

Fact Sheet for NPDES Permit WA0022527

Vashon Wastewater Treatment Plant

Effective Date: March 1, 2017

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for King County's Vashon Wastewater Treatment Plant (WWTP).

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

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for King County's Vashon WWTP, NPDES permit WA0022527, were available for public review and comment from September 27, 2016, until October 27, 2016. For more details on preparing and filing comments about these documents, please see *Appendix A - Public Involvement Information*.

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

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

Summary

King County Department of Natural Resources and Parks (DNRP), Wastewater Treatment Division (KC-WTD) owns and operates a wastewater treatment plant (WWTP) located on Vashon Island. This facility has an annual average design flow of 0.18 MGD. The facility includes a headworks and odor control system, oxidation ditches, two secondary clarifiers, and RAS/WAS pumps. For disinfection, the County uses a UV disinfection system.

The proposed permit contains the same effluent limits for Biochemical Oxygen Demand (BOD5), Total Suspended Solids (TSS), Fecal Coliform Bacteria, and pH as the permit issued in 2011. The proposed permit decreases the daily maximum limit for Total Residual Chlorine when it is used for disinfection, and removes the average monthly limit. The proposed permit removes the previous permit's requirements for a receiving water monitoring study, an outfall evaluation, and organic priority pollutant testing. Ecology expects that pretreatment-related monitoring in the proposed permit will continue to ensure the adequacy of local limits. Required nutrients monitoring also continues in the proposed permit.

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I. Introduction

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

The following regulations apply to domestic wastewater NPDES permits:

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

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

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

II. Background Information

Table 1. General Facility Information

Facility Information	
Applicant	King County Department of Natural Resources & Parks Wastewater Treatment Division 201 S. Jackson Street Seattle, WA 98104-3855
Facility Name and Address	Vashon WWTP 9621 - SW 171 Street Vashon, WA 98070
Contact at Facility	Name: Jeff Lafer Phone #: (206) 477-6315
Responsible Official	Name: Ms. Christie True Title: Director, Dept. of Natural Resources & Parks Address: 201 - S. Jackson Street Seattle, WA 98104-3855 Phone #: 206-296-6500
Type of Treatment	Oxidation Ditch
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.452091 Longitude: -122.455819
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Puget Sound Latitude: 47.452917 Longitude: -122.433333

Permit Status	
Issuance Date of Previous Permit	July 28, 2011
Application for Permit Renewal Submittal Date	September 3, 2015
Date of Ecology Acceptance of Application	October 12, 2015

Inspection Status	
Date of Last Non-sampling Inspection Date	December 17, 2015

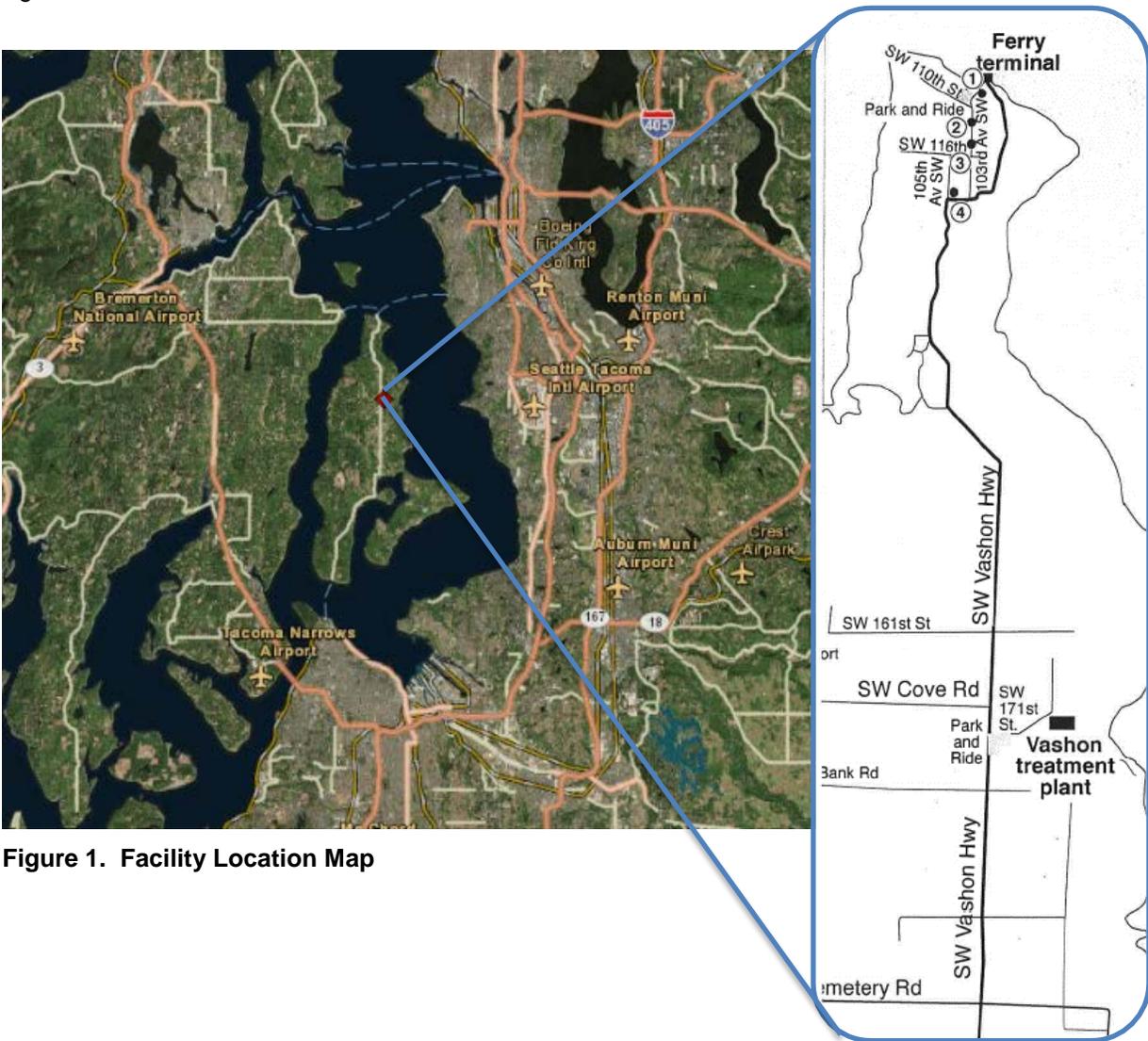


Figure 1. Facility Location Map

A. Facility description

History

The Vashon Sewer District (District), formed on September 22, 1947, first provided sewer service in 1955. The first treatment plant consisted of an Imhoff tank, trickling filter, secondary clarifier and discharge to Gorsuch Creek adjacent to the plant. The District expanded and upgraded the wastewater plant in 1976 to include an oxidation ditch and outfall to marine waters. In November 1999, King County WTD assumed ownership and operation of the Vashon treatment plant from the Vashon Sewer District. King County modified the headworks to prevent overflows, modified the Imhoff tank for use as a sludge storage tank, and replaced the chlorination system with ultraviolet disinfection. The facility expanded again in 2005-2006, increasing its design maximum month flows from 0.264 MGD to 0.52 MGD. The user base consists mostly of residential sources and one non-categorical significant industrial user (SIU), a facility that prepares tofu for commercial sale.

Collection system status

KC-WTD owns and operates the treatment plant along with the main sewer trunk line to the treatment plant. The Vashon Sewer District continues to own and maintain the collection system in the Vashon community and in the Bunker Trail area at the north end of the island. The District has experienced ongoing infiltration in the collection system since installation of the first collection sewers. Much of the older part of the collection system consists of 3-foot sections of concrete pipe with mortared joints. The Vashon Sewer District has conducted various infiltration/inflow studies on the collection system and has implemented portions of the recommendations in an attempt to reduce extraneous flows. To address health hazard problems, it constructed a sewer interceptor line to serve the Bunker Trail community at the north end of Vashon Island. KC-WTD operates and maintains the lift stations in the Bunker Trail community along with the four lift stations and force main connecting the area to the treatment plant.

Treatment processes

The treatment train includes a headworks and odor control system, an oxidation ditch, two secondary clarifiers, and a UV disinfection system. In mid-2016 KC-WTD replaced the existing UV disinfection system with a new system. During emergency or maintenance situations, operators can use the original oxidation ditch as a backup treatment unit and the original clarifier is available to serve as an equalization basin. Chlorine is available for disinfection backup in the event the UV system goes out of service.

Discharge outfall

Treated and disinfected effluent discharges into Puget Sound through an outfall located off of the east side of the island near the mouth of Gorsuch Creek. KC-WTD extended the outfall from a depth of -40 feet mean lower-lower water (MLLW) to -200 feet MLLW and began discharging through it in October 2004. The main objective of this extension was to better protect the shellfish beds along the east coast of Vashon Island. The updated outfall consists of an 8-inch diameter HDPE pipe and open-ended 8-inch port. The outfall terminates about 2700 feet from the shoreline.

B. Description of the receiving water

The Vashon WWTP discharges to Central Puget Sound. Other nearby point source outfalls include the Miller Creek WWTP, located about 3.5 miles to the southeast in Normandy Park, and the Salmon Creek WWTP, located about 4 miles to the northeast in Burien. Section III E of this fact sheet describes any receiving waterbody impairments.

The ambient background data used for this permit includes the following from DNRP's Fauntleroy/Vashon ambient Station LSNT01, located about 4 miles to the north of the outfall. This information was obtained from the June 2013 Receiving Water Characterization Study produced by the King County NPDES Monitoring Program. The date range covered in the report was January 2011 through December 2012. The data was reported on a monthly basis. Data from monitoring station LSNT01 is also available at the following link: <http://green2.kingcounty.gov/marine/Download/SelectData/LSNT01>

Table 2. Ambient Background Data

Parameter	Value Used
Temperature* (Highest annual 1-DADMax)	12.3 °C
pH* (Maximum / Minimum)	7.9/7.4 standard units
Dissolved Oxygen* (10 th percentile)	6.0 mg/L
Total Ammonia-N (Maximum)	0.09 mg/L
Fecal Coliform (Maximum)	1 CFU/100 mL
Salinity* (Maximum)	30.3 PSS
Arsenic* (Dissolved Maximum)	1.40 µg/L
Chromium* (Hex, Dissolved Maximum)	0.15 µg/L
Copper* (Dissolved Maximum)	0.34 µg/L
Lead (Dissolved Maximum)	0.01 µg/L
Mercury (Dissolved Maximum)	0.0002 µg/L
Nickel* (Dissolved Maximum)	0.43 µg/L
Zinc* (Dissolved Maximum)	0.71 µg/L

*Note: Where possible, data from the vicinity of the outfall depth (-61 meters +/- 26m) was evaluated.

C. Wastewater influent characterization

KC-WTD reported the concentration of influent pollutants in discharge monitoring reports. Table 3 summarizes the influent characteristics for the period of September 2011 to November 2015.

Table 3. Wastewater Influent Characterization

Parameter	Units	Average Value	Maximum Value
Biochemical Oxygen Demand (BOD ₅)	mg/L	394	1244
Biochemical Oxygen Demand (BOD ₅)	lbs/day	335	1016
Total Suspended Solids (TSS)	mg/L	309	965
Total Suspended Solids (TSS)	lbs/day	268	909

D. Wastewater effluent characterization

WTD reported the concentration of pollutants in discharge monitoring reports and in the permit application. The tabulated data below represents the quality of the wastewater effluent discharged from September 2011 to November 2015. This information was obtained from monthly monitoring reports and from the permit application. The wastewater effluent is characterized as follows:

Table 4. Wastewater Effluent Characterization

Parameter	Units	Average of the Monthly Averages	Maximum of the Monthly Averages	Average of the Weekly Averages	Maximum of the Weekly Averages
Biochemical Oxygen Demand (BOD ₅)	mg/L	2.7	5.0	3.6	9.1
Biochemical Oxygen Demand (BOD ₅)	lbs/day	2.6	6.8	3.8	13.1
Total Suspended Solids (TSS)	mg/L	3.9	29	4.8	13.9
Total Suspended Solids (TSS)	lbs/day	3.3	8.5	5.3	17.2

Parameter	Units	Maximum Monthly Geometric Mean	Maximum Weekly Geometric Mean
Fecal Coliforms	--	1.6	3.4

Parameter	Units	Minimum Value	Maximum Value
pH	standard units	6.6	7.2

Parameter	Units	# of Samples	Average	Maximum
Ammonia	mg/L	55	0.14	0.4
Dissolved Oxygen	mg/L	40	6.4	8.1
Oil and Grease	mg/L	3	<1.73	2.2
Total Dissolved Solids	mg/L	44	300	416
Hardness	mg/L	11	93.9	122
Arsenic	µg/L	3	1.76	1.92
Chromium	µg/L	3	0.377	0.55
Copper	µg/L	3	6.26	7.35
Lead	µg/L	3	<0.167	0.23
Mercury	µg/L	3	0.00123	0.002
Nickel	µg/L	3	2.8	4.53
Zinc	µg/L	3	39	53.6
bis(2-Ethylhexyl)phthalate	µg/L	3	<0.137	0.15
Diethylphthalate	µg/L	3	<0.355	0.527
Napthalene	µg/L	3	<0.21	0.23

E. Summary of compliance with previous permit issued August 31, 2011

The previous permit placed effluent limits on BOD₅, TSS, fecal coliform bacteria, pH, and total residual chlorine. WTD has complied with almost all of the effluent limits and permit conditions throughout the duration of the permit issued on August 31, 2011. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections. Ecology recognized WTD for outstanding performance of its Vashon WWTP for calendar year 2012.

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

Table 5. Violations

DATE	PARAMETER	NOTES
1/18/2015	pH	Missed required pH sampling frequency due to technical issue with pH analyzer after power outage.
11/1/2014	DMR	late submittal of DMR
9/1/2012	DMR	late submittal of DMR
5/1/2012	DMR	late submittal of DMR
3/25/2011	UV	Disinfection failure with approximately 9,500-10,000 gallons undisinfectied effluent discharged after plant's main breaker tripped due to ground fault.
12/1/2010	pH	pH minimum was 5.9 (minimum limit is 6.0)

F. State environmental policy act (SEPA) compliance

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

III. Proposed Permit Limits

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

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

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

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

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the *Vashon Island Wastewater Treatment Plant Facilities Plan* prepared by King County Department of Natural Resources and Parks in November 2003 and approved by Ecology on March 8, 2004. The table below includes design criteria from that report.

Table 6. Design Criteria for the Vashon Island WWTP

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	0.52 MGD
Influent BOD ₅ Loading for Maximum Month	671 lb/day
Influent TSS Loading for Maximum Month	671 lb/day

B. Technology-based effluent limits

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

The table below identifies technology-based limits for pH, fecal coliform, BOD₅, and TSS, as listed in chapter 173-221 WAC. Section III.F of this fact sheet describes the potential for water quality-based limits.

Table 7. Technology-based Limits

Parameter	Average Monthly Limit	Average Weekly Limit
BOD ₅ (concentration)	30 mg/L	45 mg/L
BOD ₅ (concentration)	In addition, the BOD ₅ effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	
TSS(concentration)	30 mg/L	45 mg/L
TSS(concentration)	In addition, the TSS effluent concentration must not exceed fifteen percent (15%) of the average influent concentration.	

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

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

Parameter	Average Monthly	Daily Maximum
Total Residual Chlorine	0.5 mg/L	0.75 mg/L

The Vashon WWTP uses UV radiation for disinfection, but maintains chlorination equipment on-site for emergency use. For occasions when the facility uses chlorine to disinfect the effluent, it must meet either technology-based or water quality-based chlorine effluent limits. Ecology originally derived the technology-based monthly average limit for chlorine from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/L chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, *Wastewater Engineering, Treatment, Disposal and Reuse*, Third Edition, 1991. Ecology assumes that a treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/L chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/L.

In drafting the previous permit, Ecology calculated a water quality-based monthly average chlorine limit of 0.44 mg/L and a daily maximum limit of 1.16 mg/L. However, because the Vashon WWTP uses chlorine as a backup for its UV disinfection system, Ecology expects the facility to use chlorine intermittently for short periods of time (a few hours to a few days) on an emergency basis. Consequently, Ecology does not consider a monthly or weekly average limit appropriate for the proposed permit because the facility will not discharge chlorine continuously for extended periods of time. For non-continuous discharges, 40 CFR 122.45(e) requires the establishment of limits that are appropriate for the nature of the discharge. Ecology considers a daily maximum limit applied each day in which the facility discharges chlorine an appropriate technology-based limit for POTWs that use chlorine as a backup disinfectant. The proposed permit includes a daily maximum limit of 0.75 mg/L, which is equivalent to the technology-based weekly average limit.

Technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for BOD₅ and Total Suspended Solids as follows:

$$\text{Mass Limit} = C \times Q \times CF$$

where:

- C = Technology-based concentration limits listed in the above table
- Q = Maximum Monthly Average Design flow (MGD)
- CF = Conversion factor of 8.34

Table 8. Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD ₅ Monthly Average	30	130
BOD ₅ Weekly Average	45	195
TSS Monthly Average	30	130
TSS Weekly Average	45	195

C. Surface water quality-based effluent limits

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

Numerical criteria for the protection of aquatic life and recreation

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

Numerical criteria for the protection of human health

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

Narrative criteria

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

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

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

Antidegradation

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

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

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

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

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.

- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

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

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

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

Mixing zones

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

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

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

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

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

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

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

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

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

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

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

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

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

3. Ecology must consider critical discharge conditions.

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

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water.

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

Table 9. Critical Conditions Used to Model the Discharge

Critical Condition	Value
Water depth at MLLW	200 feet
Density profile with a difference of sigma-t units between 56 m and 2m	Acute 0.376 Chronic 0.534
10 th and 90 th percentile current speeds for acute mixing zone	2.9 cm/sec, 22.7 cm/s
50 th percentile current speeds for chronic and human health mixing zones	8.4 cm/sec
Maximum average monthly effluent flow for chronic and human health non-carcinogen	0.7 MGD (year 2050)
Maximum daily flow for acute mixing zone	1.37 million gallons per day (MGD)
1 DAD MAX effluent temperature	22.5 °C (May-Sept) 13.1 °C (Oct-April)

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from data provided by King County.

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

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

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

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

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

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

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to

cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

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

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

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

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

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

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

7. Maximum size of chronic mixing zone.

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

8. Acute mixing zone.

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

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

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

As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration.

Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**

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

9. Overlap of mixing zones.

This mixing zone does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

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

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

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

Table 10. Marine 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	<ul style="list-style-type: none"> • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 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 use for this receiving water is identified below.

Table 11. Recreational Uses

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

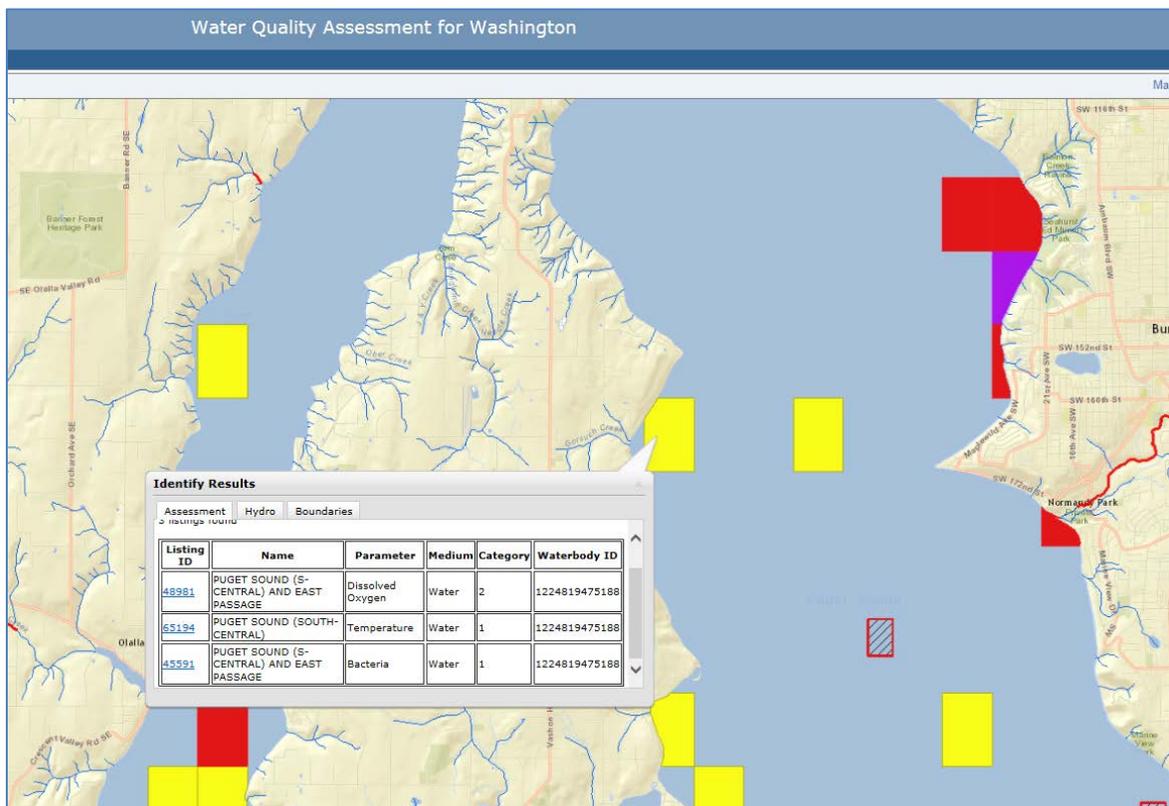
- The *miscellaneous marine water uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

E. Water quality impairments

The previous fact sheet indicated that the coastal area just west of the outfall was on the 303(d) list of impaired waterbodies for fecal coliform bacteria. The current 303(d) list no longer lists this area for fecal coliform, however the area has a Category 2 for dissolved oxygen (see figure 2). Category 2 waters are considered “waters of concern”. This listing results when there is some evidence of a water quality problem, but there is not enough evidence to list the water as impaired or to require production of a water quality improvement project (including a total maximum daily load or TMDL). There are several reasons why a water body would be placed in this category. A water body might have pollution levels that are not quite severe enough to violate the water quality standards, or there may not have been enough violations to categorize it as impaired according to Ecology’s listing policy. There might also be data showing water quality violations, but the data were not collected using proper scientific methods. In all of these situations, these are waters that Ecology wants to continue to test.

The same area is listed as Category 1 for fecal coliform and for temperature. Placement in this category means that the water body met the standards for the specific pollutant, in this case for fecal coliform and for temperature.

Figure 2. Water Quality Assessment for the Surrounding Area



Ecology Water Quality Assessment Website (accessed 1/12/2016) <https://fortress.wa.gov/ecy/wqamapviewer/default.aspx?res=2259x1271>

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

Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology’s analysis of the need for WET testing for this discharge is described later in the fact sheet.

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

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the

receiving water. Conversely, a pollutant such as biochemical oxygen demand (BOD₅) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

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

The outfall terminates about 2700 feet from the MLLW beach line. The diffuser has a single, end port with an 8 inch diameter. The diffuser mean lower low water (MLLW) depth is -200 feet.

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. The chronic mixing zone is a circle centered over the single diffuser port. The circle has a diameter of 800 feet (2*radius where radius = 200 ft MLLW + 200 ft allowed in estuarine waters). The mixing zone extends from the bottom to the top of the water column.

Acute Mixing Zone--WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone. The acute mixing zone for Outfall 001 extends 40 feet in any direction from the single discharge port and occupies a circular region with a diameter of 80 feet.

KC-WTD submitted an updated dilution model with the permit application. That updated model determined the dilution ratios at the edges of these zones at the critical condition using EPA Plumes model. The submittal proposed dilution factors of 94 for the acute zone and 756 for the chronic. The proposed dilution factors are based on modeling that assumed a mixing zone size of 200 ft in any direction from the diffuser port. While smaller than the allowable mixing zone size of 400 ft in any direction from the diffuser port, other assumptions in the model ultimately resulted in slightly less stringent dilution factors than those authorized in the previous permit. The Vashon WWTP has had no difficulty meeting limits based on dilution factors authorized in the previous permit. To avoid the potential for backsliding and because the updated dilution factors are not significantly different from the dilution factors in the existing permit, Ecology has chosen to retain the existing dilution factors in the proposed permit.

The dilution ratios are listed below.

Table 12. Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	89	681
Human Health, Carcinogen		681 ¹
Human Health, Non-carcinogen		681 ¹

¹ The dilution model submitted by KC-WTD did not calculate appropriate dilution for use in evaluating the need for human health-based limits. Ecology used the aquatic life chronic dilution factor as a conservative dilution factor. in evaluating human health criteria. Ecology may require KC-WTD to determine separate dilution factors for human health in the future.

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

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

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

A temperature-adjusted dissolved oxygen sag calculation was also done using the technology-based BOD₅ effluent limit of 45 mg/L (weekly average) as the effluent BOD₅ concentration. There was no reasonable potential for not meeting the DO criteria in the receiving water as a result of the Vashon WWTP discharge.

Calculation of BOD₅ Oxidation with Temperature Adjustment	
INPUT	
Effluent BOD ₅ (mg/L)	45
Effluent Dissolved Oxygen (DO) (mg/L)	6.4
Receiving Water Temperature (deg C)	12.3
Receiving Water DO (mg/L)	6
DO WQ Standards (mg/L)	7
Chronic Mixing Dilution Factor	681.0
Time for effluent to travel from outfall to chronic mixing boundary (days)	0.017
Oxidation rate of BOD, base e at 20 deg C, k ₁ (day ⁻¹)*	0.23
OUTPUT	
Effluent Ultimate BOD (mg/L)	65.85
Oxidation rate of BOD at ambient temperature, base e (day ⁻¹)	0.16
BOD oxidized between outfall and chronic mixing zone (mg/L)	0.18
RESULTS	
DO at chronic mixing zone	6.00
Difference between ambient DO and DO at chronic mixing boundary	0.00
There is no reasonable potential of not meeting the DO criteria under these conditions.	

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 681.

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.

Calculation of Fecal Coliform at Chronic Mixing Zone	
INPUT	
Chronic Dilution Factor	681.0
Receiving Water Fecal Coliform, #/100 ml	1
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criteria, #/100 ml	14
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	2
Difference between mixed and ambient, #/100 ml	1
Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.	

Turbidity--Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent and turbidity of the receiving water. Ecology expects no violations of the turbidity criteria outside the designated mixing zone provided the facility meets its technology-based total suspended solids permit limits.

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

The following toxic pollutants are present in the discharge: ammonia, arsenic, chromium, copper, lead, mercury, nickel, zinc, bis(2-ethylhexyl)phthalate, diethyl phthalate, naphthalene, and potentially chlorine when it is used for disinfection. Ecology conducted a reasonable potential analysis (See Appendix E) on these parameters to determine whether it would require effluent limits in this permit.

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology used available receiving water information and Ecology spreadsheet tools.

Ecology determined that the above-listed toxic pollutants pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (Appendix E) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

The facility may use chlorine on an emergency basis when the UV system is inoperable. Therefore the proposed permit must include a limit on chlorine during periods when the facility uses it for disinfection to protect aquatic life. In developing the previous permit, Ecology calculated water quality-based effluent limits using methods from EPA, 1991. Previously calculated effluent limits were as a monthly average of 0.44 mg/L and a daily maximum of 1.16 mg/L. As discussed in the technology-based limit section of this fact sheet, Ecology does not consider a monthly average limit appropriate since the facility will use chlorine intermittently for short periods of time; a single daily maximum limit equal to the technology-based weekly average limit of 0.75 mg/L is

appropriate. As shown in Appendix E, the daily maximum limit of 1.16 mg/L from the previous permit remains sufficient to protect aquatic life. Since the technology-based limit of 0.75 mg/L is more stringent than the calculated water quality-based limits, the proposed permit will include the technology-based limits.

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

- Annual maximum threshold criteria
- Incremental warming restrictions
- Protections against acute effects

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

- Annual maximum and supplementary spawning/rearing criteria

Each water body has an annual maximum temperature criterion [WAC 173-201A-210(1)(c), and Table 612]. These threshold criteria (e.g., 13, 16, 19, 22°C) protect specific categories of aquatic life by controlling the effect of human actions on temperatures. The threshold criteria apply at the edge of the chronic mixing zone. Criteria for marine waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

Ecology calculated the temperature at the edge of the chronic mixing zone assuming an ambient temperature of 12.3°C, effluent temperature of 22.5°C and a dilution factor of 681. The calculation predicted that temperature would increase to 12.31°C at the edge of the mixing zone, which is lower than the criteria temperature of 13°C.

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-210(1)(c)(i)-(ii)]. The incremental warming criteria 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. The following equation defines that increment (T_i):

$$T_i = \frac{12}{(T_{amb} - 2)}$$

This increment is permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum criteria. Based on an ambient temperature of 12.3°C, the increment based on the formula above (1.17 °C) is larger than the difference between the ambient temperature and the criteria (0.7°C). Therefore the maximum allowable incremental increase is 0.7°C. As shown above, Ecology calculated that the discharge will increase temperature by 0.01°C.

- Protections for temperature acute effects

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

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

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

Reasonable Potential Analysis

As shown above, the discharge is not predicted to cause the receiving water temperature to exceed the criterion of 13°C, will not exceed the allowable incremental increase in temperature and does not create conditions that have acute effects. Therefore, the proposed permit does not include a temperature limit. The permit requires additional monitoring of effluent to characterize the effluent for the next application for permit renewal. Ecology will reevaluate the reasonable potential during the next permit renewal.

H. 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 data and information indicating regulated chemicals occur in the discharge. Specifically mercury, nickel, bis(2-ethylhexyl) phthalate, and diethyl phthalate were among the compounds found in detectable amounts in the effluent. All have associated human health criteria that must be complied with in the receiving water.

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, and effluent limits are not needed.

I. Sediment quality

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

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

J. Whole effluent toxicity

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

The federal regulations [40 CFR 122.21(j)(5)(ii)] require domestic wastewater dischargers that meet at least one of the following criteria to submit whole effluent toxicity data with the permit application: Treatment works with a design flow greater than or equal to 1 MGD; Treatment works with an approved pretreatment program as well as those required to have one under 40CFR Part 403; and Treatment works otherwise required by Ecology to submit WET testing. Although the Vashon treatment plant does not receive wastewater from significant industrial discharges, Ecology has delegated KC-WTD as the pretreatment authority for their service area. Since the Vashon treatment area is covered by that delegation, the previous permit required KC-WTD to submit the results of WET testing with the application for permit renewal. WET testing results submitted with the application showed no reasonable potential for the effluent to cause receiving water toxicity and no need for a WET limit. The proposed permit requires the Vashon treatment plant to conduct chronic and acute WET testing for the next permit application.

K. Groundwater quality limits

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

The Vashon WWTP does not discharge wastewater to the ground. No permit limits are required to protect groundwater.

L. Comparison of effluent limits with the previous permit issued on August 31, 2011

Table 13. Comparison of Previous and Proposed Effluent Limits

Parameter	Basis of Limit	Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
		Average Monthly	Average Weekly	Average Monthly	Average Weekly
Biochemical Oxygen Demand (5-day)	Technology	30 mg/L, 130 lbs/day, 85% removal of influent BOD ₅	45 mg/L, 195 lbs/day	30 mg/L, 130 lbs/day, 85% removal of influent BOD ₅	45 mg/L, 195 lbs/day
Total Suspended Solids	Technology	30 mg/L, 130 lbs/day, 85% removal of influent TSS	45 mg/L, 195 lbs/day	30 mg/L, 130 lbs/day, 85% removal of influent TSS	45 mg/L, 195 lbs/day

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

Parameter		Limit	Limit
pH	Technology	6.0 s.u. – 9.0 s.u.	6.0 s.u. – 9.0 s.u.

Parameter		Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Total Residual Chlorine	Tech- and/or WQ-Based	0.44 mg/L (WQ-Based)	1.16 mg/L (WQ-Based)	NA	0.75 mg/L (Tech-based numeric limit, applied on a daily basis)

IV. Monitoring Requirements

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

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

A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology’s *Permit Writer’s Manual* (Publication Number 92-09) for an oxidation ditch facility.

Ecology has proposed to continue quarterly monitoring of nutrients (nitrogen species) in the proposed permit. It will use this data in the future if Ecology develops TMDLs for dissolved oxygen and establishes WLAs for nutrients.

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.

Ecology requires POTWs with delegated pretreatment programs to monitor influent, effluent and sludge in order to establish or revise local limits and to determine if pollutants interfere with or pass through the treatment process. Although KC-WTD is a delegated pretreatment authority, the Vashon treatment plant does not treat wastewater from any categorical industrial discharges. As such, Ecology does not consider monitoring of influent

and sludge for the purpose of local limit development necessary. Future permits may require influent and sludge monitoring if the Vashon plant begins treating wastewater from categorical industries.

Expanded priority pollutant testing under Part D of permit application was required by the previous permit. The proposed permit requires only the metals portion of Part D. Ecology determined that a reduction in the scope of priority pollutant testing is justified since previous testing did not show detectable concentrations of most of the organic priority pollutants. Of the three Part D organic compounds that were detected, they were present in concentrations considerably lower than the water quality standards. The small size of the treatment plant (less than 1.0 MGD); the nature of the user base that consists of mostly residential sources and one non-categorical SIU (a facility that prepares tofu and cabbage for commercial sale); and dilution modeling indicating significant available dilution in the receiving water provides additional justification for a reduction in priority pollutant monitoring. Priority pollutant metals testing combined with WET testing is sufficient to assess the need for water quality-based limits in future permits.

B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility for: BOD₅, pH, TSS, total residual chlorine, and fecal coliform bacteria (Accreditation #: W524).

V. Other Permit Conditions

A. Reporting and record keeping

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

B. Prevention of facility overloading

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require King County to:

- Take the actions detailed in proposed permit Special Condition S.4.
- Design and construct expansions or modifications before the treatment plant reaches existing capacity.
- Report and correct conditions that could result in new or increased discharges of pollutants.

Special Condition S.4 restricts the amount of flow.

C. Operation and maintenance

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

D. Pretreatment

Duty to enforce discharge prohibitions

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

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

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

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

Ecology delegated authority to King County for permitting, monitoring, and enforcement over industrial users discharging to their treatment system to provide more direct and effective control of pollutants. Ecology oversees the delegated Industrial Pretreatment

Program to assure compliance with federal pretreatment regulations (40 CFR Part 403) and categorical standards and state regulations (chapter 90.48 RCW and chapter 173-216 WAC).

As sufficient data becomes available, King County must, in consultation with Ecology, reevaluate its local limits in order to prevent pass-through or interference. If any pollutant causes pass-through or interference, or exceeds established sludge standards, King County must establish new local limits or revise existing local limits as required by 40 CFR 403.5. In addition, Ecology may require revision or establishment of local limits for any pollutant that causes a violation of water quality standards or established effluent limits, or that causes whole effluent toxicity.

Ecology may modify this permit to incorporate additional requirements relating to the establishment and enforcement of local limits for pollutants of concern.

E. Solid wastes

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

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

Requirements for monitoring sewage sludge and record keeping are included in this permit. Ecology will use this information, required under 40 CFR 503, to develop or update local limits.

F. General conditions

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

VI. Permit Issuance Procedures

A. Permit modifications

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

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

B. Proposed permit issuance

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

VII. References for Text and Appendices

Environmental Protection Agency (EPA)

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

King County NPDES Monitoring Program

- June 2013. Receiving Water Characterization Study. Prepared for Brightwater, South, Vashon, and West Point Treatment Plants, Alki, Carkeek, Elliott West, and MLK/Henderson CSO Storage and Treatment Facilities.

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

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

Washington State Department of Ecology.

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

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

Permit and Wastewater Related Information

(<http://www.ecy.wa.gov/programs/wq/permits/guidance.html>)

Water Pollution Control Federation.

1976. *Chlorination of Wastewater*.

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Appendix A--Public Involvement Information

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

Ecology placed a Public Notice of Draft on September 27, 2016, in the *Skagit Valley 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 <https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html>.

You may obtain further information from Ecology by telephone, 425-649-7201, or by writing to the address listed below.

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

The primary author of this permit and fact sheet is Tonya Lane.

Appendix B--Your Right to Appeal

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

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

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

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

ADDRESS AND LOCATION INFORMATION

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

Appendix C--Glossary

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Method detection level (MDL) -- See Detection Limit.

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

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

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

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

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

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

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

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

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

- a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day; or
- b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) -- The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and

cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to $(1, 2, \text{ or } 5) \times 10^n$, where n is an integer (64 FR 30417).

ALSO GIVEN AS:

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

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

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

Sample Maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

- 1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; and
- 2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

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

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

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

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5, 3, or 1 year(s), respectively, of professional experience working in the area of agronomy, crops, or soils.

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

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

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

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

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

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

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

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

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

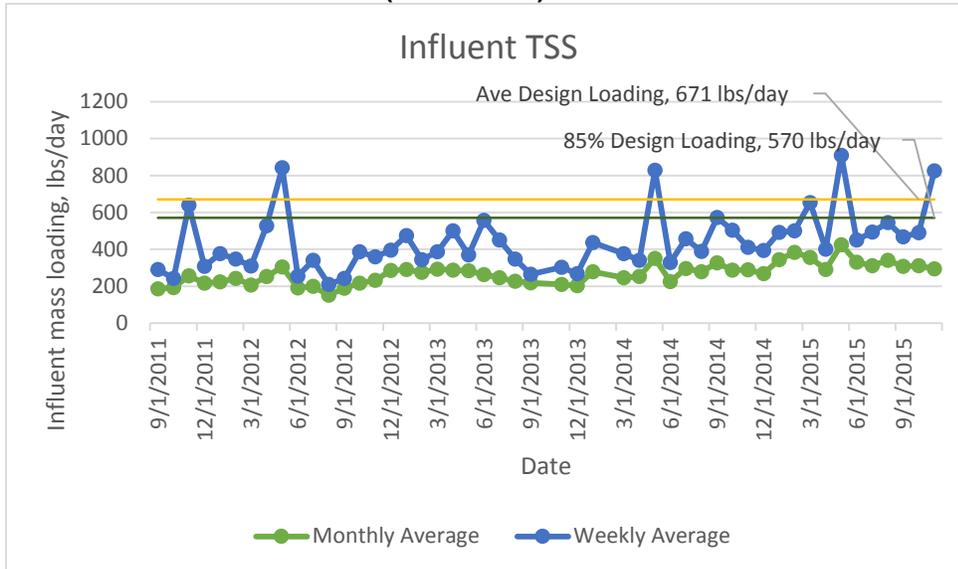
Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed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

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

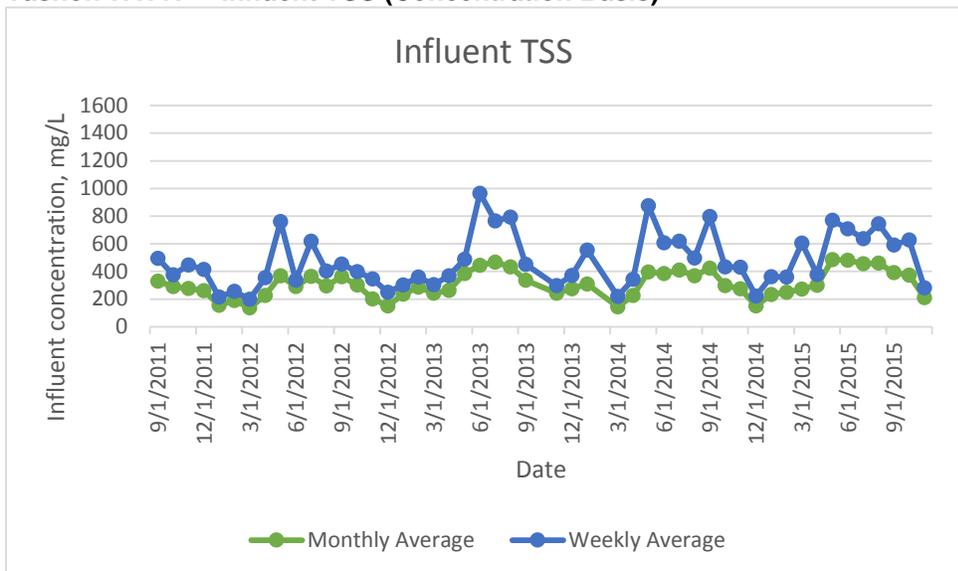
Appendix D--Vashon WWTP Discharge Monitoring Report Summary Tables and Graphs

(September 2011 – November 2015)

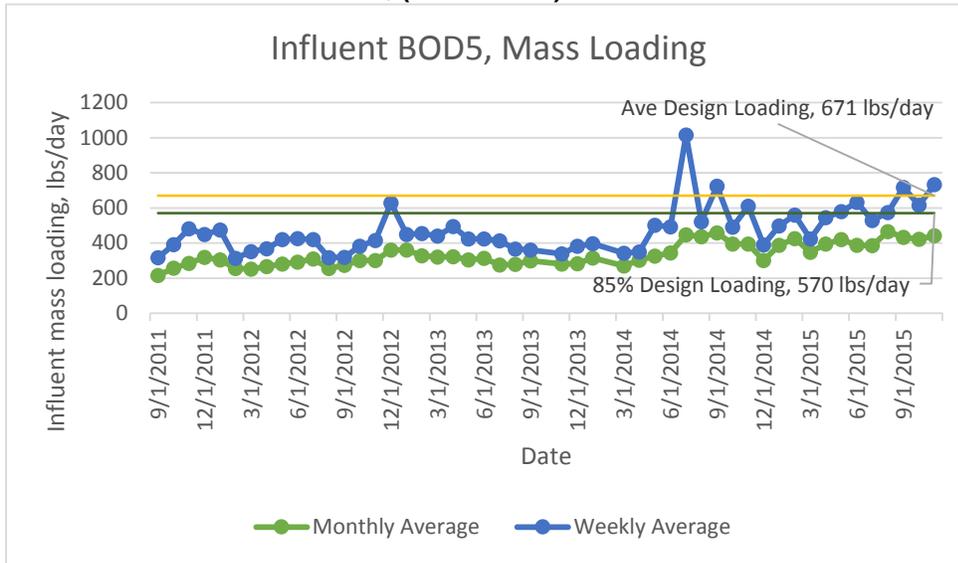
Vashon WWTP – Influent TSS (Mass Basis)



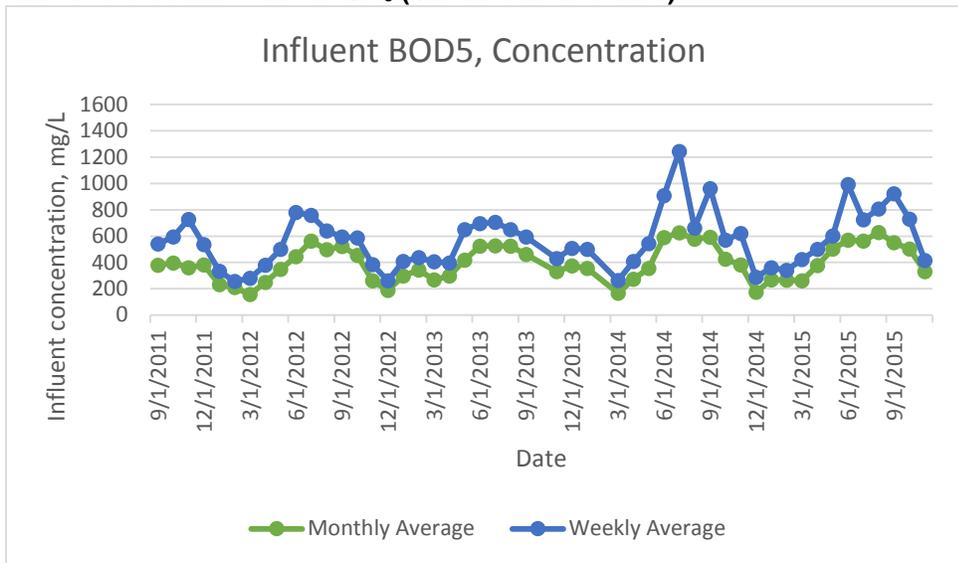
Vashon WWTP – Influent TSS (Concentration Basis)



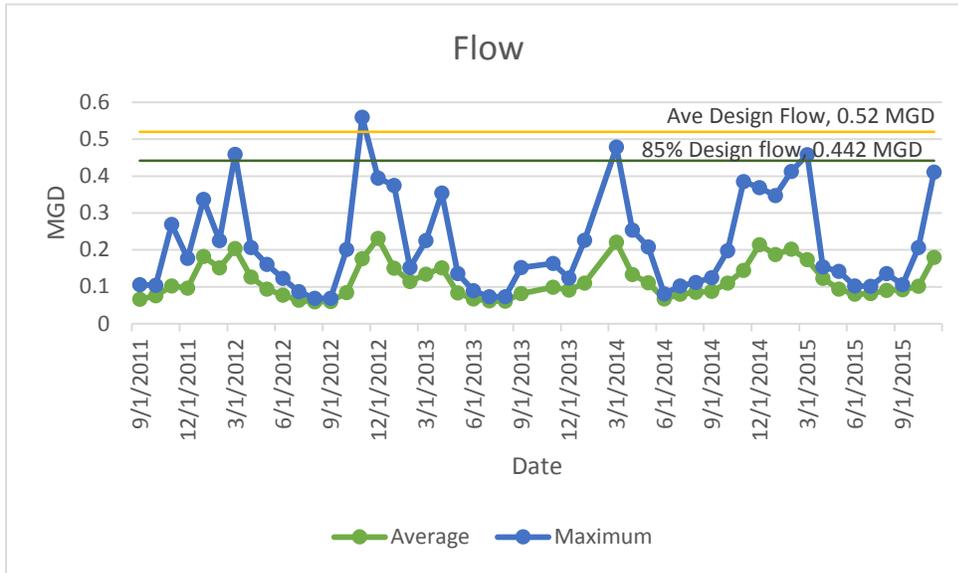
Vashon WWTP – Influent BOD₅ (Mass Basis)



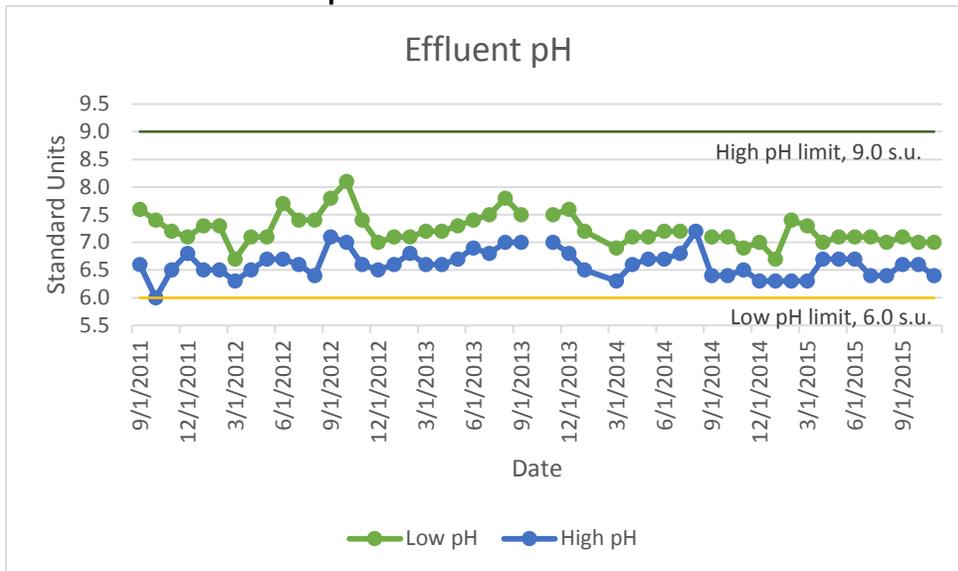
Vashon WWTP – Influent BOD₅ (Concentration Basis)



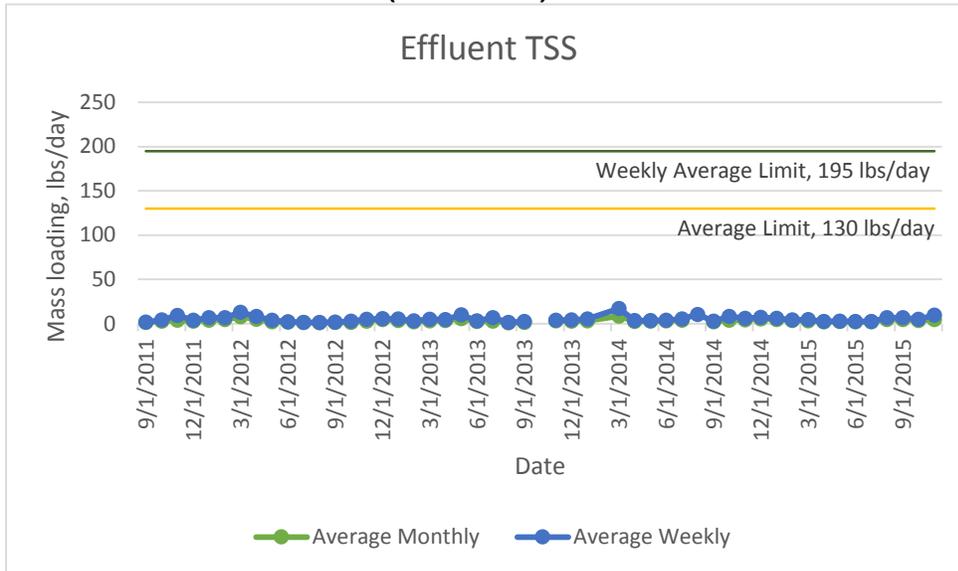
Vashon WWTP – Influent Flow



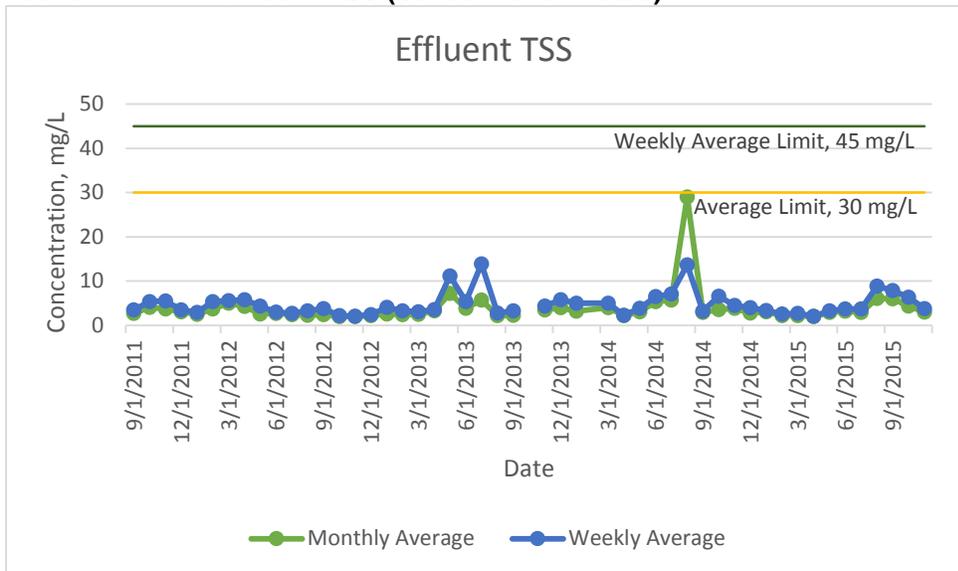
Vashon WWTP – Effluent pH



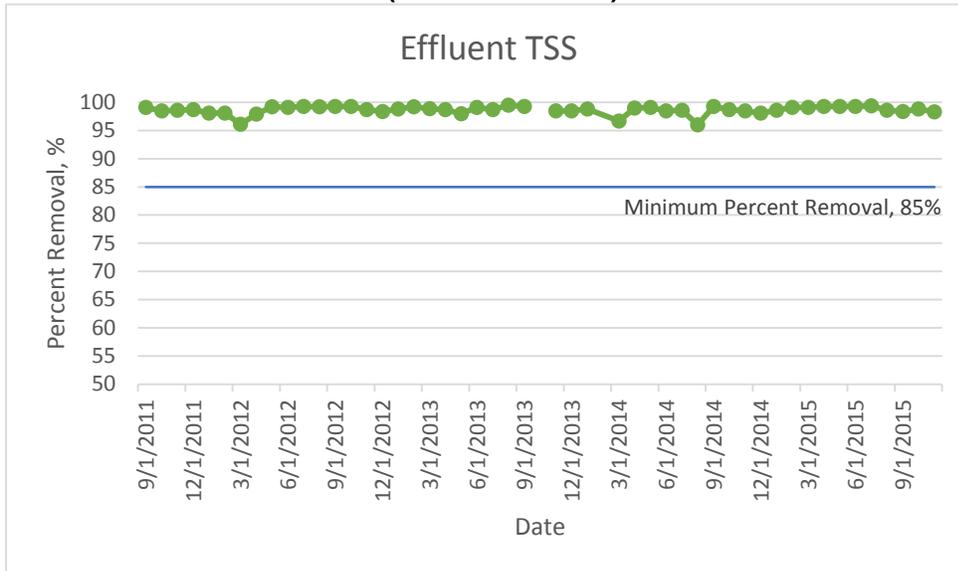
Vashon WWTP – Effluent TSS (Mass Basis)



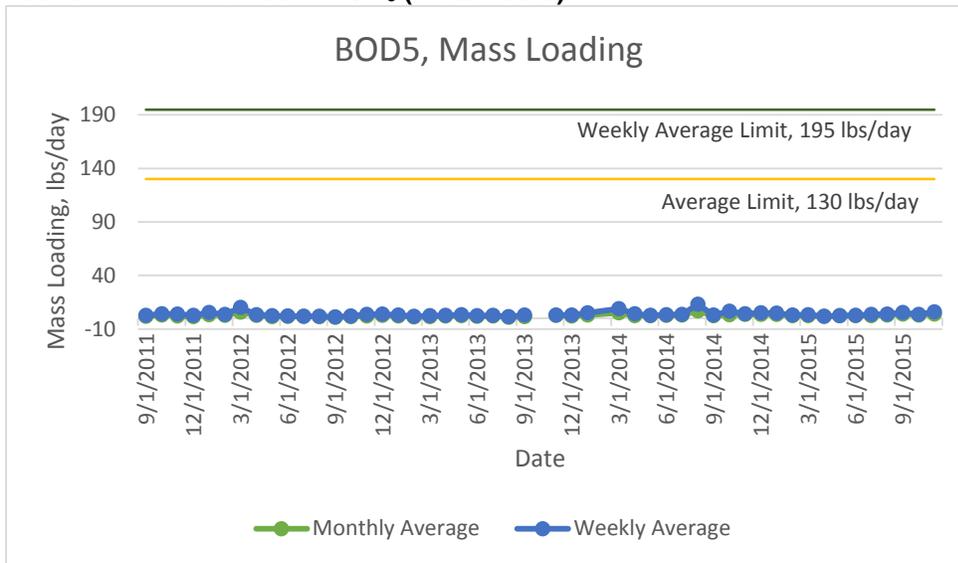
Vashon WWTP – Effluent TSS (Concentration Basis)



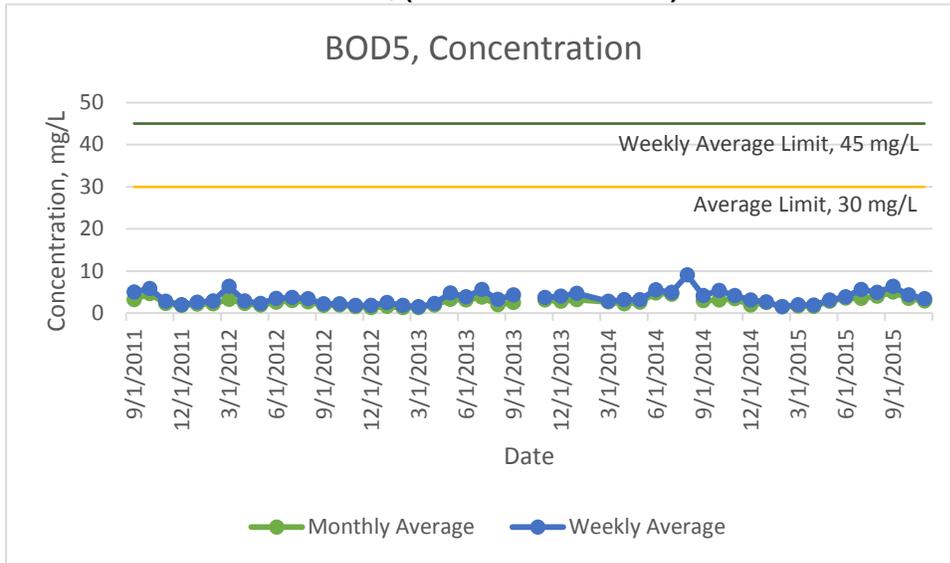
Vashon WWTP – Effluent TSS (Percent Removal)



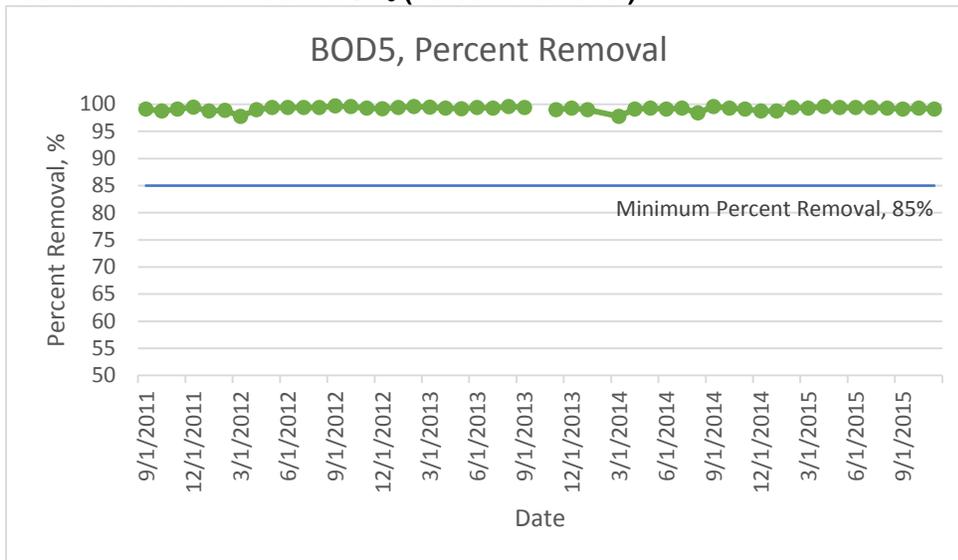
Vashon WWTP – Effluent BOD₅ (Mass Basis)



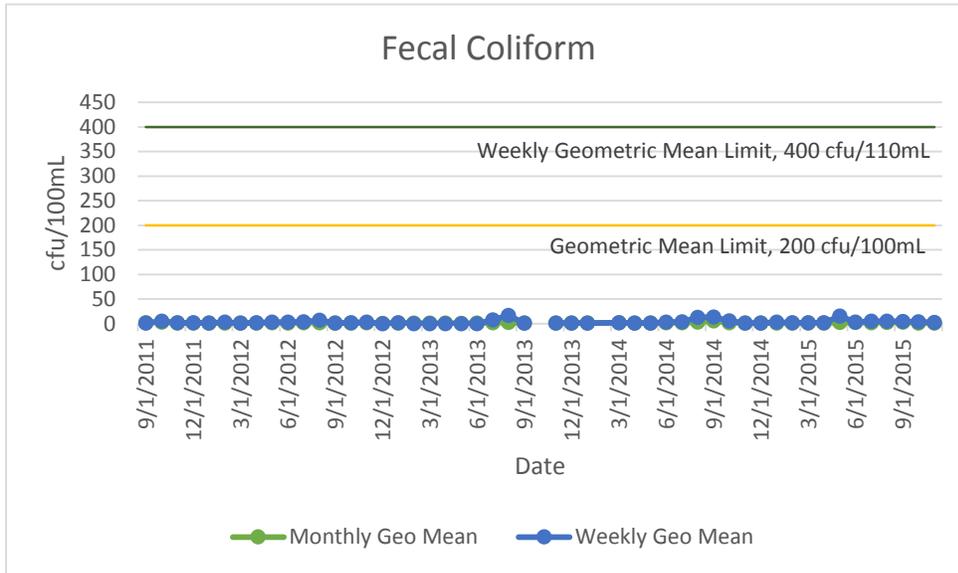
Vashon WWTP – Effluent BOD₅ (Concentration Basis)



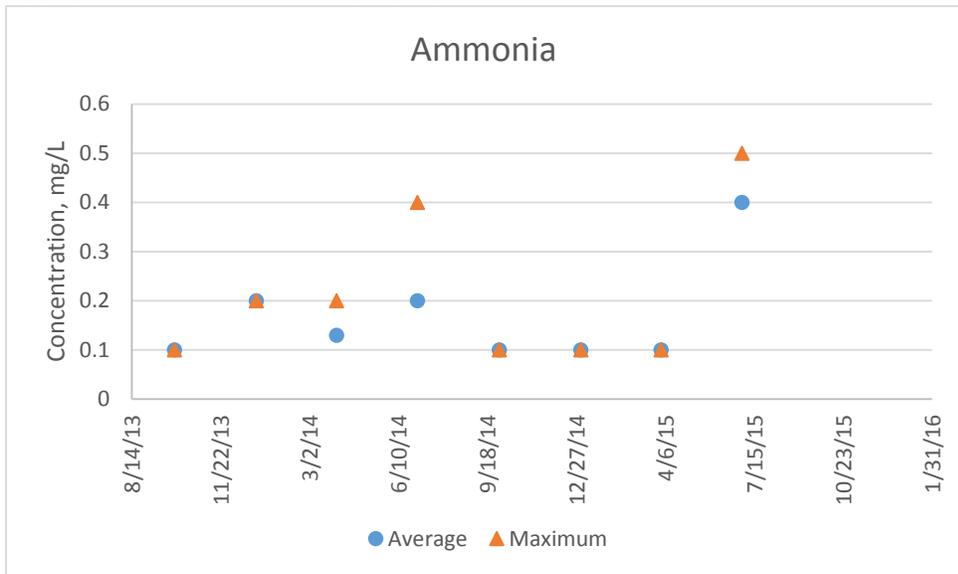
Vashon WWTP – Effluent BOD₅ (Percent Removal)

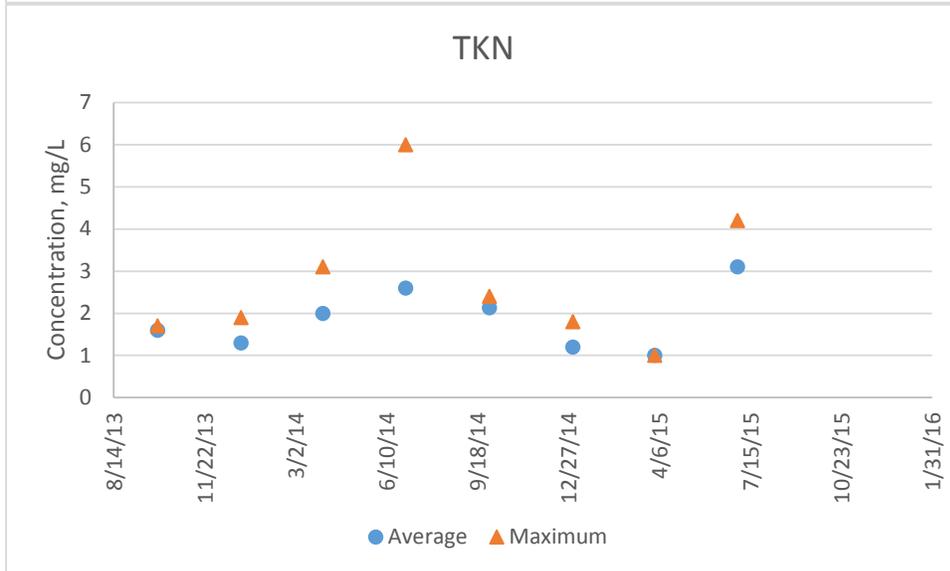
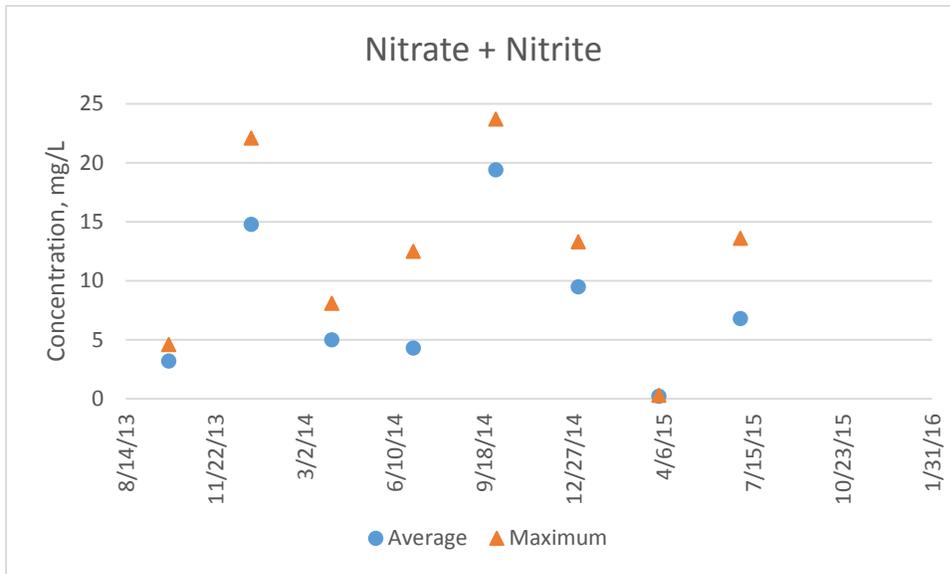


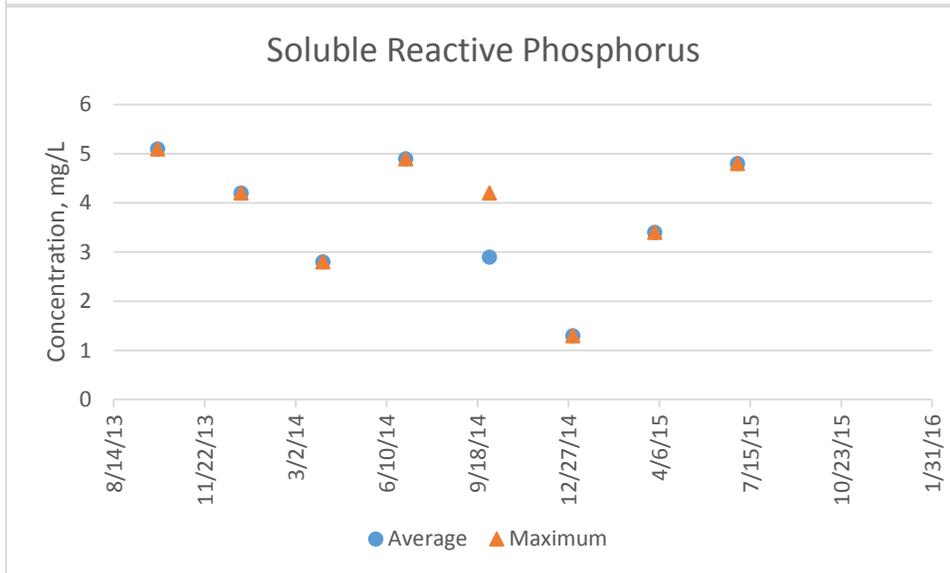
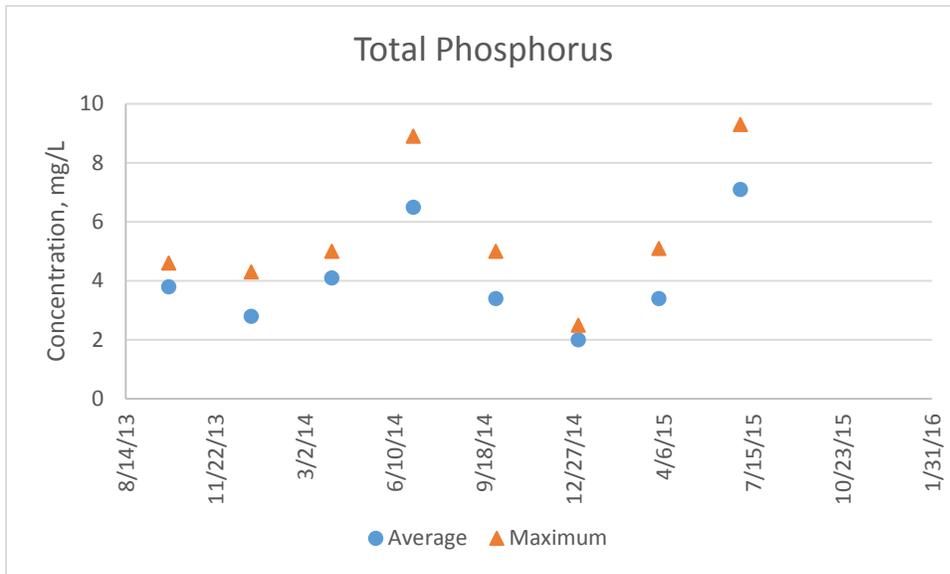
Vashon WWTP – Effluent Fecal Coliform Bacteria



Vashon WWTP – Effluent Nutrients







Appendix E--Technical Calculations and Data

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: <http://www.ecy.wa.gov/programs/wq/permits/guidance.html>.

The calculations behind the reasonable potential tables below are explained in detail in EPA's Technical Support Document for Water Quality-based Toxics Control (1991). This document is available online at: <https://www3.epa.gov/npdes/pubs/owm0264.pdf>

Marine Temperature Reasonable Potential and Limit Calculation		
Based on WAC 173-201A-200(1)(c)(i)--(ii) and Water Quality Program Guidance. All Data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at: http://www.ecy.wa.gov/biblio/0610100.html		
INPUT	May-Sep	Oct-Apr
1. Chronic Dilution Factor at Mixing Zone Boundary	681	681
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	10.8 °C	10.2 °C
3. 1DADMax Effluent Temperature (95th percentile)	22.5 °C	13.1 °C
4. Aquatic Life Temperature WQ Criterion	3.0 °C	
OUTPUT		
5. Temperature at Chronic Mixing Zone Boundary:	10.82 °C	10.20 °C
6. Incremental Temperature Increase or decrease:	0.02 °C	0.00 °C
7. Incremental Temperature Increase $12/(T-2)$ if $T \leq$ crit:	---	---
8. Maximum Allowable Temperature at Mixing Zone Boundary:	11.10 °C	10.50 °C
A. If ambient temp is warmer than WQ criterion		
9. Does temp fall within this warmer temp range?	YES	YES
10. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT	NO LIMIT
B. If ambient temp is cooler than WQ criterion but within $12/(T_{amb}-2)$ and within 0.3 °C of the criterion		
11. Does temp fall within this incremental temp. range?	---	---
12. Temp increase allowed at mixing zone boundary, if required:	---	---
C. If ambient temp is cooler than (WQ criterion-0.3) but within $12/(T_{amb}-2)$ of the criterion		
13. Does temp fall within this Incremental temp. range?	---	---
14. Temp increase allowed at mixing zone boundary, if required:	---	---
D. If ambient temp is cooler than (WQ criterion - $12/(T_{amb}-2)$)		
15. Does temp fall within this Incremental temp. range?	---	---
16. Temp increase allowed at mixing zone boundary, if required:	---	---
RESULTS		
17. Do any of the above cells show a temp increase?	NO	NO
18. Temperature Limit if Required?	NO LIMIT	NO LIMIT

Calculation of Fecal Coliform at Chronic Mixing Zone	
INPUT	
Chronic Dilution Factor	681.0
Receiving Water Fecal Coliform, #/100 ml	1
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criteria, #/100 ml	14
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	2
Difference between mixed and ambient, #/100 ml	1
Conclusion: At design flow, the discharge has no reasonable potential to violate water quality standards for fecal coliform.	

Marine Un-ionized Ammonia Criteria Calculation	
Calculation of seawater fraction of un-ionized ammonia from Hampson (1977). Un-ionized ammonia criteria for salt water are from EPA 440/5-88-004. Revised 19-Oct-93.	
INPUT	
1. Receiving Water Temperature, deg C (90th percentile):	12.3
2. Receiving Water pH, (90th percentile):	7.9
3. Receiving Water Salinity, g/kg (10th percentile):	30.3
4. Pressure, atm (EPA criteria assumes 1 atm):	1.0
5. Unionized ammonia criteria (mg un-ionized NH ₃ per liter) from EPA 440/5-88-004:	
Acute:	0.233
Chronic:	0.035
OUTPUT	
Using mixed temp and pH at mixing zone boundaries?	No
1. Molal Ionic Strength (not valid if >0.85):	0.623
2. pKa8 at 25 deg C (Whitfield model "B"):	9.317
3. Percent of Total Ammonia Present as Unionized:	1.5%
4. Total Ammonia Criteria (mg/L as NH ₃):	
Acute:	15.77
Chronic:	2.37
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	12.97
Chronic:	1.95

Reasonable Potential Calculation

Facility	Vashon
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	89	681
Human Health Carcinogenic		681
Human Health Non-Carcinogenic		681

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 740382 2M	BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	CHROMIUM (HEX) 18540299	COPPER - 744058 6M Hardness dependent	DIETHYLPHTHALATE 84662 24B	NAPHTHALENE 91203 39B	MERCURY 7439976 8M	LEAD - 7439921 7M Dependent on hardness	NICKEL - 7440020 9M - Dependent on hardness	ZINC- 7440666 13M hardness dependent	
		Effluent Data	# of Samples (n)	55	3	3	3	3	3	3	3	3	3
	Coeff of Variation (Cv)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	Effluent Concentration, ug/L (Max. or 95th Percentile)	400	1.92	0.15	0.55	7.35	0.527	0.23	0.002	0.23	4.53	53.6	
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L	90	1.4		0.15	0.34			0.0002	0.01	0.43	0.71	
	Geo Mean, ug/L			0			0		0.0002		0.43		
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	12,970	69	-	1100	4.8	-	-	1.8	210	74	90
		Chronic	1,948	36	-	50	3.1	-	-	0.025	8.1	8.2	81
	WQ Criteria for Protection of Human Health, ug/L		-	-	5.9	-	-	120000	-	0.15	-	4600	-
	Metal Criteria	Acute	-	1	-	0.993	0.83	-	-	0.85	0.951	0.99	0.946
	Translator, decimal	Chronic	-	-	-	0.993	0.83	-	-	-	0.951	0.99	0.946
	Carcinogen?		N	Y	Y	N	N	N	N	N	N	N	

Aquatic Life Reasonable Potential

Effluent percentile value		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
s	$s^2 = \ln(CV^2 + 1)$	0.555	0.555	0.555	0.555	0.555	0.555	0.555	0.555	0.555	0.555	0.555
Pn	$Pn = (1 - \text{confidence level})^{1/n}$	0.947	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368
Multiplier		1.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Max concentration (ug/L) at edge of...	Acute	93	1.449	0.167	0.542	0.000	0.017	0.576	2.411			
	Chronic	90	1.406	0.152	0.366	0.000	0.011	0.449	0.932			
Reasonable Potential? Limit Required?		NO										

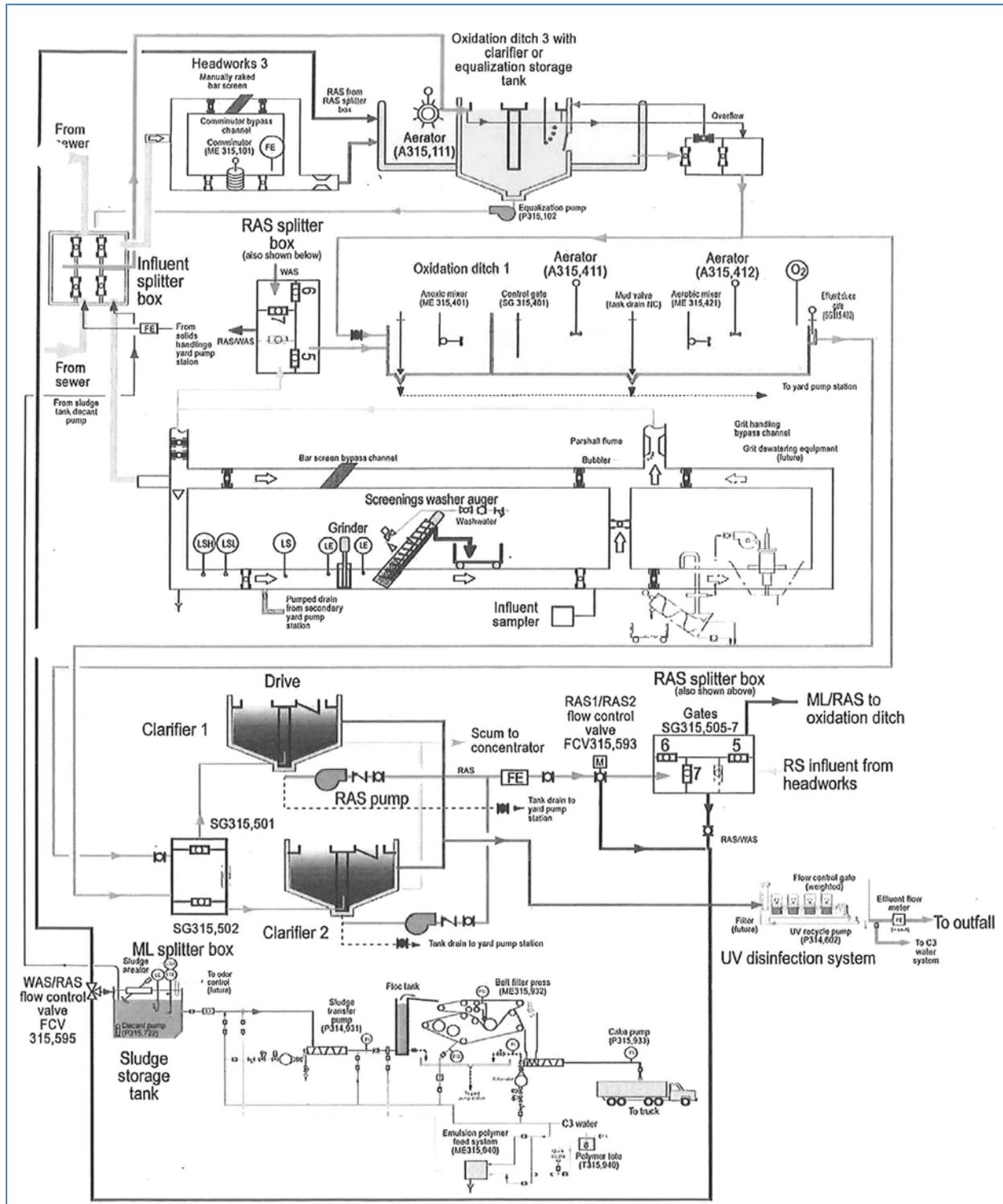
Aquatic Life Limit Calculation

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

Human Health Reasonable Potential

s	$s^2 = \ln(CV^2 + 1)$	0.554513	0.554513	0.55451	0.55451
Pn	$Pn = (1 - \text{confidence level})^{1/n}$	0.368	0.368	0.368	0.368
Multiplier		1.204861	1.204861	1.20486	1.20486
Dilution Factor		681	681	681	681
Max Conc. at edge of Chronic Zone, ug/L		0.000265	9.3E-04	0.0002	0.43738
Reasonable Potential? Limit Required?		NO	NO	NO	NO

Appendix F--Vashon WWTP Process Flow Diagram



Appendix G--Dilution Model Results

The model output below was taken from Appendix G to the fact sheet associated with the previous permit, issued on July 28, 2011.

200' depth- single port
Acute

Case 48; ambient file C:\plumes\Vashon.001.db; Diffuser table record 12: -----

P-dia	P-elev	V-angle	H-angle	Ports	SttTime	EndTime	Incrmnt			
(m)	(m)	(deg)	(deg)	()	(hr)	(hr)	(hr)			
0.2032	0.3048	0.0	90.0	1.0	1.0	48.0	1.0			
AcuteM2	ChrcM2	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt				
(m)	(m)	(m)	(m3/s)	(psu)	(C)	(kg/kg)				
12.192	121.92	60.961	0.06002	0.0	10.0	100.0				

Froude number: 8.769

Step	W Column	Amb-cur	Amb-sal	Amb-tem	P-dia	Polutnt	Dilutn	x-posn	y-posn
	(m)	(m/s)	(psu)	(C)	(m)	(kg/kg)	()	(m)	(m)
0	60.96	0.227	29.02	11.25	0.203	100.0	1.0	0.0	0.0;
100	60.59	0.227	29.02	11.26	1.073	13.8	7.108	0.0	2.775;
200	58.13	0.227	29.03	11.3	3.759	1.905	51.36	0.0	9.115;
228	56.98	0.227	29.03	11.32	5.125	1.094	89.4	0.0	12.23; acute zone, ←
300	52.28	0.227	29.03	11.4	10.92	0.263	371.9	0.0	28.41;
370	43.54	0.227	29.04	11.56	22.24	0.0658	1487.6	0.0	77.85; trap level,
391	39.87	0.227	29.04	11.62	27.49	0.0434	2254.7	0.0	122.8; chronic
zone,									
396	39.43	0.227	29.04	11.64	28.68	0.0399	2450.1	0.0	149.5; local

maximum rise or fall,
 Outside chronic zone

200' depth -single port
Chronic

Case 13; ambient file C:\plumes\Vashon.001.db; Diffuser table record 11: -----

P-dia	P-elev	V-angle	H-angle	Ports	SttTime	EndTime	Incrmnt			
(m)	(m)	(deg)	(deg)	()	(hr)	(hr)	(hr)			
0.2032	0.3048	0.0	90.0	1.0	17.0	32.0	1.0			
AcuteM2	ChrcM2	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt				
(m)	(m)	(m)	(m3/s)	(psu)	(C)	(kg/kg)				
12.192	121.92	60.961	0.03067	0.0	10.0	100.0				

Froude number: 4.411

Step	W Column	Amb-cur	Amb-sal	Amb-tem	P-dia	Polutnt	Dilutn	x-posn	y-posn
	(m)	(m/s)	(psu)	(C)	(m)	(kg/kg)	()	(m)	(m)
0	60.96	0.084	29.36	8.348	0.203	100.0	1.0	0.0	0.0;
100	60.04	0.084	29.35	8.416	0.942	14.78	6.634	0.0	2.096;
200	55.42	0.084	29.32	8.761	3.248	2.04	47.93	0.0	5.52;
282	48.05	0.084	29.28	9.312	9.182	0.402	243.0	0.0	12.2; acute zone,
295	46.69	0.084	29.27	9.415	10.88	0.311	314.4	0.0	14.11; trap level,
300	46.18	0.084	29.26	9.454	11.62	0.282	347.1	0.0	14.96;
353	43.66	0.084	29.25	9.651	16.48	0.164	594.4	0.0	24.58; local

maximum rise or fall,
 Const Eddy Diffusivity. Farfield dispersion based on wastefield width of 16.48 m

conc	dilutn	width	distance	time					
(kg/kg)		(m)	(m)	(hrs)	(kg/kg)	(s-1)	(m/s)	(m0.67/s2)	
0.16439	594.7	17.74	36.58	0.0397	0.0	0.0	0.084	3.00E-4	
0.16412	595.7	18.94	48.77	0.08	0.0	0.0	0.084	3.00E-4	
0.16245	602.0	20.06	60.96	0.12	0.0	0.0	0.084	3.00E-4	
0.15954	613.2	21.13	73.15	0.161	0.0	0.0	0.084	3.00E-4	
0.15587	628.0	22.14	85.34	0.201	0.0	0.0	0.084	3.00E-4	
0.15192	644.7	23.11	97.54	0.241	0.0	0.0	0.084	3.00E-4	
0.14792	662.5	24.04	109.7	0.282	0.0	0.0	0.084	3.00E-4	
0.144	680.9	24.93	121.9	0.322	0.0	0.0	0.084	3.00E-4	←

count: 8

Appendix H--Response to Comments

Ecology received comments from Northwest Environmental Advocates (NWEA) during the public notice period. Summaries of the comments and Ecology's responses are as follows:

NWEA Comments

Sections I and II of the comment letter do not include specific comments on this permit.

Section III of the comment letter states that the proposed permit fails to meet legal requirements. More specifically:

Comment 1a. The discharge causes or contributes to violations of WQ standards and therefore a WQBEL is required for nutrients

Comment summary: There is no WQBEL that is intended to ensure that the discharge does not cause or contribute to violations of dissolved oxygen standards or the narrative criterion by discharges of nitrogenous oxygen-demanding materials.

Response: Ecology has assessed the reasonable potential for the discharge to violate water quality standards and found that the discharge would not do so.

While treated municipal wastewater may be the dominant human source of nitrogen for Puget Sound, the largest overall source of nitrogen is the exchange of marine water with the waters of the Sound. Ecology continues to improve the modeling that allows us to assess the degree to which wastewater treatment plants may be causing or contributing to violations of water quality standards in Puget Sound. In 2014, Ecology completed the report Puget Sound and the Straits Dissolved Oxygen Assessment – Impacts of Current and Future Human Nitrogen Sources and Climate Change through 2070. Since then, Ecology incorporated into its models a more state-of-the-science methodology for accounting for sediment/water column interactions. This model improvement could affect both predictions of water quality impairments (now largely based upon model results), and estimates of nitrogen reductions needed to improve water quality.

As improved modeling results becomes available, Ecology intends to develop a coordinated permitting strategy that will reduce nitrogen discharges to Puget Sound in a cost-effective manner, to achieve the greatest environmental results with the lowest cost to the public. Ecology's ultimate decision to set permit limits for nitrogen discharges to Puget Sound may affect all the permits in the region, and must be based on accurate science.

Ecology concludes that the technology-based limits included in this permit are appropriate.

Comment 1b. The permit fails to assess reasonable potential for this discharge to cause or contribute to violations of WQ standards and to establish required effluent limits

Comment summary: Given that this discharger is a known source of nitrogen to Puget Sound, and therefore it is contributing to violations of water quality standards, the permit is required to also contain water quality-based effluent limits for total nitrogen.

Response: see above

Comment 1c. The proposed permit fails to evaluate the discharge of nutrients to Puget Sound on an appropriate bases and the establishment of BOD5 limits is both inappropriate and inadequate

Comment summary: The BOD₅ effluent limit does not provide any limits on the ammonia nitrogen oxygen demand created by the discharge that is causing or contributing to violations of water quality standards in Puget Sound.

Response: see above

Comment 1d. The proposed permit fails to comply with 40 CFR 122.44(d)(1)(ii)

Comment summary: The proposed permit does not “account for existing controls on point and nonpoint sources of pollution.” Specifically, the commenter refers to nitrogen pollution from septic systems and other wastewater treatment plants.

Response: see above.

Comment 1e. The proposed permit may be derived on an illegal basis

Comment summary: The commenter objects to fact sheet language stating “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.”

Response: Ecology develops effluent limits for pollutants with a reasonable potential to violate water quality standards. The language above is standardized and included in all Ecology fact sheets.

Comment 1f. The proposed permit fails to evaluate whether the discharge will cause or contribute to violations of narrative criteria

Comment summary: The fact sheet does not sufficiently explain the consideration and analysis of narrative criteria, specifically in regard to nutrient pollution in Puget Sound.

Response: Compliance with narrative criteria is evaluated through the use of whole effluent toxicity testing and available information about the receiving waters. Regarding the regulation of nutrient discharges affecting Puget Sound, see response to Comment 1a above.

Comment 2. Permit violates Tier 1 of the Antidegradation Policy contained in Washington’s WQ Standards

Comment summary: The permit violates Tier I of the Antidegradation Policy contained in Washington’s Water Quality Standards because it does not use enterococci bacteria as the indicator organism for pathogens.

Response to Comment 2:

Ecology must use water quality standards approved by EPA when setting limits in NPDES permits. The state’s marine water quality standards currently approved by EPA include fecal coliform bacteria as the indicator organism to protect the designated uses of shellfish harvesting and primary contact recreation. They also include enterococci bacterial as the indicator organism to protect the designated use of secondary contact recreation. Section III of the approved standards describes how the standards implement the antidegradation policy. Ecology will continue to use fecal coliform as the indicator to protect the shellfish harvesting and contact recreation designated uses.

Comment 3. Monitoring requirements are inadequate

Comment summary: Quarterly nutrients monitoring is inadequate.

Response to Comment 3:

The nutrients monitoring frequency required by the permit is consistent with Ecology guidance for facilities of Vashon's size. Ecology considers quarterly monitoring for nutrients to be sufficient because nutrients affect water quality on a seasonal or annual cycle.

Comment 4. The permit fails to properly address temperature

Comment summary: The previous fact sheet cited an ambient temperature of 14.5 degrees C, which exceeds standards and, as such, should trigger end-of-pipe temperature limits.

Response to Comment 4:

Ecology considers all relevant data when evaluating the water quality impacts of a discharge. In this case Ecology cannot verify the accuracy of the ambient temperature listed in the previous fact sheet. Although the previous fact sheet lists 14.5 degree C as the ambient temperature, records included with the permit file for the 2011 permit do not include that temperature. Ecology believes the previous fact sheet cited erroneous temperature data.

The area around the Vashon outfall is listed as Category 1 for temperature, meaning that the receiving water meets standards (see image below). Ecology evaluated whether a reasonable potential exists for the discharge to cause a violation of the applicable temperature standard. Per policy that analysis uses the 90th percentile value for ambient temperature, not the maximum temperature. The 2016 Fact Sheet used appropriate values for the reasonable potential evaluation for temperature. The conclusion that the discharge complies with applicable water quality standards is correct.

Water Quality Listing Policy	
Listing ID: 65195	
Main Listing Information	
Listing ID: 65195	Current Category: 1 <input checked="" type="checkbox"/>
Waterbody Name: PUGET SOUND (SOUTH-CENTRAL)	2012 Category: 1 <input checked="" type="checkbox"/>
Medium: Water	2008 Category: 3 <input type="checkbox"/>
Parameter: Temperature	2004 Category: 3 <input type="checkbox"/>
WQI Project: None	On 1998 303(d) List?: N
Designated Use: None Assigned	On 1996 303(d) List?: N
Assessment Unit	
Assessment Unit ID: 47122E4F4	
Additional Location Identification	
County: King	WRIA: 15 - Kitsap
Waterbody ID (WBID): None Assigned	Waterbody Class: None Assigned
Town/Range/Section: None Assigned	
Basis	
Location ID [303D_MSJL01] -- In 2006, 0 out of 6 (0%) samples did not show any excursions beyond the criterion of 13 degrees Celsius.	
Location ID [303D_MSJL01] -- In 2005, 1 out of 12 (8%) samples showed an excursion beyond the criterion of 13 degrees Celsius.	
Location ID [303D_MSJL01] -- In 2004, 3 out of 12 (25%) samples showed an excursion beyond the criterion of 13 degrees Celsius.	
Remarks	
Remark	
This listing was reviewed by Department of Ecology Environmental Assessment Program staff, who concluded that the excursions in this water body are a natural condition and that human influences in this area are not sufficient to cause the observed temperature increases.	
EIM	
User Study ID	User Location ID
KCmar-1	303D_MSJL01

Source: https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx?LISTING_ID=65195

Comment 5. Summary: Commenter indicates that the permit violates federal anti-backsliding provisions by removing the ambient monitoring permitting condition (40 C.F.R. § 122.44(I)(1)).

Response to Comment 5:

The anti-backsliding provisions apply to discharge limits and conditions that directly regulate effluent quality. Ambient monitoring does not impact effluent quality. Therefore removing the monitoring requirement does not violate anti-backsliding.

Although the permit will not require ambient monitoring, Ecology will continue to have access to sufficient ambient data to evaluate the water quality impacts of the facility in future permits. Ecology maintains a long-term monitoring station approximately 4 miles SE of the Vashon outfall. King County, which has a lengthy history of ambient monitoring in the area and has committed to continue this monitoring as a member of the multi-jurisdictional Puget Sound Assessment and Monitoring Program, will continue to operate a long-term station approximately 4 miles N of the Vashon outfall. A permit requirement is not necessary to ensure adequate ambient data.

Comment 6. Summary: Commenter makes a number of statements related to the use of ambient monitoring data. One comment requests justification of use of long term monitoring station four miles north of the outfall. A later comment reiterates that ambient data from a station four miles

away is too far to be representative, and that the sample frequency is insufficient to capture day-to-day “natural chemical variability”. Commenter requests all data collected at Station LSNT01 and the monitoring dates and, if samples were not included in the analysis, an explanation for why they were not included.

Response to Comment 6:

Ecology considers LSNT01 to be representative of the ambient environment into which the Vashon facility discharges. Adding monitoring stations for each discharger and conducting daily monitoring to capture “day-to-day” variability is not feasible or necessary. Regarding the amount of data used to determine a representative background, in some cases there is a very large quantity of historical data and permit writers may select more recent monitoring years as representative of existing ambient conditions. In each case sufficient data quantity is used to derive a meaningful, representative ambient value. A date range for ambient data used in the reasonable potential evaluations in this permit has been specified in the Fact Sheet. Ambient data was obtained from the Receiving Water Characterization Study conducted by the King County NPDES Monitoring Program (June 2013, Final Report). Data from monitoring station LSNT01 is also available at the following link:

<http://green2.kingcounty.gov/marine/Download/SelectData/LSNT01>

Comment 7. Summary: Asks for all data used in calculations in the appendices.

Response to Comment 7:

Summary data used in the calculations is provided in Tables 2-4. Detailed monitoring data used in the preparation of this permit is also available directly to the public via the PARIS database website:

https://fortress.wa.gov/ecy/wqreports/public/f?p=110:1000:3017277712028761::NO:RP:P1000_FACILITY_ID,P1000_FACILITY_NAME:2908289,King%20County%20Vashon%20WWTP.

Comment 8. Summary: Why does Ecology limit the data being analyzed to that collected in the previous permit cycle? In Vashon’s case why not include data prior to 2011? Comment states that Ecology is “discarding” prior data.

Response to Comment 8:

Ecology conducts reasonable potential evaluations on monitoring data obtained under the requirements of the preceding permit. This data is most representative of currently existing effluent quality. Ecology may consider historical data on a case-by-case basis when more recent data yields ambiguous results. In addition, if an analysis based on more recent data concludes that a less stringent limit should be placed in the permit, Ecology will retain the more stringent limit from a previous permit to prevent backsliding.

Comment 9. Summary: Table 4 of the Fact Sheet does not include effluent ammonia.

Response to Comment 9:

The effluent ammonia value was included in Appendix E and has been added to Table 4.

Comment 10. Summary: The 2011 permit required monitoring for silver and toluene, yet the 2016 Fact Sheet does not address these parameters. Please explain.

Response to Comment 10:

The 2016 permit requires the monitoring of silver as part of priority pollutant metals reapplication monitoring requirements (see Monitoring Schedule Table in S2.A. and Appendix A). As for toluene, the volatile organic compound was not detected in any of the priority pollutant monitoring scans submitted during the previous permit cycle. Three consecutive scans were non-detect for toluene at a detection level of 1 $\mu\text{g/L}$. This is orders of magnitude lower than the toluene value cited in the 2011 Fact Sheet. Considering this, as well as the nature of the Vashon WWTP service area that contains no significant industrial users (aside from a tofu production facility), toluene monitoring was not added to the new permit requirements. Federal guidelines that automatically require expanded priority pollutant effluent scans (which include the monitoring of toluene) apply to facilities discharging over 1 MGD, whereas the Vashon facility has a design flow of 0.5 MGD.

Comment 11. Summary: Fact Sheet Table 2 does not state if the ambient ammonia value is a maximum, average, median or minimum. Please clarify.

Response to Comment 11:

The ammonia value is a maximum. This has been clarified in the Fact Sheet.

Comment 12. Summary: The Note at the bottom of Table 2 in the 2016 Fact Sheet states that “where possible, data from the vicinity of the outfall depth (-61 m +/- 26 m) was evaluated.” Please explain why this was done and if any data were excluded from the data set because of this and how that affected the conclusions drawn by Ecology in writing the draft permit.

Response to Comment 12:

Some long term monitoring stations track a limited set of parameters at depth. Including ambient data at all available depths from surface to seabed would provide a vertically-averaged view of ambient water quality. Because data at depth is available, focusing on data closer to the outfall itself is an attempt to obtain a more representative view of what ambient quality aquatic life might encounter closer to the acute and chronic mixing zones. Consequently and as stated in the footnote, ambient information for the indicated parameters did not include near surface data. This did not change the conclusions drawn by Ecology in drafting the permit.

Comment 13. Summary: Commenter requests example reasonable potential calculation and indicates that the wrong effluent data was used in the reasonable potential spreadsheet.

Response to Comment 13:

The process and formulas for determining reasonable potential and effluent limits in the spreadsheet are taken from the Technical Support Document for Water Quality-based Toxics Control, (EPA 505/2-90-001). A link to this source and the example calculations it contains have been added to the Fact Sheet. A link to Ecology spreadsheet tools is also provided so the public can see the coding in the calculated columns they contain. The Table 4 effluent data is correct, whereas during permit development the parameter header in the reasonable potential spreadsheet

was rearranged and not all of the data was reordered to match. Thank you for pointing out this error, it has been corrected.

Comment 14. Summary: Comment argues that the use of enhanced secondary and/or tertiary treatment for removal of nitrogen is AKART and cites the cases, *City of Bellingham v. Washington Ecology*, PCHB No. 84-211 and *Sierra Club v. Washington*, PCHB No. 11-184 in support.

Response to Comment 14:

Chapter 173-221 WAC establishes and defines AKART for domestic wastewater treatment plants by setting discharge standards which represent "all known, available, and reasonable methods" of prevention, control, and treatment for domestic wastewater facilities which discharge to waters of the state. The regulation defines secondary treatment as AKART for all domestic wastewater treatment facilities and establishes effluent quality requirements with respect to BOD₅, TSS, Fecal coliform, and pH. The regulation does not include nutrient removal in the definition of AKART for domestic wastewater facilities. The legal cases cited by the commenter do not apply broadly to all domestic wastewater facilities. The cases involved legal questions specifically applicable to the facilities or receiving waters involved in those cases.

Comment 15. Summary: Commenter questions Ecology's existing policies and practices regarding mixing zones. The letter specifically questions the size of the authorized mixing zone, the use of diffusers and the methods of modeling dilution.

Response to Comment 15:

This comment relates to Ecology's agency-wide policies and the State's WQ standards. Ecology developed this permit consistent with the State's water quality standards, the methods described in its Permit Writers' Manual, and relevant Federal laws and rules. Section III.C of the fact sheet includes thorough documentation on Ecology's decision to authorize the mixing zone for the Vashon WWTP. Chapter 6 of the permit writer's manual describes how Ecology uses mixing zones in evaluation the need for water quality based limits and Appendix C of the manual fully describe Ecology's policies and practices for conducting mixing zone analyses. The current Permit Writer's Manual and appendices are available at this location:

<https://fortress.wa.gov/ecy/publications/summarypages/92109.html>

Comment 16. Summary: Comment states that the Public Involvement Calendar website did not have the Vashon notice ("came up empty"), that the Public Notice itself didn't include a date, and that there was no e-mail address or individual identified to whom public comments should be sent.

Response to Comment 16:

A search of the Public Involvement Calendar shows that the Vashon public comment period was properly posted in the calendar and is still there as a record. The notice in the Seattle Times states that the open period for commenting is 30 days after the publication of the notice. The notice states that comments should be sent to the attention of the "Permit Coordinator" at the address given in the notice. It is true that no e-mail address was provided in the Vashon notice, however Ecology intends to add the e-mail address of the Permit Coordinator to notices in the future.