94.5	14.8	21.5	482	702	92.9	7.10	7.40	16	91	166	960	5.4
June-07	4.0	4.4	15.9	33.3	547	1,170	91.7	15.6	24.8	528	850	93.0	7.10	7.50	9	17	61	290	2.1
July-07	4.0	4.4	8.2	9.0	273	301	95.3	11.4	15.5	378	507	95.0	7.10	7.40	30	109	39	160	1.3
August-07	4.0	4.7	8.2	9.2	273	313	95.8	10.7	12.7	351	427	95.4	7.10	7.40	27	90	34	90	1.1
September-07	3.7	4.9	11.0	12.5	349	391	94.0	18.3	20.6	566	644	91.3	6.90	7.30	20	25	68	320	2.1
October-07	4.0	4.5	8.1	13.0	269	454	95.9	10.5	17.5	345	608	94.5	6.70	7.30	29	125	38	140	1.3
November-07	5.5	6.6	9.2	11.5	417	504	94.1	12.1	15.8	561	753	92.8	6.90	7.30	71	103	85	340	3.8
December-07	9.0	23.8	5.9	6.7	424	484	92.3	7.3	10.0	559	770	94.0	6.60	7.10	55	81	90	200	6.6
January-08	8.0	10.1	5.6	7.5	382	567	92.8	7.8	10.2	528	765	94.1	6.90	7.10	23	78	95	160	6.3
February-08	6.6	8.7	6.3	9.0	351	539	95.8	25.0	40.0	2,460	3,936	85.0	6.90	7.10	40	65	76	240	4.2
March-08	6.6	8.7	6.9	9.0	351	539	95.8	7.6	10.5	420	624	95.1	6.90	7.10	40	65	76	240	4.2
April-08	7.3	9.2	7.1	10.7	418	671	93.7	5.2	7.7	309	465	96.5	6.70	7.20	30	63	109	310	6.6
May-08	4.5	5.7	6.7	12.0	244	416	95.3	7.0	9.1	259	320	95.8	6.80	7.30	13	41	124	230	4.6
June-08	4.7	7.0	10.1	19.4	382	702	93.8	8.5	12.7	329	460	95.1	7.00	7.30	38	82	98	265	3.8
July-08	4.2	4.7	8.6	15.1	300	521	95.1	9.6	12.9	336	444	95.2	7.00	7.30	104	208	109	275	3.8
August-08	4.1	4.8	8.6	9.9	296	350	94.8	25.0	40.0	355	438	85.0	7.10	7.30	113	152	117	250	4.0
September-08	4.1	4.4	9.4	10.0	318	341	94.3	10.5	10.9	357	370	94.5	7.00	7.20	90	158	97	180	3.3
October-08	4.1	5.2	11.9	14.0	397	471	94.8	11.2	13.4	375	451	94.5	7.00	7.20	97	139	97	210	3.3
November-08	6.3	8.5	14.6	18.2	781	1,068	92.9	16.6	19.3	870	1,104	90.4	6.70	7.10	77	159	76	250	3.9
December-08	6.1	4.7	9.3	13.1	464	627	94.9	12.3	18.2	613	886	93.2	6.70	7.20	63	178	71	180	3.6
January-09	6.9	9.6	6.2	7.4	358	379	95.6	9.0	9.4	524	538	93.5	6.60	7.10	27	55	74	160	4.2
February-09	6.0	6.4	18.6	23.9	940	1,208	89.9	26.8	32.7	1,350	1,604	83.6	6.70	7.20	93	199	106	250	5.3
March-09	6.8	9.5	17.1	23.7	974	1,315	90.4	19.6	33.0	1,091	1,853	87.6	6.70	7.20	21	42	98	240	5.5
AVE:	5.6	7.7	8.0	10.9	358	495	95.3	11.4	15.1	532	727	94.1	6.96	7.30	44	128	93	303	4.2
MIN:	3.7	4.0	3.4	4.3	124	175	89.9	5.2	6.9	203	246	83.6	6.60	7.10	2	3	34	90	1.1
MAX:	11.2	23.8	18.6	33.3	974	1,315	98.3	26.8	40.0	2,460	3,936	98.1	7.21	7.60	115	391	187	960	9.6
Median	5.3	6.5	7.5	10.0	338	451	95.6	10.6	13.2	468	602	94.9	7.00	7.30	37	110	91	260	4.0
95th Percentile	8.3	15.9	14.6	19.4	547	1,055	97.7	20.2	32.4	965	1,525	97.3	7.20	7.50	104	275	153	357	6.7
LIMIT:	10.0		25	40	2,460	3,936	85	30	45	2,952	4,430	85	6.0	9.0	200	400	228	598	22.4
DESIGN:	11.8																		

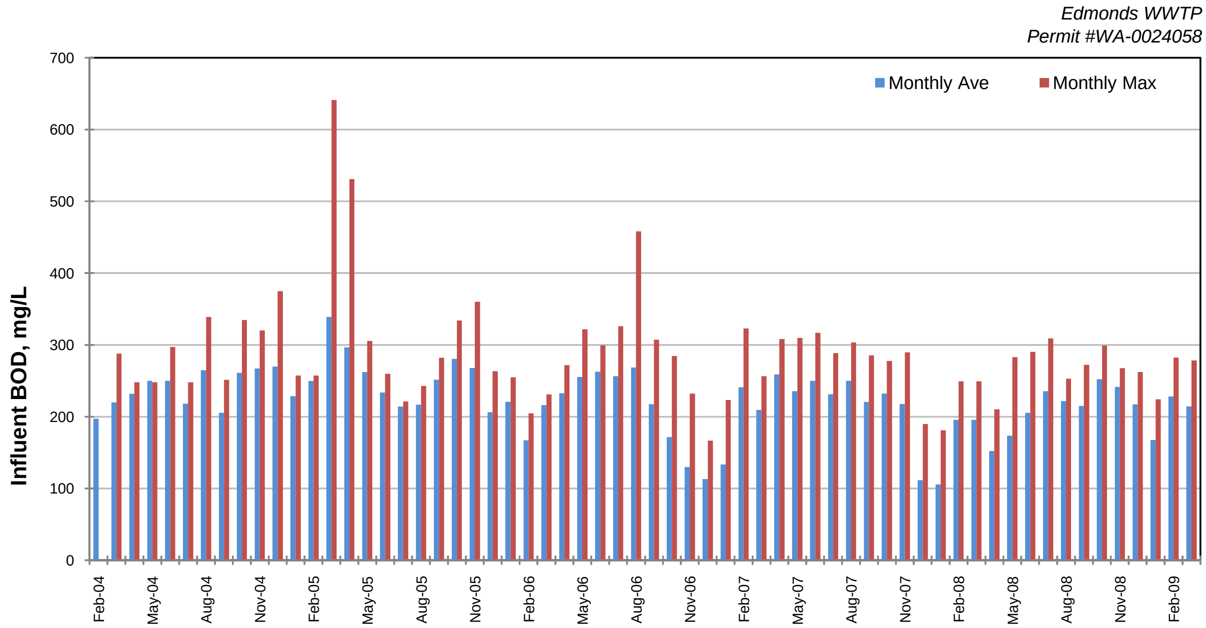
exceeds permit limits

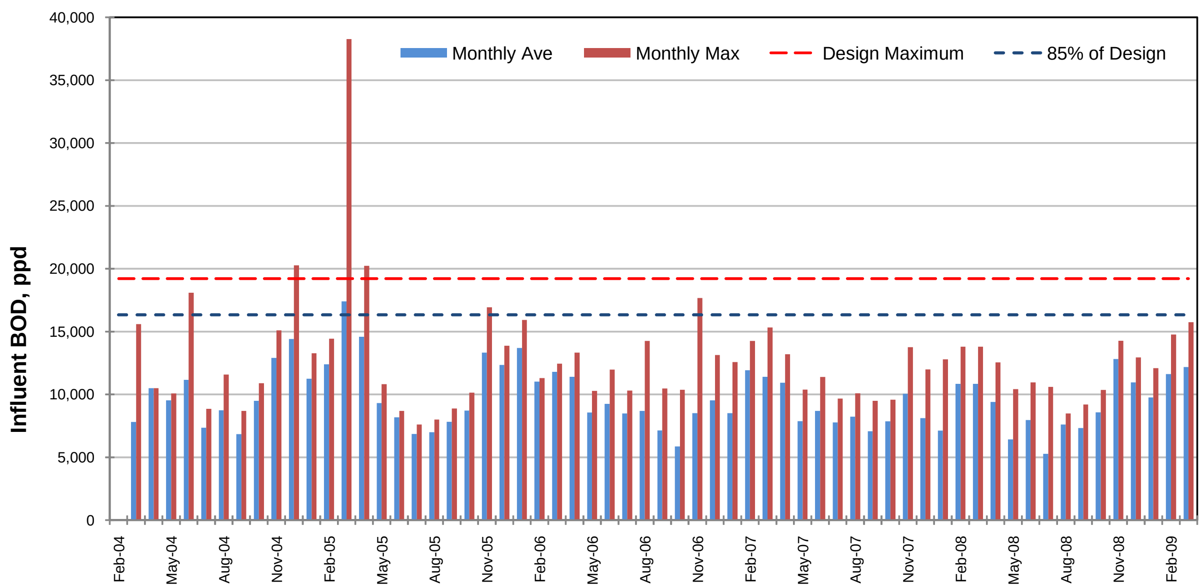
Discharge Monitoring Data, Flow and Effluent pH, 2004-2009



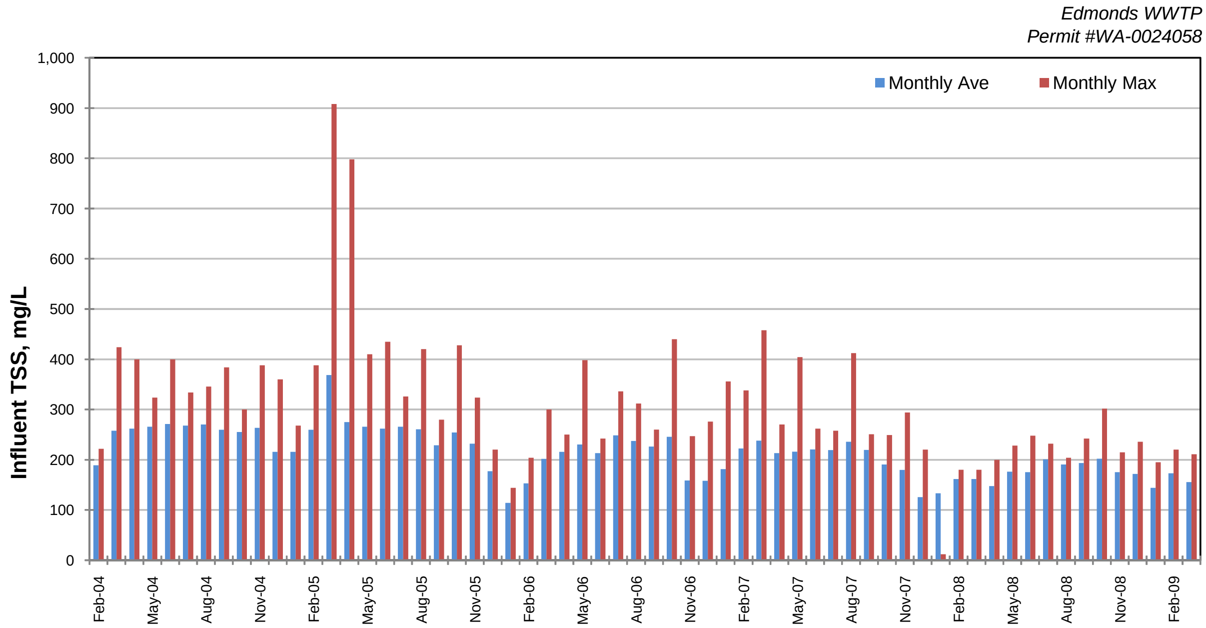


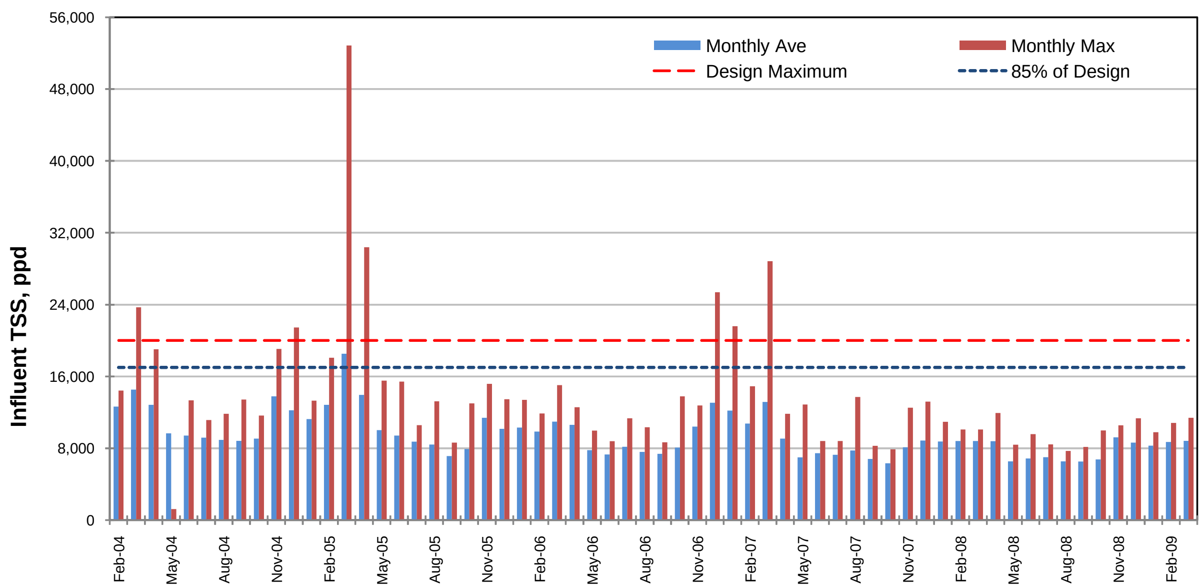
Discharge Monitoring Data, Influent BOD, 2004-2009



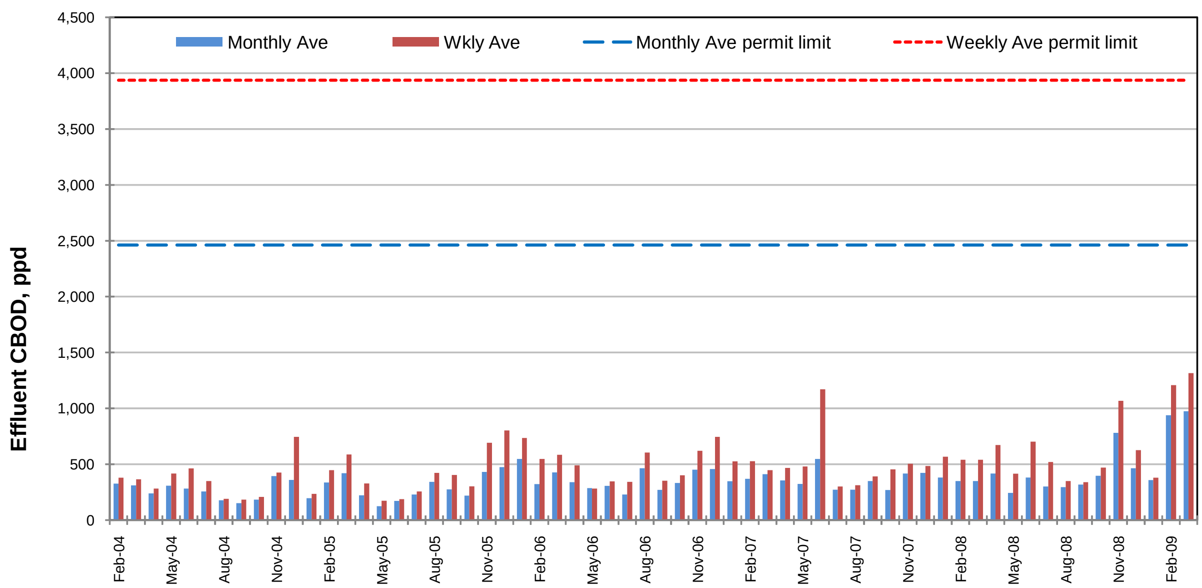


Discharge Monitoring Data, Influent TSS, 2004-2009

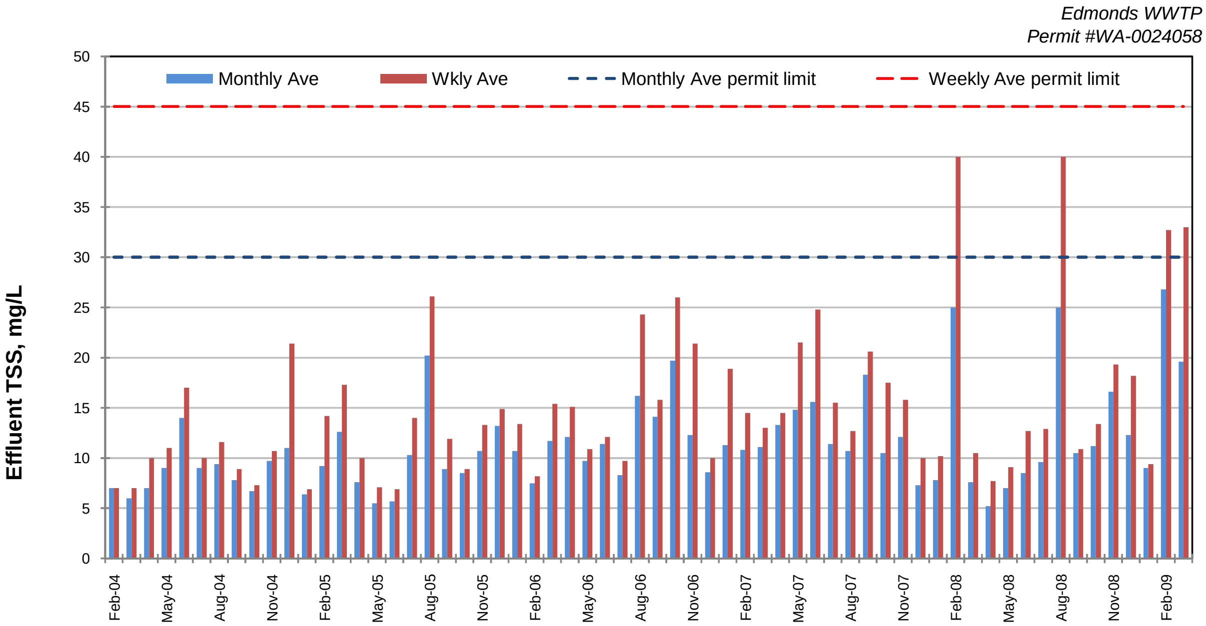


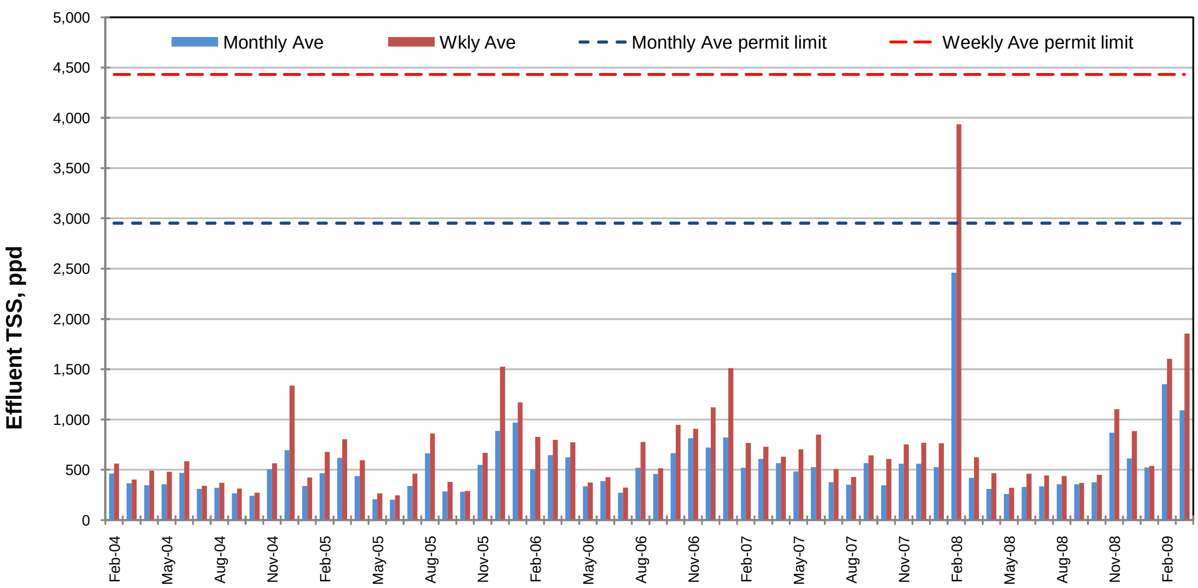


Discharge Monitoring Data, Effluent CBOD, 2004-2009

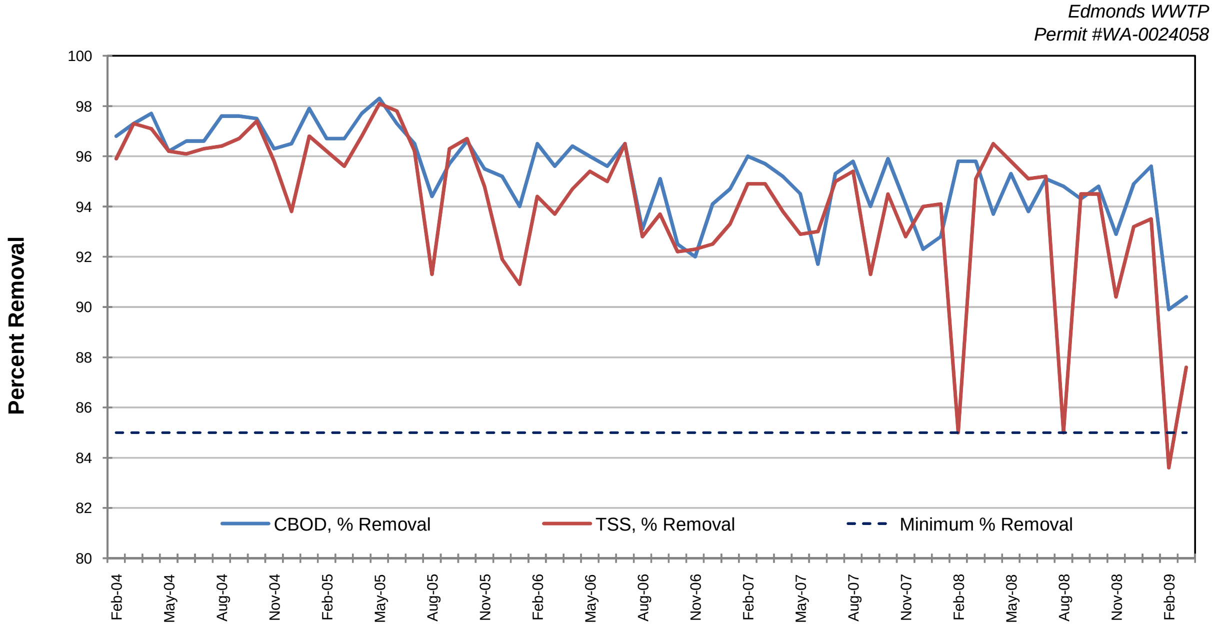


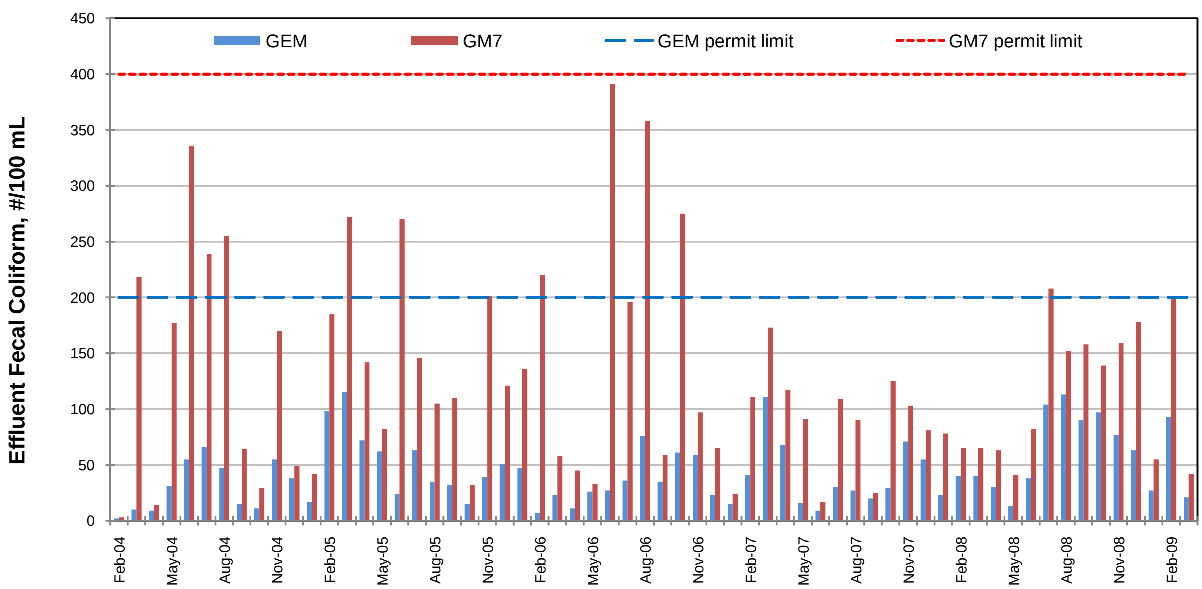
Discharge Monitoring Data, Effluent TSS, 2004-2009



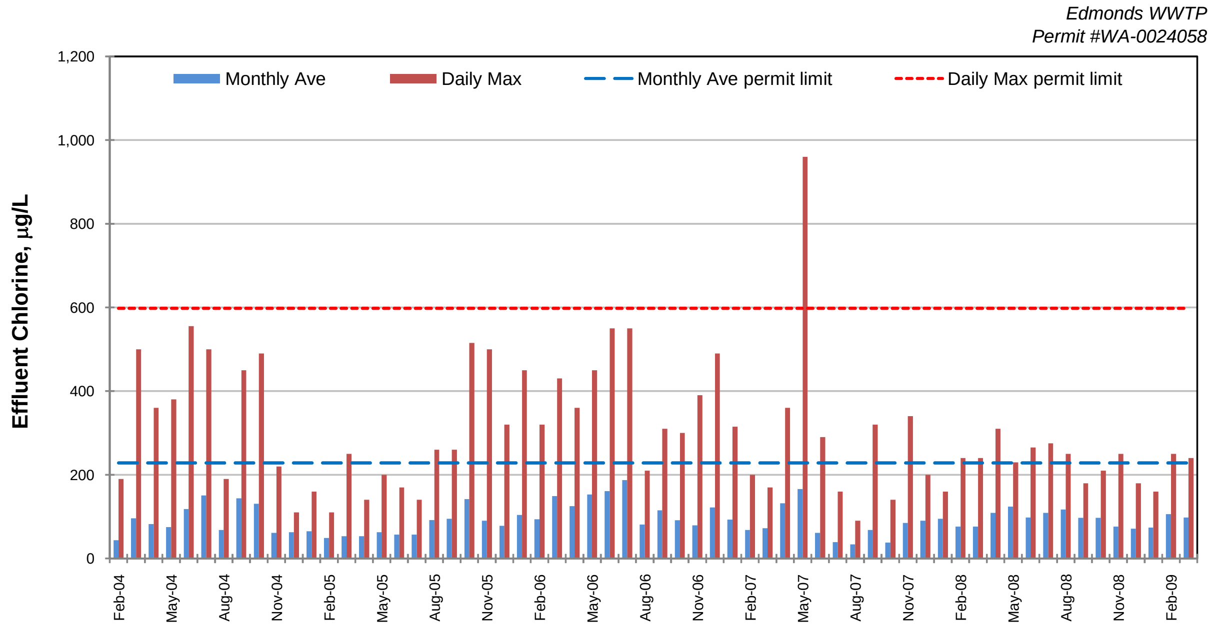


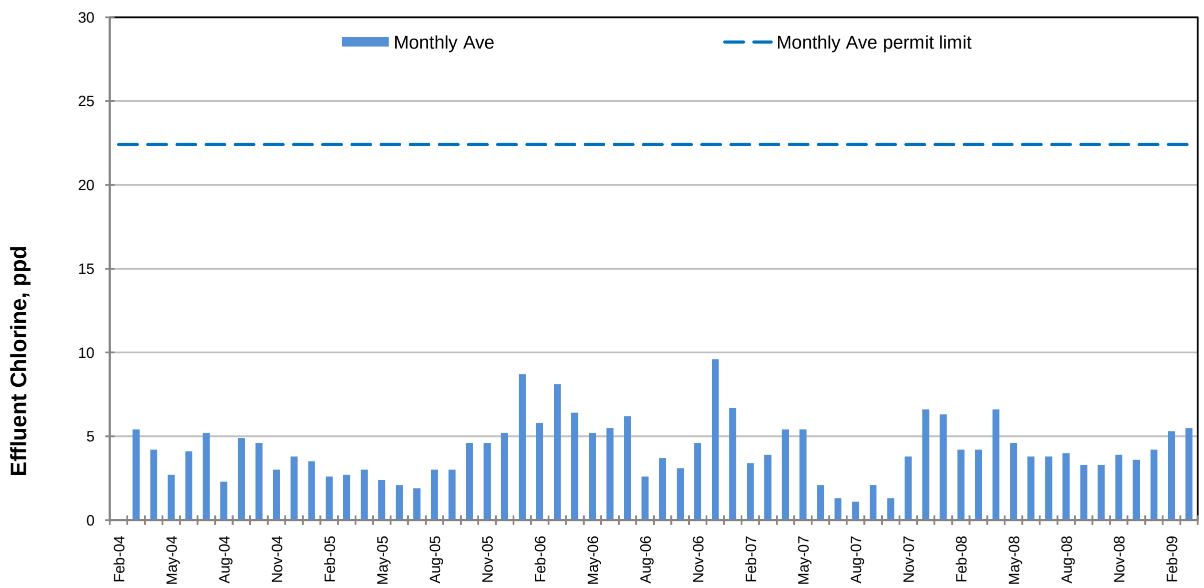
Discharge Monitoring Data, CBOD/TSS % Removal and Effluent Fecal Coliform, 2004-2009





Discharge Monitoring Data, Effluent Residual Chlorine, 2004-2009



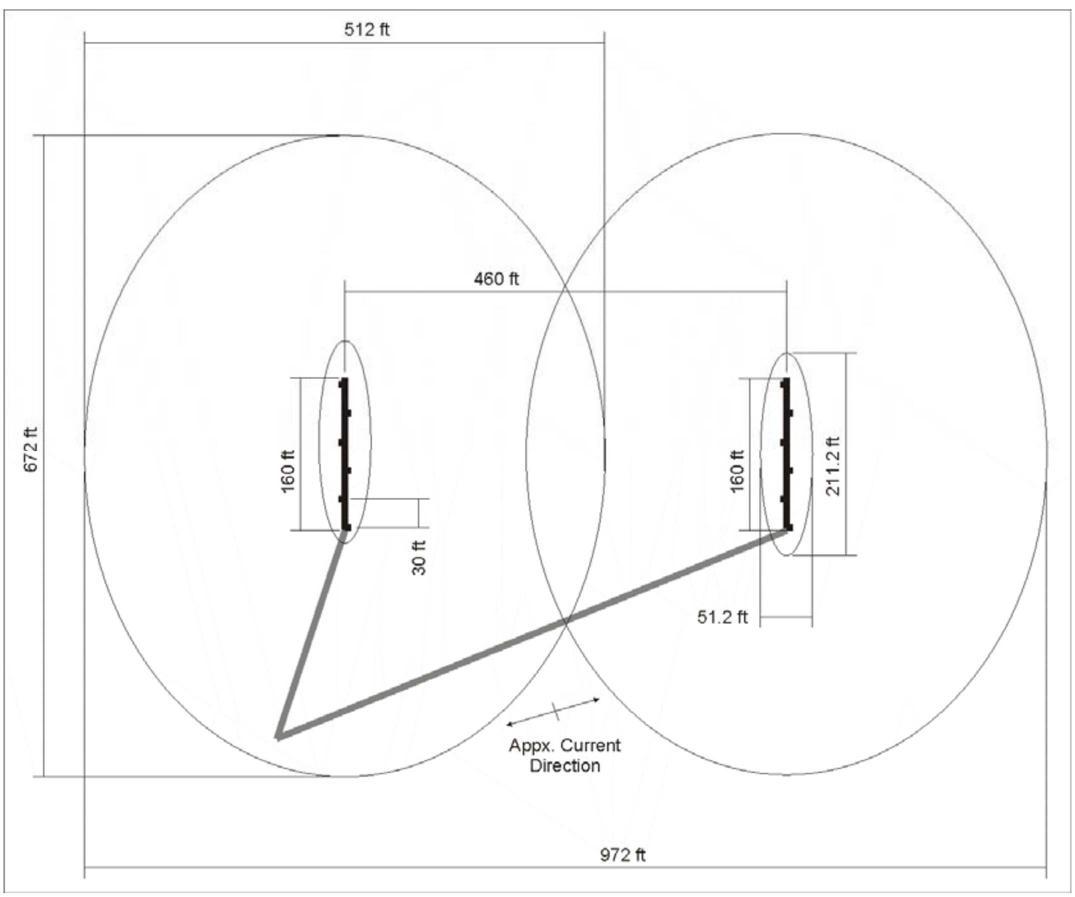


APPENDIX E—MIXING ZONE ANALYSIS

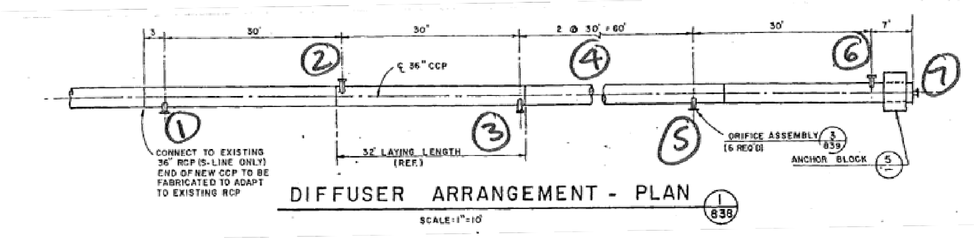
The City of Edmonds Wastewater Treatment Plant has a complex outfall configuration that does not lend itself to straightforward modeling. The previous NPDES permit treated the outfall as two separate discharge outfalls that were equipped with 7-port diffusers. However, this analysis may have oversimplified the mixing analysis and allowed for more mixing than actually occurs. Ecology reassessed the dilution provided by the diffusers using current 3-dimensional modeling software and determined that mixing is lower than what it allowed in the previous permit. Ecology used the 3-Dimensional Updated Merged Computational Method in EPA's Visual Plumes software package to model the discharge.

Outfall Description:

The Edmonds Wastewater Treatment Plant discharges secondary treated effluent through a single line that runs from the treatment plant to Puget Sound, terminating in the region between the Port of Edmonds Marina and the Washington State Ferry dock. At the beach, the main effluent line is split into two lines running to two independent diffusers. Although each line includes isolation valves that allow Edmonds to direct all of the plant flow to one diffuser line at any given time, the city routinely uses both diffuser lines simultaneously. Edmonds only closes the isolation valves to perform maintenance on a line or to perform annual operational testing of the valves. As such, Ecology modeled the diffusers assuming continuous simultaneous operation. The following drawing illustrates the configuration of the Edmonds outfall.



Each diffuser is 160 feet long and is equipped with seven diffuser ports. The first six diffuser ports are spaced 30 feet apart and discharge in alternating directions. The seventh port is located 7 feet away from the sixth port, on the diffuser's end cap, and discharges in a direction parallel to the diffuser line. The following illustration shows the port configuration of each diffuser line.



The diffusers are laid parallel to each other at an approximate bearing of 285° (WNW), separated by a distance of 460 feet. They are laid at a considerable slope along the sea floor such that there is more than a 10-foot difference in elevation between ports at opposite ends of each diffuser. The North Diffuser (closest to the ferry dock) terminates at a depth of approximately 65 feet (MLLW) at the following coordinates: Latitude 47° 48' 47" N, Longitude 122° 23' 25" W. The South Diffuser (closest to the marina) terminates at an approximate depth of 73 feet (MLLW) at the following coordinates: Latitude 47° 48' 42" N, Longitude 122° 23' 27" W.

The following table identifies the approximate depth (at MLLW) and discharge direction of each port on the two diffuser lines. Port numbering starts at the end of the diffuser closest to shore and ends at the diffuser terminus. Discharge directions are based on the port's offset from true north. Each port is 5 inches in diameter, discharges horizontally, and sets 36 inches off of the sea floor.

North Line			South Line		
Port Number	**Discharge Direction (Degrees)**	**Port Depth (ft, MLLW)**	**Port Number**	**Discharge Direction (Degrees)**	**Port Depth (ft, MLLW)**
N1	15	56	S1	15	60
N2	195	58	S2	195	61
N3	15	59	S3	15	63
N4	195	61	S4	195	65
N5	15	63	S5	15	68
N6	195	64	S6	195	70
N7	285	65	S7	285	73

<u>Ambient Variables:</u>

Ecology's long-term monitoring station located at the south end of Admiralty Inlet (Station ADM 003) provides ambient data for Puget Sound in the region near the city of Edmonds. Mixing zone analyses must consider the mixing available when the ambient water column has the greatest density and temperature stratification as well as when the water column has the least density and temperature stratification. Ecology used historic monthly data from the South Admiralty Inlet station for the period between 1990 and 2008 to determine when the highest and lowest stratification would likely occur. The analysis compared average salinity (used as a proxy for density) for each month in the period of record and the 90th percentile temperature for each month at 5-meter intervals to a depth of 25 meters. The data indicates that the highest variability (greatest stratification) occurs during the month of June; the least stratification occurs during December. The average salinity and 90th percentile temperature profiles for June and December are shown in the following table.

	June		December	
Depth (meters)	**Average Salinity (psu)**	**90th Percentile Temperature (Deg. C)**	**Average Salinity (psu)**	**90th Percentile Temperature (Deg. C)**
1	25.70	14.269	28.77	9.77
5	27.48	13.32	29.27	10.072
10	29.07	11.78	29.61	10.352
15	29.27	11.407	29.77	10.414
20	29.37	11.344	29.88	10.508
25	29.44	12.652	29.96	10.512
Variability	*1.1978*	*0.9517*	*0.3499*	*0.2336*

Ecology's mixing zone guidance requires evaluating mixing at a variety of current profiles. Acute mixing must consider the 90th and 10th percentile current velocities in both the ebb and flood directions. Chronic mixing must consider the median velocity in both directions. Estimated current directions and velocities used for evaluating the Edmonds outfall are based on NOAA tide and current prediction tables for a location 2.7 miles WSW of Edmonds. Based on predictions for June and December 2009, critical currents are as follows:

	Flood Current: 170°		Ebb Current: 000°	
Predicted Velocity (knots)	**June**	**December**	**June**	**December**
Median Velocity	0.10	0.10	0.50	0.50
10th percentile velocity	0.02	0.03	0.28	0.27
90th percentile velocity	0.30	0.30	0.70	0.80

Effluent Variables

Mixing is primarily influenced by three effluent characteristics: flow rate, effluent temperature, and effluent salinity. Ecology assumes a typical domestic wastewater salinity of 0.5 psu for the City of Edmonds' effluent. The city reported a maximum summer effluent temperature of 22.5°C and a maximum winter temperature of 18.6°C in their NPDES permit application. Using Ecology's guidance for facilities operating at less than 85% of design capacity, Ecology evaluated chronic mixing based on the highest maximum monthly average flow over the last three years for the two seasons evaluated. Similarly, Ecology evaluated acute mixing based on the seasonal maximum daily flows reported over the last three years. Flow values used were:

Season	Chronic Flow	Acute Flow
Summer Critical (June)	4.7 MGD	7.0 MGD
Winter Critical (December)	9.8 MGD	17.7 MGD

Mixing Analysis

Ecology used the 3-Dimensional UM3 (Updated Merge) Model in EPA's Visual Plumes to evaluate mixing of the Edmonds' effluent with the receiving water. The first step in the analysis evaluated whether individual plumes from each port had the potential to merge with other nearby plumes within either the authorized acute or chronic zones. Modeling predicted that the diameter of each plume would be much less than 30 feet at the acute boundary, indicating that there was little potential for merging within the acute region. Although the plume diameters within the chronic zone indicate that the individual plume sizes are large enough to overlap with adjoining ports, the alternating discharge direction mitigates the potential for plume merging. The centerline trajectories of each individual plume, in conjunction with estimated plume diameters, indicate a low potential for plumes to merge in the chronic zone. Therefore, Ecology modeled the outfall as a series of independent, single-port diffusers.

The following table shows the predicted dilution for each diffuser port under various ambient conditions. The results presented in the table indicate that the worst-case mixing for the chronic mixing zone will occur when the water column has the highest degree of stratification, during the summer months, and at the slower flood tides. Worst case acute mixing occurs during winter months when the water column has the least stratification and during the slower velocity periods of flood tides. Furthermore, the North Diffuser line is predicted to provide slightly less dilution than the South Diffuser line. Based on this analysis, Ecology proposes to grant a mixing zone for Edmonds' Wastewater Treatment Plant outfalls as follows:

- Acute dilution factor: 34
- Acute zone size: Zone will consist of multiple circular regions, each with a radius of 25.6 feet from any port on either diffuser line.
- Chronic dilution factor: 225
- Chronic zone size: Zone will consist of two overlapping elliptical regions that measure 256 feet in any direction from either diffuser line.

North Line

			June						December					
			Acute Ebb Tide		Acute Flood Tide		Chronic Condition		Ebb Tide		Flood Tide		Chronic Condition	
	Discharge Direction	Port Depth	10th Percentile Velocity	90th Percentile Velocity	10th Percentile Velocity	90th Percentile Velocity	Ebb Tide, Median Velocity	Flood Tide, Median Velocity	10th Percentile Velocity	90th Percentile Velocity	10th Percentile Velocity	90th Percentile Velocity	Ebb Tide, Median Velocity	Flood Tide, Median Velocity
Port Number	(Degrees)	(ft, MLLW)	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution
N1	15	56	107	***73***	77	287	737	227	43	46	38	316	854	279
N2	195	58	318	150	81	120	758	***225***	377	188	***34***	52	846	***267***
N3	15	59	109	75	84	293	819	253	44	47	38	323	876	297
N4	195	61	324	151	88	123	841	252	386	196	34	53	869	282
N5	15	63	113	76	95	305	965	293	45	48	40	330	926	316
N6	195	64	331	154	95	125	950	283	387	200	35	54	903	296
N7	285	65	197	120	106	245	1186	349	111	111	42	192	1095	339

South Line

			June						December					
			Ebb Tide		Flood Tide		Chronic Condition		Ebb Tide		Flood Tide		Chronic Condition	
	Discharge Direction	Port Depth	10th Percentile Velocity	90th Percentile Velocity	10th Percentile Velocity	90th Percentile Velocity	Ebb Tide, Median Velocity	Flood Tide, Median Velocity	10th Percentile Velocity	90th Percentile Velocity	10th Percentile Velocity	90th Percentile Velocity	Ebb Tide, Median Velocity	Flood Tide, Median Velocity
Port Number	(Degrees)	(ft, MLLW)	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution	Dilution
S1	15	60	111	***81***	87	298	852	262	44	47	39	324	889	302
S2	195	61	324	170	88	123	841	***252***	386	196	***34***	53	869	***282***
S3	15	63	113	82	95	305	965	293	45	48	40	330	926	316
S4	195	65	331	173	97	125	996	294	388	202	36	54	917	300
S5	15	68	118	86	109	312	1184	353	46	49	41	337	1007	338
S6	195	70	348	181	111	130	1226	357	396	210	37	57	996	320
S7	285	73	213	138	132	265	1724	442	118	116	46	203	1239	378

APPENDIX F—TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on Ecology's homepage at http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html.

Ammonia Criteria

The spreadsheet nh3salt2.xls calculates water quality criteria for ammonia in saltwater using the method specified in EPA 440/5-88-004 [Ambient Water Quality Criteria for Ammonia (Saltwater)-1989].

Calculation of seawater fraction of un-ionized ammonia from Hampson (1977). Un-ionized ammonia criteria for salt water are from WAC 173-201A and EPA 440/5-88-004.

INPUT	
1. Temperature (deg C):	12.5
2. pH:	8.3
3. Salinity (g/Kg):	28.4

OUTPUT	
1. Unionized ammonia NH3 criteria (mgNH3/L)	
Acute:	0.233
Chronic:	0.035
2. Total ammonia nitrogen criteria (mgN/L)	
Acute:	5.280
Chronic:	0.793

pH Analysis

The spreadsheet phmix3 calculates the pH of a saltwater mixture of two sources from temperature, pH, alkalinity, and salinity. Ecology evaluates the water quality impact of pH at the edge of the chronic mixing zone for both the minimum and maximum limits in the proposed permit.

pH = 6.0 Standard Units

Calculation of pH of a mixture in seawater.
Based on the CO2SYS program (Lewis and Wallace, 1998)
http://cdiac.esd.ornl.gov/oceans/co2rprt.html

INPUT

1. MIXING ZONE BOUNDARY CHARACTERISTICS	
Dilution factor at mixing zone boundary	225.000
Depth at plume trapping level (m)	9.559
2. BACKGROUND RECEIVING WATER CHARACTERISTICS	
Temperature (deg C):	12.50
pH:	8.30
Salinity (psu):	28.40
Total alkalinity (meq/L)	2.02
3. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	22.50
pH:	6.00
Salinity (psu)	0.50
Total alkalinity (meq/L):	2.46
4. CLICK THE 'calculate" BUTTON TO UPDATE OUTPUT RESULTS >>>	calculate

OUTPUT

CONDITIONS AT THE MIXING ZONE BOUNDARY	
Temperature (deg C):	12.54
Salinity (psu)	28.28
Density (kg/m^3)	1021.32
Alkalinity (mmol/kg-SW):	1.98
Total Inorganic Carbon (mmol/kg-SW):	1.73
pH at Mixing Zone Boundary:	8.27

pH = 9.0 Standard Units

Calculation of pH of a mixture in seawater.
Based on the CO2SYS program (Lewis and Wallace, 1998)
http://cdiac.esd.ornl.gov/oceans/co2rprt.html

INPUT

1. MIXING ZONE BOUNDARY CHARACTERISTICS	
Dilution factor at mixing zone boundary	225.000
Depth at plume trapping level (m)	9.559
2. BACKGROUND RECEIVING WATER CHARACTERISTICS	
Temperature (deg C):	12.50
pH:	8.30
Salinity (psu):	28.40
Total alkalinity (meq/L)	2.02
3. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	22.50
pH:	9.00
Salinity (psu)	0.50
Total alkalinity (meq/L):	2.46

4. CLICK THE 'calculate" BUTTON TO UPDATE OUTPUT RESULTS >>> calculate

OUTPUT

CONDITIONS AT THE MIXING ZONE BOUNDARY	
Temperature (deg C):	12.54
Salinity (psu)	28.28
Density (kg/m^3)	1021.32
Alkalinity (mmol/kg-SW):	1.98
Total Inorganic Carbon (mmol/kg-SW):	1.72
pH at Mixing Zone Boundary:	8.30

Reasonable Potential Analysis

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

Calculation of Water Quality-Based Effluent Limits

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

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

   WLA_a = (acute criteria x acute zone dilution factor) - (bkgrnd conc.x (acute zone dilution factor - 1))

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

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

   $LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$ where: $\sigma^2 = \ln[CV^2 + 1]$
   $z = 2.326$
   CV = coefficient of variation = std. dev./mean

   $LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$ where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$
   $z = 2.326$

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

   Maximum Daily Limit = MDL

   $$MDL = LTAx\, e^{(Z\sigma - 0.5\sigma^2)}$$

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

   Average Monthly Limit = AML

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

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

REASPOT.XLS

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	State Water Quality Standard Acute ug/L	State Water Quality Standard Chronic ug/L	Max concentration at edge of... Acute Mixing Zone ug/L	Max concentration at edge of... Chronic Mixing Zone ug/L	LIMIT REQ'D?
AMMONIA unionized -see seperate spreadsheets for FW criter			34.0000	5280.00	793.00	2468.11	401.82	NO
CHLORINE (Total Residual) 7782505				13.00	7.50	10.50	1.59	NO
COPPER - 744058 6M Hardness dependent	0.83	0.83	0.4060	4.80	3.10	1.47	0.57	NO
ZINC- 7440666 13M hardness dependent	0.95	0.95	1.1350	90.00	81.00	4.98	1.72	NO

CALCULATIONS

Parameter	Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
AMMONIA unionized -see seperate spreadsheets for FW criter	0.95	0.368	27600.00	0.60	0.55	3	3.00	34	225	
CHLORINE (Total Residual) 7782505	0.95	0.998	357.00	0.50	0.47	1860	1.00	34	225	Effluent concentration listed is 95th percentile value calculated from DRM data
COPPER - 744058 6M Hardness dependent	0.95	0.549	19.00	0.60	0.55	5	2.32	34	225	
ZINC- 7440666 13M hardness dependent	0.95	0.549	60.00	0.60	0.55	5	2.32	34	225	

LIMIT.XLS

Permit Limit Calculation Summary

PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator or Acute	Metal Criteria Translator or Chronic	Ambient Concentration ug/L	Water Quality Standard Acute ug/L	Water Quality Standard Chronic ug/L	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments
CHLORINE (Total Residua	34.0	225.0				13.00	7.50	**191**	**442**	

Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations / Statistical variables for permit limit calculation

PARAMETER	WLA Acute ug/L	WLA Chronic ug/L	LTA Acute ug/L	LTA Chronic ug/L	LTA Coeff. Var. (CV) decimal	LTA Prob'y Basis decimal	Limiting LTA ug/L	Coeff. Var. (CV) decimal	AML Prob'y Basis decimal	MDL Prob'y Basis decimal	# of Samples per Month n	
CHLORINE (Total Residua	442	1687.50	164.7	981.0	0.50	0.99	164.7	0.50	0.95	0.99	30.00	1.00

HUMAN-H.XLS

Revised 3/00

Parameter	Ambient Concentration (Geometric Mean) ug/L	Water Quality Criteria for Protection of Human Health ug/L	Max concentration at edge of chronic mixing zone. ug/L	LIMIT REQ'D?	Expected Number of Compliance Samples per Month	AVERAGE MONTHLY EFFLUENT LIMIT ug/L	MAXIMUM DAILY EFFLUENT LIMIT ug/L
CHLOROFORM 67663 11V		470.00	0.01	NO	3	NONE	NONE
METHYLENE CHLORIDE 75092 22V		1600.00	0.01	NO	3	NONE	NONE
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B		5.90	0.01	NO	3	NONE	NONE

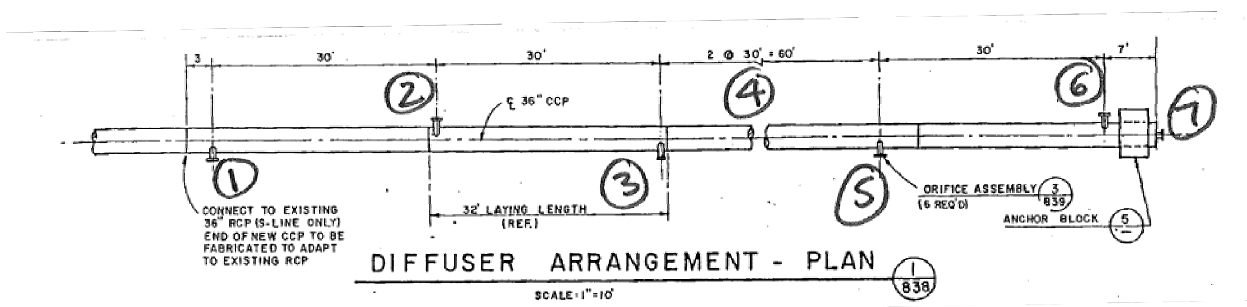
Parameter	Estimated Percentile at 95% Confidence	Pn	Max effluent conc. measured ug/L	Coeff Variation CV	S	# of samples from which # in col. K was taken n	Multiplier	Calculated 50th percentile Effluent Conc. (When n>10)	Dilution Factor
CHLOROFORM 67663 11V	0.50	0.55	2.50	0.60	0.6	5	0.93		225.0
METHYLENE CHLORIDE 75092 22V	0.50	0.55	2.60	0.60	0.6	5	0.93		225.0
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	0.50	0.55	1.90	0.60	0.6	5	0.93		225.0

APPENDIX G—RESPONSE TO COMMENTS

Ecology received the following comments from the City of Edmonds during the public comment period.

Comment 1

Outfall Diffuser: Ecology used an incorrect number of ports for the diffusers. Each diffuser includes a port on the terminus that is also five inches in diameter, which we suspect you were not aware of. Therefore, each diffuser has seven ports, not six as used in the dilution modeling. As-built drawings are attached [relevant image shown below]. The dilution modeling, the fact sheet and the Permit section should all be updated to reflect this configuration. We were not able to exactly replicate Ecology's UM3 model runs, but we believe that the revised acute and chronic dilution factors would be approximately 34 and 230, respectively. We request that Ecology revise the dilution factors cited in the NPDES permit section S1.B accordingly, as well as the RPA spreadsheet described above.



Response:

Ecology appreciates the clarification of the outfall design and has revised the dilution modeling with seven ports per diffuser. Dilution factors cited in the fact sheet and permit, as well as all calculations that rely on dilution, have been corrected based on the revised modeling.

Comment 2

Receiving Water Study: The City of Edmonds requests the Department to waive the requirement of collecting new water information in Section S8. The City of Edmonds believes the receiving water sampling required in the permit condition is unnecessary and that it be removed in its entirety. King County conducted a comprehensive ambient water column sampling program in 1999-2000 for metals and other water quality parameters. There were two sampling stations, located near Point Wells and Picnic Point, which bracket the Edmonds outfall and provide relevant ambient data for Ecology to determine if the effluent has a reasonable potential to cause a violation of water quality standards. We have requested Mr. Scott Mickelson of King County DNR to forward you station maps, metals data, and the QAPP for their study. Edmonds requests the Department to recognize that data in lieu of Edmonds duplicating this expensive procedure.

Response:

Ecology received the metals testing data and project quality assurance plan from Mr. Mickelson. After reviewing the data, Ecology believes that data from the Point Wells monitoring location (latitude: 47° 47' 06", longitude: 122° 24' 24") is the most representative of ambient conditions near the Edmonds' outfall due to its proximity to Edmonds and likelihood to be exposed to similar upland influences and current profiles. Ecology revised the reasonable potential analysis to use the following ambient concentrations of copper and zinc: 0.406 µg/L for copper and 1.135 µg/L for zinc. Both values represent the 90th percentile value of all samples taken throughout the water column at the Point Wells sampling location. The analysis still does not indicate that the discharge has a reasonable potential to exceed water quality standard even with the increased ambient concentrations.

The reasonable potential analysis predicts that concentrations of both copper and zinc at the edges of the mixing zones will be significantly lower that the applicable water quality standards even when using the ambient concentrations identified above. Ecology believes that it is unlikely that the reasonable potential analysis would change if additional ambient monitoring were conducted. Therefore, Ecology has removed the ambient monitoring requirement originally included in Condition S8 and has renumbered remaining conditions accordingly.

Comment 3

Reasonable Potential Analysis: We have updated the reasonable potential analysis (RPA) for copper and zinc from the last page in Appendix F – Technical Calculations in the draft fact sheet. Making no other changes, we inserted critical 90th percentile ambient values from the King County ambient sampling at 5m depth. The revised spreadsheet is enclosed with these comments [table omitted from fact sheet, however it will be made available upon public request]. The results confirm that there is no reasonable potential to cause a violation of water quality standards. We request that this RPA spreadsheet be updated in the final fact sheet for the permit.

Response:

Ecology has revised the reasonable potential analysis based on changes resulting from the two previous comments. This revised analysis is presented in Appendix F of the final fact sheet.

Comment 4

Current Speed Statistics: We believe that the current speed statistics used in the mixing zone modeling, 3 miles from the outfall, may not be representative of the actual discharge site. We do recognize that Ecology used the best available data. Thus, we request an opportunity to obtain site specific data that could further revise the mixing zone dilution factors cited in the NPDES permit. In addition, the City of Edmonds is considering evaluating outfall system hydraulics, including head losses and effluent pumping. Specifically, the City may consider enlarging the effluent diffuser ports to reduce head losses and allow for more frequent gravity flow, which would save energy costs. We request that Ecology allow the City to conduct a comprehensive *outfall evaluation during the term of the NPDES permit. The evaluation may include (a) measurement of site specific current speed, (b) comprehensive hydraulic evaluation including alternative port sizing and orientation, (c) revise mixing zone modeling and dilution factors based on the above considerations. If the results indicate that dilution factors should be revised, we would request Ecology to reopen the permit accordingly, or update them in the following NPDES permit renewal.*

Response:

As acknowledged in the comment, Ecology used the best available information on current speeds and directions in conducting the outfall evaluation. While it is preferable to have measured, ambient data, to our knowledge such data does not exist. Therefore, predicted data in a close proximity to the outfall must be used. The data used is the closest proximity that Ecology could find.

Ecology acknowledges that there is considerable uncertainty with the values used for the low-end current velocity (10^{th} percentile data). Ecology has recalculated the 10^{th} and 90^{th} percentile values based on the average of predicted values for each month and the standard deviation of those values. This recalculation resulted in a slight increase in the minimum velocities used in the dilution modeling.

The City has the option to conduct additional analyses of the outfall during the term of the permit. Additional analyses include collection of site-specific current data, reevaluation of the outfall's hydraulic performance, and development of their own dilution model. Ecology will consider any new information the City presents during the permit term and, at its discretion, may modify the permit based on the new information.

Comment 5

Minor factual inaccuracy: Delete "grit and" from parenthetical statement of solids removal from the headworks. Located on Page 10, first sentence. [Facility design does not include grit removal at the headworks.]

Response:

Correction made.