Fact Sheet for NPDES Permit WA0032247

Brightwater Wastewater Treatment Plant

Effective Date: March 01, 2018

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

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for the Brightwater WWTP, NPDES permit WA0032247, were available for public review and comment from January 10, 2018, until February 9, 2018. 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 closed, Ecology summarized substantive comments and provided responses to them. Ecology included the summary and responses to comments in this fact sheet as **Appendix H - Response to Comments**, and published 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

The Wastewater Treatment Division of King County's Department of Natural Resources and Parks owns and operates an advanced membrane bioreactor (MBR) wastewater treatment plant in south Snohomish County to treat domestic wastewater from residences and industries in north King County and south Snohomish County. Ecology issued the previous permit for the facility on June 10, 2011 with an effective date of August 1, 2011. That permit included effluent limits on 5-day biochemical oxygen demand, total suspended solids, pH, fecal coliform bacteria, and total residual chlorine. It also granted limited authorization for bypassing peak wet weather flows around the membrane treatment system and treating for treatment through a chemically enhanced primary treatment system. The proposed permit retains the same discharge limits as the previous permit and modifies the authorization for wet weather bypasses.

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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 summarized the responses to comments and any changes to the permit in **Appendix H**.

II. Background Information

A. Facility description

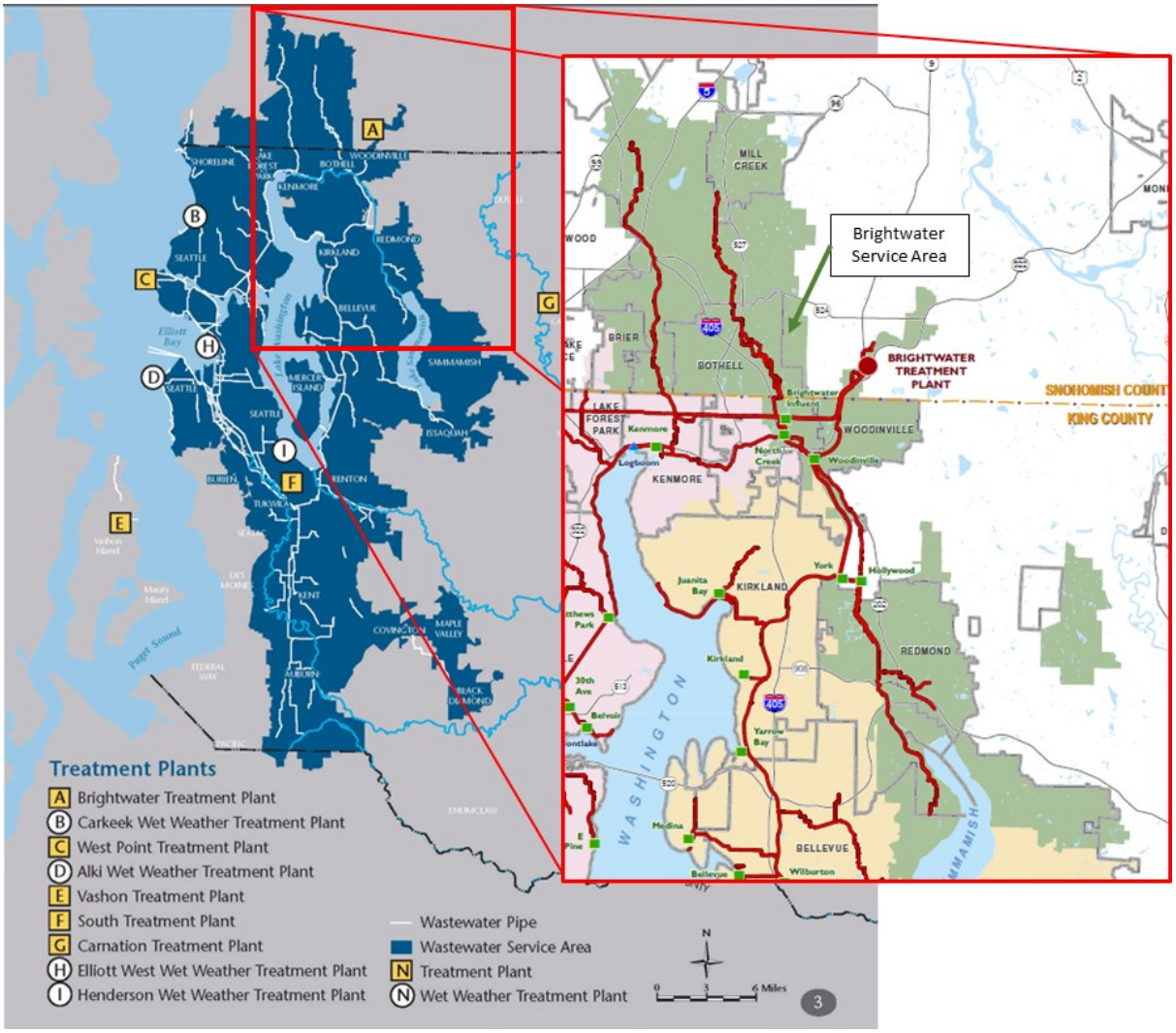
Table 1. General Facility Information

Facility Information	
Applicant	King County Dept. of Natural Resources & Parks Wastewater Treatment Division 201 S. Jackson Street Seattle, WA 98104-3855
Facility Name and Address	Brightwater Wastewater Treatment Plant (WWTP) 22505 State Route 9 SE Woodinville, WA 98072
Permit Administration Contact	Name: Jeff Lafer Telephone #: (206) 477-6315
Contact at Facility	Name: Matt Nolan Telephone #: (206) 263-9483
Responsible Official	Name: 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	Membrane Bioreactor
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.790397 Longitude: -122.141487
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Puget Sound through Outfall #1 Diffuser #1 Latitude: 47.777138 Longitude: -122.416949 Diffuser #2 Latitude: 47.776987 Longitude: -122.417957

History

In 1958, voters in Seattle and King County (County) created Metro, an agency charged with creating a regional wastewater conveyance and treatment system. In 1994, King County assumed authority of Metro and its legal obligation to treat wastewater for 34 jurisdictions and local sewer agencies throughout the Puget Sound region. The Wastewater Treatment Division (WTD) of the County's Department of Natural Resources and Parks (DNRP) oversees the administration and operation of the County's conveyance and treatment systems. The County's regional system serves approximately 1.6 million people in a 424 square mile area of western King County and portions on southwest Snohomish and northwest Pierce counties. The Brightwater wastewater treatment plant (WWTP) serves 67 square miles in the northeast portion of the regional service area stretching from the north end of Lake Sammamish to the City of Mill Creek in Snohomish County. The facility treats domestic sewage from a residential population of about 205,000 as well as wastewater from commercial, light industrial, and major industrial facilities.

Figure 1. Facility Location Map



The King County Council adopted the *Regional Wastewater Services Plan* (RWSP) under Ordinance 13680 in November 1999. That plan identified the need to construct a new 36- to 54-million gallon per day (mgd) wastewater treatment plant and conveyance system in north King County or south Snohomish County by 2010. A wide range of factors influenced the decision to build a third regional wastewater treatment plant, known as the Brightwater Treatment Plan. Factors included population growth, economic development, requirements for urban services, environmental and public health protection, capacity constraints within the County's existing treatment plants and conveyance facilities, and prevention of sanitary sewer overflows to Lake Washington.

Construction of the Brightwater WWTP and outfall conveyance system began in 2005. The County completed construction of the treatment plant in 2011 and began using it for treating wastewater in September 2011. Due to a delay in the construction of the outfall conveyance line, the County initially returned treated effluent from the facility to the collection system for conveyance to the County's South Wastewater Treatment Plant for additional treatment and disposal. Construction of the outfall conveyance line was completed in 2012 and the facility started discharging to Puget Sound in November 2012.

Ecology approved the original *Brightwater Regional Wastewater Treatment System Facilities Plan* in 2005. The facility plan described treatment facilities necessary to provide service through 2040 and beyond. Since 2005 the County has amended this facilities plan three times. The first amendment, approved by Ecology in 2007, proposed phased construction of tanks and equipment in four process areas. In addition to postponing construction of some treatment basins and solids handling equipment, the amendment proposed phased installation of membrane cassettes in the membrane bioreactor (MBR) process in two stages: Phase 1 - Initial to treat flows through 2016 design conditions and Phase 1 - Final to treat flows between the 2017 to 2040 design conditions. Phase 2 included installing the necessary equipment to accommodate full build-out conditions. The second amendment, approved by Ecology in 2008, revised the configuration of the outfall in Puget Sound. The most recent amendment, approved by Ecology in 2016, proposed altering the phased construction schedule for the facility and proposed modifying the wet weather operating strategies for the facility. The third amendment justified delaying the full installation of membranes (Phase 1 – Final) until 2030 based on revised flow and loading projections.

Collection system status

Table 2. Agencies Tributary to Brightwater WWTP

City or Sewer/Utility Districts	Percent of Agency Area in Brightwater Service Area	Calculated Residential Population in Brightwater Service Area (2015)
Alderwood Water And Wastewater District	71%	74,265
City of Bellevue	7%	9,779
City of Bothell	36%	4,086
City of Brier	31%	2,012
Cross Valley Water District	97%	86
Northeast Sammamish Sewer And Water District	100%	13,291
Northshore Utility District	1%	810
City of Redmond	96%	58,172
Silver Lake Water and Sewer District	12%	568
Woodinville Water District	90%	15,964

King County owns and operates the major sewer interceptors and pump stations that convey sewage collected by local sewer utilities to its regional wastewater treatment plants. The County has divided the service area into two administrative sections and three treatment service area. The West Section manages all conveyance and treatment system operations in areas tributary to the West Point WWTP, including the four combined sewer overflow treatment facilities and 38 CSO outfalls. The East Section manages conveyance and treatment operations for the South Treatment Plant service area and for the Brightwater WWTP service area. The East Section also oversees operations in the Carnation and Vashon service areas. In general, all collection systems within the East Section are separate sanitary sewer systems. The County's combined sewer collection systems are limited to the West Section and to the Rainier Valley area of Seattle that flows to the South Treatment Plant. Figure 1 shows the Brightwater Treatment Area and Table 2 above lists the local sewer utilities within that area.

The local sewer utilities listed above own, operate, and maintain the pipelines and other conveyance facilities within their service areas. The local collection systems feed into the County's network of trunk lines and pump stations that direct flow to the Brightwater Influent Pump Station (IPS) located in Bothell. The IPS pumps all flows from the Brightwater Treatment Area approximately 2.5 miles to the headworks at the Brightwater WWTP. The County monitors and controls the Brightwater collection system using a SCADA (Supervisory Control and Data Acquisition) system which is interconnected to their regional wastewater treatment system.

Inflow and infiltration

The King County Council approved the Regional Infiltration/Inflow (I/I) Control Program as part of its Regional Wastewater Services Plan. It was the first comprehensive investigation of I/I in the local agency service areas and relied on a cooperative partnership between the County and the 34 local sewer utilities serving the Seattle Metropolitan area. The program's goal was to use I/I control, when cost effective to do so, to reduce the amount of peak wet weather flow entering the County's conveyance system.

KC-WTD estimated the annual average rate of I/I at approximately 2.3 million gallons per day (MGD). The North Creek Interceptor (NCI), which the County acquired from the Alderwood Water and Wastewater District (AWWD), has generally been a major source of I/I directly into the County's system. In 2013 KC-WTD completed repairs of 17 manholes identified or suspected as sources of I/I. Flow monitoring conducted in early 2013, after completing repairs on the first seven manholes, showed a substantial reduction in I/I. KC-WTD also started work in 2015 to repair and replace the NCI. The work, which should be complete in early 2018, will increase capacity and reliability of the pipeline.

In addition to repairing manholes and working on the NCI, KC-WTD has coordinated with AWWD on I/I reduction efforts in their service area that is tributary to the NCI. In 2013 AWWD completed smoke testing in basins with higher than expected I/I and completed CCTV inspections in several basins that feed into the NCI. Based on this testing AWWD made several minor repairs to manholes. The district will continue to monitor side sewers identified as possible sources of I/I.

Industrial discharges

In addition to domestic sewage from residential and light commercial activities located within the service area, the treatment plant receives pretreated industrial wastewater from significant industrial users (SIUs) permitted by the County's Industrial Waste (IW) Program. Ecology delegated pretreatment authority to the County and approved its pretreatment program in April 1981. They last amended their pretreatment ordinances in September 2010. The permit renewal application identified three Non-Categorical SIUs and 15 Categorical Industrial Users (CIUs) as dischargers of pretreated wastewater in the Brightwater service area. Table 3 bellow lists those industrial dischargers.

Table 3. Pretreatment Industries

Name	City	Industrial Process	Categorical Pretreatment Standards	Permitted Process Wastewater Flow (gallons per day)
Aerojet Rocketdyne, Inc.	Redmond	Metal Finishing	40 CFR 433	27,195
CMC ICOS Biologics, Inc.	Bothell	Pharmaceutical Mfg.	40 CFR 439	12,000
Eldec Corp.	Lynnwood	Metal Finishing	40 CFR 433	12,000
Microsurgical Technology	Redmond	Metal Finishing	40 CFR 433	1,100
National Industrial Concepts	Woodinville	Metal Finishing	40 CFR 433	21,000
Precor, Inc. - Plant 2	Woodinville	Metal Finishing	40 CFR 433	13,000
Primus International - University Swaging Division	Woodinville	Metal Finishing	40 CFR 433	5,600
Prototron Circuits, Inc.	Redmond	Metal Finishing	40 CFR 433	32,000
Romac Industries, Inc.	Bothell	Metal Finishing	40 CFR 433	5,000
Sanofi-Aventis US, LLC.	Lynnwood	Pharmaceutical Mfg.	40 CFR 439	50,000
Spiration, Inc., dba Olympus Respiratory America	Redmond	Metal Finishing	40 CFR 433	500
Ste. Michelle Wine Estates	Woodinville	Food Processing - Winery	N/A	113,000
Terex Washington, Inc. - North Campus	Redmond	Metal Finishing	40 CFR 433	42,000
Terex Washington, Inc. - South Campus	Redmond	Metal Finishing	40 CFR 433	141,000
UniSea, Inc.	Redmond	Food Processing - Seafood	N/A	140,000
Universal Sheet Metal, Inc.	Woodinville	Metal Finishing	40 CFR 433	5,700
Total				**877,095**

Treatment processes

The Brightwater WWTP provides preliminary, primary, and secondary treatment of domestic wastewater prior to disinfection and discharge to Puget Sound. During wet weather events, when flows exceed capacity of the secondary process, a portion of the flow receives chemically enhanced primary treatment and bypasses the secondary treatment step. The flow bypassed during wet weather recombines with secondary effluent prior to disinfection and discharge. Appendix F includes a process flow diagram depicting the treatment units and shows how wastewater flows through the treatment facility.

Preliminary Treatment

The influent pump station (IPS), located approximately 2.5 miles southwest of the WWTP along 195th Street in Bothell, pumps sewage collected from the Brightwater service area through dual raw sewage lines to the headworks at the treatment plant site. Two flow meters, one per force main, measure the influent flow rate entering the plant. A composite sampler collects raw sewage samples from the influent lines as they discharge to the headworks. The influent lines discharge into the influent distribution channel, which evenly distributes flow to 10 mm screens. Internal process drains, pumped drainage, and pumped chemical drainage also routes to the influent distribution channel.

Screened influent flows move directly from the screen outlet channels to the aerated grit removal distribution channel. The channel distributes flow to aerated grit tanks that remove sand, grit and other heavy particles. Each grit tank has two cells; one receiving high-volume airflow that provides high turbulence and the other receiving low volume airflow with low turbulence. Each aerated grit tank is directly connected to a primary clarifier basin.

Primary Treatment

Primary treatment includes primary clarification and primary effluent screening. Flow from the grit chambers enters the primary clarifiers for primary solids removal. Troughs at the top of the clarifiers remove scum that raises to the water surface. Launders in the clarifiers collect primary effluent and directs it through the primary effluent control box to primary effluent screens. Under normal flow conditions all primary effluent passes through 2 mm screens to protect the membranes in the secondary process from damage from fine particles (hairs and fibers) that were not removed from by the coarse screens or primary clarifiers.

Secondary Treatment

The Brightwater WWTP uses a membrane bioreactor (MBR) system for secondary treatment. The MBR system consists of three aeration basins and eight membrane basins. The aeration basins provide for biological treatment of the wastewater. The membranes allow treated liquids to discharge from the system while retaining solids. Each membrane basin contains 20 cassettes of hollow-fiber membranes that have a design flux rate ranging between 10 to 17 gallons per square foot of membrane surface area per day. The membrane system is designed to operate with a nominal monthly average flow capacity of 30 MGD and a peak hour flow capacity of 44 MGD. MBR systems remove nearly all of the BOD_5 and TSS from the wastewater and achieves greater removal of dissolved pollutants (metals and toxic organic pollutants) than conventional secondary systems. The Brightwater WWTP is also designed to nitrify the wastewater to achieve low effluent ammonia concentrations, but does not remove total nitrogen through denitrification. Caustic soda is added to the Return Activated Sludge (RAS) conveyed to the aeration basins for alkalinity addition, and pH control in the final effluent.

The County considered multiple treatment alternatives during the initial facility planning of the Brightwater WWTP, including treatment using a conventional activated sludge (CAS) process and the MBR process. The analysis showed that, although the MBR process produces a superior effluent compared to CAS, it was cost prohibitive to construct a MBR plant sized to treat the projected peak hour flows with a 1 in 20-year recurrence interval. The County proposed, and Ecology approved, a treatment concept that bypasses flows exceeding the membrane capacity during wet weather around the secondary MBR system. The bypassed flow would instead receive chemically enhanced primary treatment (CEPT) and then would blend with MBR effluent prior to disinfection. The analysis demonstrated that this treatment configuration would still produce an effluent better than a CAS system and would achieve a net environmental benefit (NEB). The approved design of the Brightwater WWTP includes bypassing of wet weather flows that exceed a peak hour flow rate of 44 MGD or a 31-day average flow rate of 30 MGD and treating those flows with CEPT. Section V.H of this fact sheet and appendix G provide further details about this approved bypass of secondary treatment and the NEB limit.

Membrane flow capacity test performance data through 2015 demonstrated that the membranes may periodically have reduced capacity to pass peak flows at the design rate of 44 MGD during wet weather months due to reduced filterability of the plant's mixed liquor. Initial testing demonstrated that the plant can comply with the NEB limit when partially bypassing the MBRs during wet weather. However, since the membranes cannot consistently achieve a peak hour flow rate of 44 MGD, the plant has not reached the flow rates set in the existing permit that allow for the MBR bypass. The County has instead accommodated flows exceeding the operating capacity of the membranes through influent storage and diversion to the South Treatment Plant in Renton. Amendment Number 3 to the Brightwater Facility Plan proposed changing the basis for initiating a wet weather bypass from the original design flow values to a value calculated daily based on membrane performance testing. The County finalized this amendment in October 2016 and Ecology approved it on November 10, 2016.

Wet Weather Treatment

During wet weather periods influent flows to the treatment plant may exceed the operating capacity of the membranes. As noted above, although the MBR treatment system provides a superior effluent quality compared to the typical CAS process, it is cost prohibitive to construct a membrane plant sized to treat the projected peak hour flows with a 1 in 20-year recurrence interval. Ecology approved a design and operations strategy that uses a combination of storage, flow diversion to other treatment plants, and flow blending at the Brightwater WWTP to manage peak wet weather flows. Based on the approved strategy, operators first use the influent tunnel to store flows that exceed membrane capacity during wet weather. When storage capacity has been reached, operators will divert excess flow to the West Point and/or South treatment plants if those plants have available treatment capacity. If influent flows exceed the membrane capacity and the available capacity for storage and diversion to other treatment plants, operators will initiate a split flow mode that diverts a portion of the flow through CEPT and bypasses the MBR system.

The membranes installed at the Brightwater WWTP have a peak hour design flow capacity of 44 MGD, and are designed to operate at a maximum transmembrane pressure (TMP) of 8 pounds per square inch (psi). When the operating TMP of a basin approaches 8 psi, it goes into "TMP control mode." In this mode the MBR control system alters the permeate pumping rate to maintain TMP below the design maximum. Under TMP control mode the control system calculates "Currently Available MBR Capacity" as a function of the maximum design flow, the number of membrane basins in service, and the flow rate(s) that keeps the TMP near, and below, 8 psi. The control system automatically performs peak flow tests once daily on two MBR trains simultaneously to determine the "Current Available MBR Capacity". The 1-hour long performance test consist of five production cycles, with a backwash cycle between each production cycle and sets the membrane aeration to maximum air scouring to maximize permeate flow through the membranes. The peak flow test starts with the membrane flow rate set within 10 percent of the design peak hourly flow. If the basins do not reach the TMP limit during the test, the "Current Available Capacity" is the design peak hour capacity of 44 MGD. However if TMP control is activated during the test, the "Current Available Capacity" is calculated based on the average flow rate through the trains for the 1-hour period, including the backwash cycles.

Flows in excess of the "Current Available Capacity" of the membranes and the storage and diversion capacities described above is treated with CEPT. The CEPT process combines conventional primary sedimentation with chemical addition that enhances the wastewater solids settling rate and provides greater pollutant removal than conventional primary clarification. The control system for the individual sedimentation tanks select between conventional or CEPT modes based on influent flow rates. The tanks operating in CEPT mode receive a combination of the chemicals with flocculation occurring in the grit tanks. The original treatment alternatives analysis assumed BOD_5 and TSS removal efficiencies of 50% and 70%, respectively, for the CEPT process. Pilot testing, however, indicated TSS removals greater than 90% and BOD_5 removals greater than 68% are possible when operated at the projected maximum day flow conditions. CEPT effluent, when combined with MBR effluent, is expected to meet all permit limits. Aside from testing during the initial plant testing, the County has not used the CEPT process.

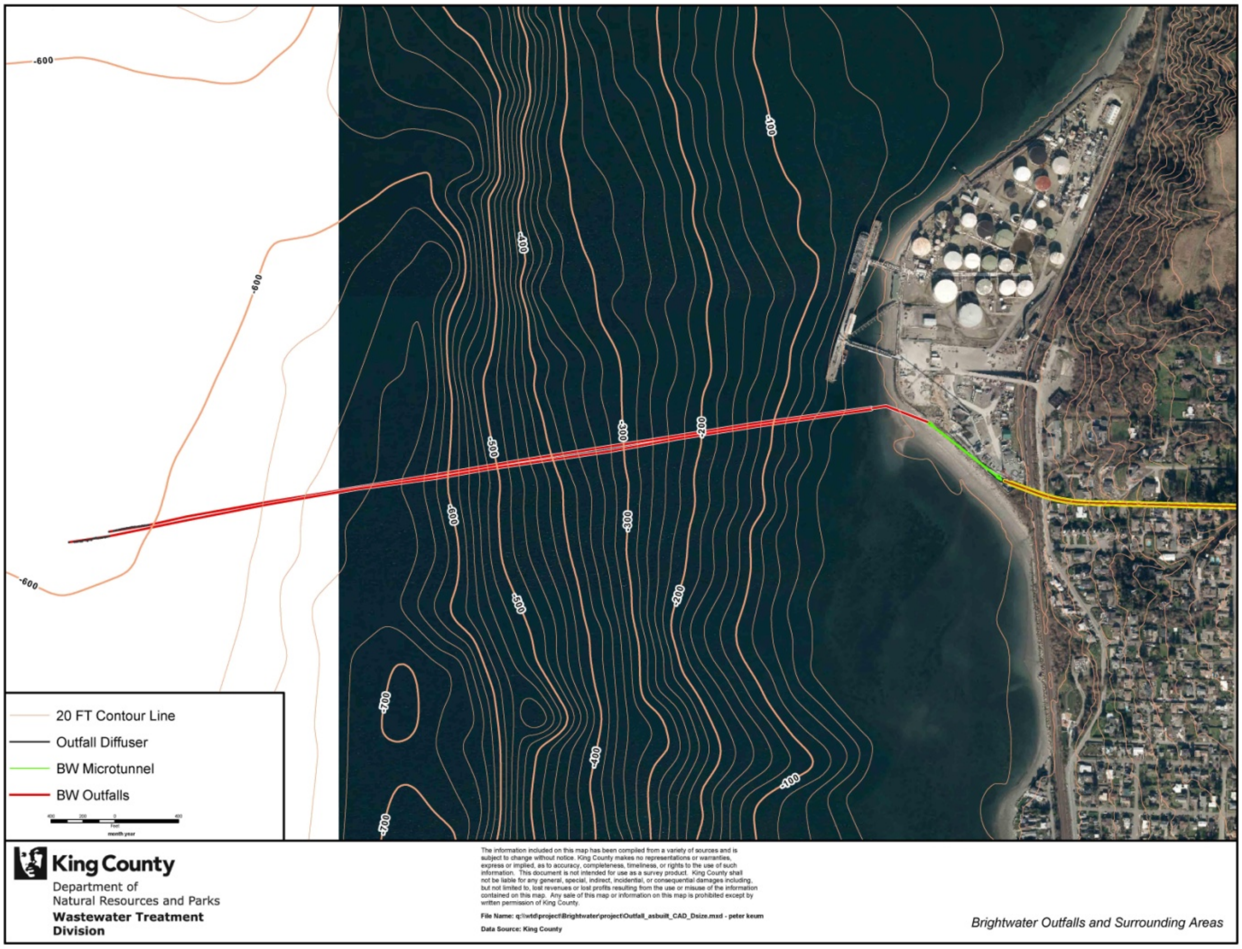
The CEPT process uses Ferric chloride as the primary coagulant added at the entrance of the aerated grit tank for the primary train operating in CEPT mode. Poly-aluminum chloride is added immediately downstream of the ferric chloride as a flocculent. After flocculation in the aerated grit tanks an anionic polymer is added at the entrance to the primary clarifier to strengthen the floc particle and enhance sedimentation. The CEPT collection channel conveys the bypassed flow to the effluent collection box where it receives a dose of sodium hypochlorite for disinfection before discharge to Puget Sound.

Disinfection

Membrane effluent is pumped to the Membrane Effluent Box in the Disinfection Building. The effluent box splits effluent flow to three separate use areas: onsite reuse as plant process water (C3 water), the reclaimed water distribution system (regulated under permit ST004598), and plant effluent. Flows exceeding the demand of the internal C3 reuse water system and the reclaimed water system is discharged as effluent. Sodium hypochlorite can be added to the final effluent at the membrane effluent box prior to discharge into the effluent collection box. Sodium hypochlorite under normal operations is added only at the effluent collection box. During wet weather conditions with CEPT operations, the CEPT flow blends with membrane effluent in the effluent collection box where additional sodium hypochlorite is added to the blended effluent prior to discharge to the effluent tunnel. The sodium hypochlorite dose also is increased as CEPT operations begin. The effluent tunnel between the Brightwater WWTP and the IPS provides the necessary contact time for disinfection. A continuous chlorine analyzer at the IPS monitors the effluent residual chlorine concentration and plant staff collect effluent samples at the IPS for fecal coliform testing.

Discharge outfall

Figure 2. Outfall location

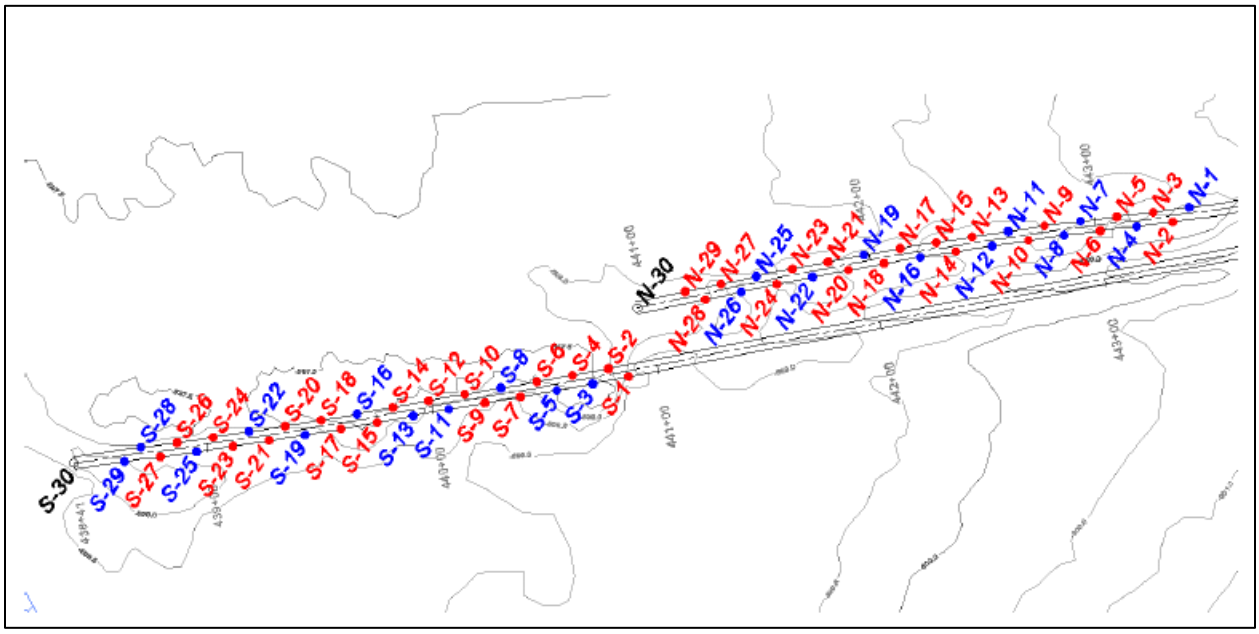


Treated and disinfected effluent from the Brightwater WWTP discharges to Puget Sound near Point Wells, approximately 13 miles west of the treatment plant location. Effluent flows by gravity from the IPS through the Brightwater Tunnel to the Point Wells Portal, locate along the shoreline at the southern edge of Point Wells. An 84-inch steel pipe conveys effluent from the portal approximately 800 feet in the near-shore environment before the line bifurcates into two, 63-inch diameter HDPE outfall pipes. The outfall lines extend approximately 5,200 feet into Puget Sound and terminate in twin 250-foot-long multi-port diffusers positioned end-to-end at a depth of 598 feet MLLW. The two diffusers are arranged in a staggered configuration to form a total diffuser length of 500 feet. Each diffuser is comprised of 30 diffuser ports. Twenty-nine of the ports are equally spaced along the diffuser at 8-foot intervals, directed 30 degrees from vertical in an alternating configuration. Each of these ports is constructed with a 9-inch HDPE riser with a 5.348-inch diameter opening. The risers elevate the effective discharge location to a depth of 594 feet MLLW. The final port is located on the end of the diffuser and is 5.76 inches in diameter. KC-WTD currently operates the outfall with 38 of the

60 diffusers open. The remaining 22 ports will be opened as part of a future (2040 or later) expansion project that will increase the facility design flow from 36 to 54 MGD.

As part of the outfall commissioning in September 2012, KC-WTD's contractor used a remotely operated vehicle to inspect the submerged portions of the outfall lines. The inspection noted that the pipelines were suspended over depressions in the seabed in a number of locations and that the pipe had rotated slightly as it sunk into place. The inspection also noted evidence of currents scouring bed sediments from the south side of the lines and depositing sediments on the north side. There was no evidence of damage or other structural defects to the line and the inspection team's biologist concluded that the outfall line serves as hard surface that is allowing marine organisms not typically found in the outfall area to become established. A review team for the outfall construction manager evaluated the inspection and determined that rotation and suspension were within acceptable tolerances. The reviewers recommended additional monitoring to track the settling of the pipeline and to ensure that settling does not result in structural problems.

Figure 3. North and South Diffusers (active ports colored red, inactive ports blue)



Residual solids

The Brightwater WWTP removes solids during the treatment at various locations. Solids removed by coarse screens at the headworks, fine screens after the primary clarifiers and grit removed by the aerated grit tanks are dewatered and disposed of as solid waste along with incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Primary sludge mixes with waste activated sludge and scum from secondary basins (aeration and membrane basins) in a raw sludge blend tank. Blended sludge is thickened with gravity belt thickeners then sent to digestion in anaerobic digesters along with scum from the primary clarifiers. After digestion the biosolids are dewatered using centrifuges and land applied under permits in King, Snohomish, Douglas, Yakima, Benton, and Klickitat counties.

B. Description of the receiving water

Water quality

Table 4. Ambient Data

Parameter (unit)	Min	Max	Mean	Median	St Dev
Conventional Parameters					
DO (mg/L) n = 254 [a]	5.6	12.9	--	8.0	--
pH (unitless) n = 108	7.5	8.0	7.7	7.7	0.1
Salinity (PSS) n = 262	26.061	30.719	29.175	29.431	0.932
Temperature (°C) n = 262	7.177	13.951	--	9.933	--
TSS (mg/L) n = 128	0.6	7.0	2.4	2.1	1.4
Metals (µg/L) n = 12 for all					
Arsenic, Total	1.11	1.41	1.29	1.33	0.10
Arsenic, Dissolved	1.15	1.43	1.33	1.37	0.09
Cadmium, Total	0.0636	0.0864	0.0732	0.0715	0.0064
Cadmium, Dissolved	0.0520	0.0734	0.0664	0.0693	0.0068
Chromium, Total	0.096	0.377	0.144	0.110	0.079
Chromium, Dissolved	0.092	0.150	0.114	0.110	0.020
Copper, Total	0.314	1.220	0.437	0.373	0.249
Copper, Dissolved	0.234	0.617	0.322	0.308	0.104
Lead, Total	0.007	0.046	0.020	0.014	0.015
Lead, Dissolved [b]	--	--	--	--	--
Mercury, Total [c]	0.00020	0.00055	0.00030	0.00026	0.00012
Mercury, Dissolved [d]	--	--	--	--	--
Nickel, Total	0.400	0.593	0.435	0.423	0.051
Nickel, Dissolved	0.387	0.443	0.408	0.407	0.016
Silver, Total [e]	0.016	0.030	--	--	--
Silver, Dissolved [e]	0.019	0.029	--	--	--
Zinc, Total	0.330	0.890	0.513	0.475	0.152
Zinc, Dissolved	0.170	0.694	0.438	0.417	0.187

[a]	"n" indicates the number of sample data points on which the presented statistics were calculated.
[b]	Dissolved lead was detected in 1 out of 12 samples at a concentration of 0.010 µg/L. The method detection limit for dissolved lead was 0.005 µg/L.
[c]	Total mercury was detected in 9 out of 12 samples. The minimum value for total mercury represents the lowest detected value. The method detection limit of 0.00020 µg/L was used as the value of the 3 undetected samples when computing the mean, median, and standard deviation.
[d]	Dissolved mercury was not detected in any of the 12 samples at a method detection limit of 0.00020 µg/L.
[e]	Total and dissolved silver were detected in 6 out of 12 samples. The minimum values for total and dissolved silver represent the lowest detected value. The method detection limit for silver was 0.010 µg/L. Due to the low number of detections, meaningful mean and median values cannot be presented.

The Brightwater WWTP discharges to Central Puget Sound near Point Wells. Other nearby point source outfalls include the following: stormwater runoff and treated groundwater from the Paramount Petroleum Richmond Beach Asphalt and Marine Fuels remediation site,

located less than one mile east at Point Wells; treated domestic wastewater from the Edmonds WWTP, located approximately 2.7 miles northeast in Edmonds; and treated domestic wastewater from the Kingston WWTP, located approximately 3.4 miles west in Appletree Cove. Significant nearby non-point sources of pollutants include urban stormwater runoff from areas within the cities of Shoreline and Edmonds and unincorporated areas of King and Snohomish Counties. Pollution from stormwater runoff in the area is regulated by general industrial and construction stormwater permits as well as Phase I (King and Snohomish Counties), Phase II (Shoreline and Edmonds), and WSDOT municipal stormwater permits. Section III.E of this fact sheet describes any receiving waterbody impairments.

The ambient data used for this permit includes the following from the June 2013 Receiving Water Characterization Study – King County NPDES Monitoring Program, prepared by King County DNRP – Marine and Sediment Assessment Group. Table 4 above summarizes data collected between January 2011 and December 2012 at the County's KSBP01 monitoring station, located approximately 2.0 miles south of the outfall.

During the 24-month sampling period from January 2011 through December 2012, fecal coliform bacteria were detected in 3 out of 24 samples. One sample had a bacteria count of 4 colony forming units per 100 milliliters (CFU/100 ml) and the other two samples had counts of 1 CFU/100 ml each. The calculated fecal coliform bacteria geometric mean for the 24-month sampling period is 1 CFU/100 ml.

Ecology also used ambient data for ammonia from its core marine monitoring station located approximately 7.5 miles northwest of Point Wells at the south end of Admiralty Inlet (Station ADM003: 47.8792°,-122.4818°). Ambient ammonia concentrations in the area are 34 μg/L based on data collected between 1990 and 2008.

Sediment quality

KC-WTD performed extensive baseline sediment testing in the vicinity of the Brightwater WWTP outfall prior to its construction and commissioning. An initial sediment survey was completed as part of the outfall siting study in 2001. Between 2006 and 2007, a two-year baseline characterization study was completed to partially fulfill requirements for an aquatic lands lease from the Washington State Department of Natural Resources and for the Hydraulic Project Approval permit from Washington State Department of Fish and Wildlife. In October 2011 KC-WTD conducted the fourth and final sediment sampling near the outfall to complete sediment characterization. Objectives of the study were to characterize the spatial distribution of sediment chemical concentrations near the outfall location before discharges from the treatment plant started and to compare the results to sediment quality chemical criteria. The study also analyzed the diversity of benthic organisms observed during each sampling events.

The 2011 study detected seven of eight trace metals with marine chemical criteria in the state's Sediment Management Standards (WAC 173-204) and 17 of 39 organic compounds with marine chemical criteria. All detected concentrations were lower than the Sediment Quality Standard for each pollutant. The study also determined that a consistent variety of benthic organisms exist throughout the study area, with mollusks and crustaceans dominating. Appendix E includes a summary of results from the chemical and benthic organism evaluations done as part of the 2011 study.

C. Wastewater influent characterization

KC-WTD monitors influent flow and waste loading at the Brightwater WWTP to verify actual loadings do not exceed approved design capacities. Table 5 summarizes loading to the facility from the period of September 2011 through September 2016. Appendix E contains complete data for all influent monitoring reported by the facility.

Table 5. Influent Loading Summary

Parameter	Average Value	Maximum Value
Monthly Average Daily Flow	15.9 MGD	24.1 MGD
Monthly Maximum Daily Flow	18.9 MGD	32.2 MGD
Monthly Average 5-day Biochemical Oxygen Demand (BOD_5)	316 mg/L 40,296 lbs/day	513 mg/L 53,292 lbs/day
Monthly Average Total Suspended Solids (TSS)	283 mg/L 36,382 lbs/day	709 mg/L 67,305 lbs/day

D. Wastewater effluent characterization

KC-WTD reported in the permit application and DMRs concentrations of pollutants discharged to Puget Sound via outfall 001. Table 6 summarize effluent data for routinely monitored parameters, as reported in DMRs between November 2012 and September 2016, which represents the timeframe that the facility discharged effluent to Puget Sound. Effluent produced at the facility between September 2011 and October 2012 was discharged to KC-WTD's South WWTP for further treatment. Table 7 summarizes expanded testing for conventional and non-conventional pollutants as well as detected priority pollutants. Appendix E includes complete discharge monitoring data submitted by KC-WTD through DMRs.

Table 6. Outfall 001 Monitoring Data, Common Parameters

Parameter	Average Value	95th Percentile Value
Monthly Average Flow	16.2 MGD	21.6 MGD
Monthly Average BOD_5 [a]	<1.3 mg/L <182 lbs/day >99.6% removal	<2.0 mg/L <306 lbs/day
Monthly Average TSS [a]	<2.0 mg/L <271 lbs/day >99.3% removal	<2.0 mg/L <359 lbs/day
Monthly Geometric Mean of Fecal Coliform Bacteria	0.5 cfu/100 mL	1.4 cfu/100 mL
Typical pH Range	6.4 – 7.3	—
Monthly Average Residual Chlorine	0.13 mg/L	0.18 mg/L
Monthly Maximum Ammonia	0.9 mg/L-N	2.3 mg/L-N
Monthly Average Nitrate+Nitrite	30.8 mg/L-N	37.0 mg/L-N
Monthly Average Total Kjeldahl Nitrogen	1.7 mg/L-N	2.5 mg/L-N
Monthly Average Total Phosphorus	4.5 mg/L-P	5.7 mg/L-P
Monthly Average Ortho-phosphate	4.3 mg/L-P	5.3 mg/L-P
Temperature, Daily Maximum	66.1 °F (18.9 °C)	74.6 °F (23.7 °C)
[a] Results for BOD_5 and TSS were typically below detection limits.		

Table 7. Outfall 001 Expanded Effluent Characterization

Parameter	Units	# of Samples	Average	Maximum
Dissolved Oxygen	mg/L	365	5.1	8.7
Oil and Grease	mg/L	10	<1.58	2
Total Dissolved Solids	mg/L	3	398	408
Hardness	mg/L		58	65
Antimony	µg/L	10	<0.349	0.75
Arsenic	µg/L	10	0.966	1.07
Cadmium	µg/L	10	<0.06	0.15
Chromium	µg/L	10	0.5	0.58
Copper	µg/L	10	8.13	12.1
Lead	µg/L	10	0.552	2.97
Mercury	µg/L	10	0.0012	0.0015
Nickel	µg/L	10	1.88	2.93
Selenium	µg/L	10	<0.501	0.51
Zinc	µg/L	10	40.9	51
Total Phenolic Compounds	mg/L	10	<0.044	0.08
Chloroform	µg/L	5	14.9	31.5
Dichlorobromomethane	µg/L	5	<0.282	4.65
Phenol	µg/L	6	<0.683	1.6
2,4,6-trichlorophenol	µg/L	6	<0.523	0.6
bis(2-Ethylhexyl)phthalate	µg/L	6	<0.455	1.54
Di-N-butylphthalate	µg/L	6	<0.143	0.21
Diethylphthalate	µg/L	6	<0.192	0.366

Whole effluent toxicity testing

Between March 2013 and January 2015, KC-WTD conducted several acute and chronic toxicity tests for initial effluent characterization and for permit reapplication purposes. Acute toxicity tests were conducted with Daphnia pulex and fathead minnow. All but one acute test showed greater than 90% survival in 100% effluent and no toxicity at the acute critical effluent concentration (ACEC). Ecology determined that the one test with less than 90% survival (sample date of March 18, 2013) was anomalous and rejected the results.

Chronic toxicity tests were conducted with Atlantic mysid and topsmelt. All chronic toxicity tests showed no chronic toxicity at the chronic critical effluent concentration (CCEC). Appendix E includes summarized results of the acute and chronic toxicity tests.

E. Permit status and compliance summary

Ecology issued the previous permit for this facility on June 10, 2011, with an effective date of August 1, 2011. KC-WTD submitted an application for permit renewal on July 30, 2015, and Ecology accepted it as complete on February 17, 2016. The permit was set to expire on July 31, 2017, but has been administratively extended.

The previous permit placed effluent limits on $BOD_{5,}$ TSS, fecal coliform bacteria, pH and total residual chlorine. The Brightwater WWTP has generally complied with the effluent limits and permit conditions throughout the duration of the previous permit. KC-WTD

reported one effluent limit violation during the permit term; a violation of the daily minimum pH limit of 6.0 in November 2014 (reported value of 5.8). The county has also had occasional late submittals of DMRs and written reports between 2012 and 2015, however this has not been a chronic issue. Ecology assessed compliance based on its review of the facility's information in the Ecology Permitting and Reporting Information System (PARIS), discharge monitoring reports (DMRs) and on inspections.

The most significant violations associated with the Brightwater WWTP permit have been related to recurring overflows from the North Creek Interceptor in Bothell. In May 2013 Ecology issued a $22,000 penalty for nine separate overflow events between November 2012 and January 2013. The overflows impacted North Creek either through direct discharges to the creek or indirect discharges through a wetland that drains to the creek.

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

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

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for this facility's treatment plant in the *Brightwater Regional Wastewater Treatment System Facilities Plan* dated May 2005 and prepared by CH2M-Hill. Amendment number 3 to the *Brightwater Regional Wastewater Treatment System Facilities Plan*, dated October 2016 and prepared by Brown and Caldwell, revised the projected flows and loadings to the plant and modified the schedule for phased capacity increases at the plant. The original facilities plan proposed expanding treatment capacity in 2016. The revised projections presented in amendment number 3 demonstrated that the existing facility has sufficient treatment capacity for the near term and that KC-WTD can delay expanding treatment until 2030. Table 8 below includes design criteria from the referenced reports.

Table 8. Design Criteria for King County Brightwater WWTP

Parameter	Design Quantity
Plant Maximum Month Design Flow (MMDF)	40.9 MGD
Membrane Design Capacity for Average Month	30 MGD
Peak Hour Membrane Capacity[1]	44 MGD
Plant BOD_5 Loading for Maximum Month	66,063 lbs/day
Plant TSS Loading for Maximum Month	61,400 lbs/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, BOD_5, and TSS, as listed in chapter 173-221 WAC. Section III.F of this fact sheet describes the potential for water quality-based limits.

[1] The installed membranes have a rated capacity of 44 MGD for a peak hour flow at a design TMP of 8 psi. Actual membrane capacity may be lower due to the characteristics of the mixed liquor produced in the aeration basins. The membrane control system calculates the plant's available membrane capacity each day based on daily membrane performance testing.

Table 9. 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.	
Total Residual Chlorine	0.5 mg/L	0.75 mg/L
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

Ecology 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. 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.

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 BOD_5 and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

where:

CL = Technology-based concentration limits listed in the above table

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 10. Technology-based Mass Limits

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
BOD_5 Monthly Average	30	10,233
BOD_5 Weekly Average	45	15,350
TSS Monthly Average	30	10,233
TSS Weekly Average	45	15,350

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

In 1992, U.S. EPA published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State in its National Toxics Rule (40 CFR (EPA, 1992). Ecology submitted a standards revision for 192 new human health criteria for 97 pollutants to EPA on August 1, 2016. In accordance with requirements of CWA section 303(c)(2)(B), EPA finalized 143 new and revised Washington specific human health criteria for priority pollutants, to apply to waters under Washington's jurisdiction. EPA approved 45 human health criteria as submitted by Washington. The EPA took no action on Ecology submitted criteria for arsenic, dioxin, and thallium. The existing criteria for these three pollutants as adopted in the National Toxics Rule (40 CFR 131.36) remain in effect.

These newly adopted criteria, located in WAC 173-201A-240, 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)(a)(ii-iii) or WAC 173-201A-400(7)(b)(ii-iii)].

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

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 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 Brightwater 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.

Table 11. Critical Conditions Used to Model the Discharge

Critical Condition	Value
Water depth at MLLW	594 feet
Density profile with a difference of 0.96 sigma-t units between 185 m (607 ft) and the surface	
Range of 90th percentile current speeds between 0 – 200 m (0 – 656 ft) for acute mixing zone	28 – 35 cm/sec
50th percentile current speeds for chronic and human health mixing zones	14 cm/sec
Maximum average monthly effluent flow for chronic and human health non-carcinogen	51 MGD
Annual average wet weather flow for human health carcinogen	36 MGD
Maximum 1-hr design flow for acute mixing zone	130 MGD
1 DAD MAX effluent temperature range between 0 – 185 m (0 – 607 ft)	8.26 – 8.42 °C
Number of operating diffuser ports	38

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.

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from the *Effluent Dilution Modeling for Brightwater Treatment Plant Outfall* study prepared by KC-WTD in July 2015.

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 mixing zone.

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

8. Acute mixing zone.

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

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

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

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

- **Comply with size restrictions.**

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

9. Overlap of mixing zones.

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 12. 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	• 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 use* is primary contact recreation.

The recreational uses for this receiving water are identified below.

Table 13. Recreational Uses

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

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

E. Water quality impairments

Ecology has not documented any water quality impairments in the receiving water in the vicinity of the outfall. The current Water Quality Assessment includes the following listings near the outfall:

Listing 49002, Category 2 (Waters of Concern) listing for dissolved oxygen
https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx?LISTING_ID=49002

Listing 45594, Category 1 (Meets Standards) for bacteria
https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx?LISTING_ID=45594

Listing 65344, Category 1 for temperature
https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx?LISTING_ID=65344

Ecology also has Category 2 listings for sediments in the general region of the outfall for the following parameters: Bis(2-Ethylhexyl)phthalate, benzoic acid, and 4-methylphenol.

The above listings do not require development of a TMDL or waste load allocations as they are not impairment listings. Category 1 listings demonstrate that the water body complies with applicable water quality criteria for the listed parameter. Although a Category 2 listing in a water body results from tests that suggest the water body may not comply with water quality criteria for the listed parameter, Ecology has determined that the tests do not provide sufficient evidence to consider the water impaired.

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

Ecology must consider the narrative criteria described in WAC 173-201A-160 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 BOD_5 is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge 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 Brightwater outfall consists of twin 250-foot-long multi-port diffusers, positioned end-to-end, at a depth of -598 feet MLLW. The diffusers are offset by approximately 10 feet and arranged in an end-to-end configuration to form an effective 500-foot long diffuser. Each diffuser consists of 30 ports. Twenty-nine ports with 5.348-inch openings discharge laterally on alternating sides of the pipe at 8-foot intervals. The final port on each diffuser is a 5.67-inch end port positioned 22 feet from the nearest lateral port. Flow from diffuser ports exit through risers that extends 9 inches above the 60-inch diameter pipe, placing each discharge port elevation at -594 feet MLLW. The outfall currently has 38 of the 60 outfalls open. Figure 3 in Section I shows the port configuration of the outfall diffuser.

Chronic Mixing Zone--WAC 173-201A-400(7)(b) specifies that mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports and may not occupy more than 25% of the width of the water body as measured during MLLW. Given the discharge depth of -594 feet, The horizontal distance of the chronic mixing zone extends 794 feet from each port.. 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. Therefore the acute mixing zone extends 79.4 feet in any direction from any discharge port.

KC-WTD prepared an updated dilution model of the Brightwater outfall in July 2015 and submitted it with the permit application. The model used the UM3 and RSB components of the VISUAL PLUMES model and followed mixing zone modeling guidance in Ecology's Permit Writer's Manual. The model predicted the available dilution for aquatic life and human health criteria based on the critical conditions shown in Table 14.

Table 14. Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	115	238
Human Health, Carcinogen		511
Human Health, Non-carcinogen		415

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

Dissolved Oxygen--BOD_5 and Ammonia Effects--Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The BOD_5 of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

As noted earlier (Section III. E.), Ecology has listed the receiving water in the vicinity of the outfall as a "water of concern" for dissolved oxygen. Studies of anthropogenic impacts to dissolved oxygen in Puget Sound are ongoing. As modeling improves, Ecology will develop a coordinated permitting strategy to address dissolved oxygen issues within the Puget Sound basin. That effort may result in limits on BOD_5 and nitrogen in the Brightwater WWTP discharge. Until those efforts are complete, we will continue to evaluate discharges based on their reasonable potential to impact dissolved oxygen at the edge of the chronic mixing zone.

With technology-based limits, this discharge results in a small amount of biochemical oxygen demand (BOD_5) relative to the large amount of dilution in the receiving water at critical conditions. Ecology used a temperature-adjusted dissolved oxygen sag calculation to evaluate the potential change in dissolved oxygen at the edge of the chronic mixing zone. The analysis used the technology-based BOD_5 effluent limit of 45 mg/L (weekly average) as the effluent BOD_5 concentration, the average effluent dissolved oxygen and minimum ambient dissolved oxygen concentrations, and the estimated travel time of 39 minutes to the edge of the mixing zone. This analysis indicated no change in dissolved oxygen concentration at the edge of the mixing zone compared to ambient concentrations. Therefore the technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

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

Fecal Coliform--Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml, an ambient concentration of 1 organism per 100 ml, and a dilution factor of 238. Under critical conditions, modeling predicts that the discharge would increase fecal coliform concentration to 3 organisms per 100 ml at the edge of the chronic mixing zone, well below the water quality criteria value of 14 organisms per 100 ml (see Appendix D). Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

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.

Monitoring conducted by KC-WTD at the Brightwater WWTP between 2012 and 2016 revealed detectable concentrations of the following toxic pollutants: ammonia, arsenic, cadmium, chlorine, chromium, copper, lead, mercury, nickel, selenium, and zinc. Only hexavalent chromium is toxic to aquatic life in the marine environment, however the effluent data does not specify which chromium species was detected. For this analysis Ecology use the conservative assumption that all detected chromium is hexavalent.

Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards. KC-DNRP's June 2013 *Receiving Water Characterization Study* contained valid ambient data necessary to calculate an appropriate ammonia criteria and provided background concentrations of the following pollutants: arsenic, cadmium, chromium (assumed to be hexavalent chromium), copper, lead, mercury[2], nickel, and zinc. Ecology also used data from its long-term monitoring station at the south end of Admiralty Inlet (Station ADM003: 47.8792, -122.4818) for the ambient concentration of ammonia. No valid ambient data were available for chlorine and selenium and ecology used zero for background concentrations for these parameters.

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

Temperature – The state temperature standards for marine waters (WAC 173-201A-210) include multiple elements:

- Annual 1-Day maximum criteria
- Incremental warming restrictions
- Protections against acute effects

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

Annual 1-Day maximum criteria

Each marine 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 water column temperatures. The threshold criteria apply at the edge of the chronic mixing zone. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual

[2] Although the County's ambient monitoring detected total mercury in the receiving water, it did not detect dissolved mercury. Ecology's analysis is based on the presence of dissolved metals and, therefore, it used an ambient concentration of zero for mercury.

maximum temperature (1-DMax). Ecology concludes that there is no reasonable potential to exceed the temperature standard when the mixture of ambient water and effluent at the edge of the chronic mixing zone is less than the criteria of 13°C.

Incremental warming criteria

The water quality standards also 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 (T_i), calculated as:

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

This increment is permitted only to the extent doing so does not cause temperatures to exceed the annual maximum criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition. When Ecology has not yet completed a TMDL to address documented temperature impairments, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

Temperature Acute Effects

1. Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C; unless a dilution analysis indicates ambient temperatures will not exceed 33°C 2-seconds after discharge.
2. 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.
3. 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

Ecology calculated the reasonable potential for discharges from the Brightwater WWTP to exceed the annual 1-Day maximum temperature and incremental warming criteria at the edge of the chronic mixing zone during critical conditions. As shown in Appendix D, Ecology predicts that the discharge will increase temperature in the vicinity of the outfall by 0.04° C to a temperature of 13.99° C.

The maximum ambient temperature reported in KC-DNRP's June 2013 *Receiving Water Characterization Study* was 13.95 °C for the region around the outfall. Since this temperature exceeds the water quality criteria of 13.0 °C, the maximum allowable

incremental warming for the discharge is 0.3 °C. As noted above, Ecology predicts the discharge to cause an incremental temperature increase of 0.04°C, which is well within the allowable incremental change. Based on the predicted temperature and incremental change at the edge of the chronic mixing zone, there is no reasonable potential for discharges from the Brightwater WWTP to exceed water quality standards and no temperature limit is needed.

Ecology also considered the acute effects the discharge may have in the receiving water. The Brightwater WWTP discharges treated domestic wastewater that traditionally does not approach temperatures near 33°C. Therefore, no reasonable potential exists for instantaneous lethality. Furthermore, ambient records do not indicate that receiving water temperatures approach 17.5°C or 23°C.

H. Human health

Washington's water quality standards include numeric human health-based criteria that Ecology must consider when writing NPDES permits. In accordance with the requirements of CWA section 303(c)(2)(B), EPA has finalized 144 new and revised Washington-specific human health criteria for priority toxic pollutants, to apply to waters under Washington's jurisdiction, and has approved 45 new human health criteria submitted by Washington. For arsenic, dioxin, and thallium, the existing criteria from the National Toxics Rule (40 CFR 131.36) remain in effect.

Priority pollutant monitoring at the Brightwater WWTP identified that the discharge contains the following pollutants that are toxic to human health: antimony, arsenic, mercury, nickel, selenium, bis(2-ethylhexyl)phthalate, chloroform, dichlorobromomethane, diethylphthalate, di-n-butyl phthalate, phenol, and 2,4,6-trichlorophenol. Only the inorganic forms of antimony and arsenic are toxic to human health, however the effluent data does not specify which form of these compounds are found in the effluent. For this analysis we made a conservative assumption that all antimony and arsenic in the effluent is inorganic.

Ecology used all applicable receiving water data to evaluate the discharge. Valid ambient background data were available from KC-DNRP's June 2013 *Receiving Water Characterization Study* for the following pollutants: nickel, mercury, diethylphthalate, and di-n-butyl phthalate. No valid ambient data was available for the remaining parameters and ecology used zero for background concentrations for them.

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

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. https://www.ecy.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups

KC-WTD conducted four different baseline sediment studies at the location of the Brightwater WWTP outfall between 2001 and 2011. The studies provided data on the sediment characteristics and benthic organism diversity present at the site before discharging began. These studies showed that the sediments do not contain pollutants at concentrations close to the chemical criteria listed in the Sediment Management Standards and that there is diversity in benthic organisms.

Ecology considers discharges with the following characteristics to be a low risk for causing adverse sediment impacts: is a freshwater discharge to marine water; has received secondary treatment or equivalent; and discharges into an area with an average tidal velocity of 1 cm/s or greater. The discharge from the Brightwater WWTP meets each of these conditions. The effluent is generally a freshwater from a sewage treatment facility that uses better than secondary treatment. The mixing zone analysis demonstrated that the average current speed near the outfall is between 9 cm/s and 14 cm/s. Furthermore, the facility typically discharges an effluent with little to no TSS that could settle onto the sediments near the outfall. Based on these characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards and will not require sediment monitoring in the proposed permit. Ecology may include sediment monitoring in a future permit.

J. Whole effluent toxicity

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

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

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

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute or chronic toxicity. The proposed permit will not include an acute WET limit. KC-WTD must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization. KC-WTD may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing and/or chemical analyses after the process or material changes have been made. Ecology recommends that the Permittee check with it first to make sure that Ecology will consider the demonstration adequate to support a decision to not require an additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased.

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 Brightwater 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 June 10, 2011

The following tables compare the limits from the existing permit and the proposed permit.

Table 15. Comparison of Previous and Proposed Effluent Limits

	Previous Effluent Limits: Outfall # 001		Proposed Effluent Limits: Outfall # 001	
Parameter	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand (5-day)	30 mg/L 10,233 lbs/day 85% removal	45 mg/L 15,350 lbs/day	30 mg/L 10,233 lbs/day 85% removal	45 mg/L 15,350 lbs/day
Total Suspended Solids	30 mg/L 10,233 lbs/day 85% removal	45 mg/L 15,350 lbs/day	30 mg/L 10,233 lbs/day 85% removal	45 mg/L 15,350 lbs/day
Total Residual Chlorine	0.5 mg/L	0.75 mg/L	0.5 mg/L	0.75 mg/L

Parameter	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**	**Monthly Geometric Mean Limit**	**Weekly Geometric Mean Limit**
Fecal Coliform Bacteria	200/100 mL	400/100 mL	200/100 mL	400/100 mL
Parameter	**Daily Limit (min-max)**		**Daily Limit (min-max)**	
pH	6.0 – 9.0		6.0 – 9.0	

IV. Monitoring Requirements

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

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, 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 92-109) for large (>5.0 MGD) activated sludge plants and with other KC-WTD treatment plants, except for fecal coliform bacteria. Ecology proposes a reduced frequency of 5 days per week for fecal coliform due to consistent results near zero in past monitoring. In addition, Ecology has included monitoring of nutrients in the proposed permit.. It will use this data in the future as it 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.

As a pretreatment publicly owned treatment works (POTW), KC-WTD is required to sample influent, final effluent, and sludge for toxic pollutants to determine if pollutants interfere with the treatment process or pass-through the plant to the sludge or the receiving water. Sampling is also used to determine if changes are needed for local limits.

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). KC-WTD uses the accredited lab at their South WWTP for most compliance monitoring. Ecology accredited the laboratory at the South WWTP (Accreditation #W687) for general chemistry and microbiology parameters in non-potable water. The facility is also accredited for some general chemistry parameters in solid and chemical materials. Priority pollutant and toxicity testing is conducted by King County's Environmental Lab (#G656). Complete lists of accredited parameters and methods for both labs are available through Ecology's searchable Lab Accreditation database at the following web addresses.

South WWTP:
https://fortress.wa.gov/ecy/laboratorysearch/SearchLabName.aspx?CompanyID=687

King County Environmental Lab:
https://fortress.wa.gov/ecy/laboratorysearch/SearchLabName.aspx?CompanyID=656

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 KC-WTD 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 influent flow and loading of BOD_5 and TSS to the plant's rated design capacities for those parameters. The condition also requires KC-WTD to submit a Wasteload Assessment Report once during the permit term to compare actual influent flows and loadings to design ratings. In addition to comparing actual loading to design capacities, the assessment must evaluate if flows and loadings are consistent with projections presented in Amendment No. 3 to the facility plan. The report must also provide an overview of I/I monitoring and improvement measures planned or implemented for the service area contributing flows to the Brightwater WWTP.

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

The previous permit required KC-WTD to review the O&M manual for the Brightwater WWTP annually and to send a letter to Ecology each year to verify that review. The proposed permit retains the requirement for an annual review of the manual, however it removes the requirement for submitting a letter to verify the review. It instead requires KC-WTD to submit an up-to-date electronic copy of the Brightwater O&M manual. KC-WTD must also submit an electronic copy of any substantive changes made to the manual during the next permit term for Ecology's review and approval.

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 the 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 biosolids 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. KC-WTD submitted a local limit evaluation report for the Brightwater service area in October 2017. The report reviewed data from 2015 to 2016 to assess whether existing local limits are sufficiently protective for the treatment plant. The report concluded that the County's existing local limits are appropriate for the Brightwater service area.

E. Solid wastes

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

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

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. Spill plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080]. In May 2011 KC-WTD developed an emergency response plan that included plans for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the facility to review this plan annually and update the plan as necessary.

H. Wet weather bypass approval

Ecology reviewed and approved the facility plan for the Brightwater WWTP in June 2005. At the time of the plant's planning and initial design there was a national debate regarding the use of bypassing to manage peak wet weather flows. Although the federal "bypass regulation" prohibits the bypass of waste streams from any portion of the treatment process except under certain conditions [40 CFR §122.41(m)], NPDES permitting authorities throughout the county had varying interpretations and inconsistent application of the bypass regulation.

To restore consistency EPA proposed a policy entitled *National Pollutant Discharge Elimination System (NPDES) Permit Requirements for Municipal Wastewater Treatment Discharges During Wet Weather Conditions* in November 2003, referred to as the draft "blending policy." This early draft recognized the challenges utilities face managing wet weather flows. In response to significant comments on the flow blending policy, EPA published the Proposed Peak Wet Weather Policy in the *Federal Register* On December 22, 2005 (70 FR 76013). The revised policy addressed NPDES permit requirements for peak wet weather discharges from publicly owned treatment works (POTWs). It followed the joint recommendations of the Natural Resources Defense Council (NRDC) and the National Association of Clean Water Agencies (NACWA) and was substantially different from the 2003 draft flow blending policy.

To date EPA has not finalized the policy. As such, the proposed permit enforces the existing bypass regulation. The existing regulation allows the NPDES permitting authority to approve an anticipated bypass, after considering the adverse effects of the bypass, if the bypass meets the following conditions:

- Is necessary to prevent loss of life, personal injury, or severe property damage;
- No feasible alternative to bypassing exists;
- The permittee provides notice of the bypass.

Ecology determined that KC-WTD's bypass and blending of peak wet weather flows at the Brightwater WWTP meets the conditions necessary for approval as an anticipated bypass. The proposed permit authorizes the diversion of flows exceeding the available membrane capacity through CEPT and blending with membrane effluent prior to disinfection and discharge to Puget Sound. Since actual membrane performance at any given time may differ from the performance during the daily peak flow test, the proposed permit allows operators to initiate a bypass when influent flow rates are within 10% of the calculated available capacity. Prior to initiating a bypass, KC-WTD must first maximize the use of available storage in the collection system and maximize diversion to other treatment plants. The permit also requires KC-WTD to report each bypass on their monthly DMRs and in an annual bypass report. Appendix G includes further analysis to support Ecology's bypass authorization.

Net environmental benefit

Ecology's approval of Amendment No. 1 to the Brightwater facility plan included an approval of a flow blending operating strategy for managing peak flows during wet weather. As outlined in Seciton I of this fact sheet, flows exceeding the available membrane capacity may be divertied through CEPT and bypass the membrane treatment process. Ecology accepted this split flow treatment configuration based on the facility demonstrating a net environmental benefit (NEB). The NEB is defined as the percentage reduction in mass of pollutants (BOD_5 and TSS) discharged to Puget Sound from a split flow MBR treatment system when compared to the mass of pollutants discharged from a conventional activated sludge treatment plant that does not divert peak flows around the secondary process. Please see Appendix G for additional background information about the NEB and flow blending authorization.

The proposed permit includes a NEB performance standard that assesses performance based on maximum month and maximum year conditions. The permit includes a requirement to report to Ecology the NEB achieved each year. Ecology will compare the NEB achieved to the theoretical values shown in Table 16. The NEB will also be used to evaluate and ensure that membrane capacity is installed commensurate with increased flows and loads over time.

Table 16. Net Environmental Benefit – Split-flow Membrane Bioreactor versus Conventional Activated Sludge Treatment

Net Environmental Benefit, Split-flow Membrane Bioreactor

Parameter	Net Environmental Benefit (percent reduction in BOD/TSS) [a]	Effluent Discharge (pounds per year)	
		Split-flow MBR	Full-flow CAS [b]
BOD_5			
Average year	69 percent	368,000	1,190,000
Maximum year [c]	46 percent	697,000	1,300,000
Average December	48 percent	61,300	118,000
Maximum month [c]	8 percent	222,000	241,000
TSS			
Average year	76 percent	283,000	1,190,000
Maximum year [c]	61 percent	503,000	1,300,000
Average December	64 percent	42,500	118,000
Maximum month [c]	45 percent	132,000	241,000

[a] Net environmental benefit is the reduction in a pollutant compared to the discharge from a CAS process.
[b] Assumes 15 mg/L BOD_5/TSS for yearly conditions and 25 mg/L BOD_5/TSS for maximum-month condition.
[c] 20-year maximum flow based on 63 years of rainfall data.
BOD_5 = 5-day biochemical oxygen demand, MBR = membrane bioreactor, TSS = total suspended solids

I. Outfall evaluation

As noted in part II.A of this fact sheet, the 2012 Brightwater Marine Outfall Inspection and Commissioning report documented that the pipelines were suspended over depressions in the seabed in a number of locations, one of the pipes had rotated slightly as it sunk into place, and there was evidence of currents scouring bed sediments from the south side of the lines and depositing sediments on the north side. The report recommended additional monitoring. As such, the proposed permit requires KC-WTD to conduct an outfall inspection and submit a report detailing the findings of that inspection (Special Condition S.10). The inspection must evaluate the physical condition of the discharge pipe and diffusers, and evaluate the extent of sediment accumulations in the vicinity of the outfall.

K. 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

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King County.

October 2016. *2016 Updated Utility Analysis: Brightwater Treatment Plant*

October 2016. *Amendment No. 3 to the Facilities Plan: Brightwater Regional Wastewater Treatment System.*

July 2015. *Effluent Dilution Modeling for Brightwater Treatment Plant Outfall* (attachment to the NPDES application).

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May 2007. *Amendment No. 1 to Facilities Plan: Brightwater Regional Wastewater Treatment System.*

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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)

Permit and Wastewater Related Information (https://www.ecy.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance)

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Appendix A – Public Involvement Information

Ecology proposes to reissue a permit to the King County Brightwater 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 January 10, 2018, 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.

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 Shawn McKone, PE.

Appendix B – Your Right to Appeal

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

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

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

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

ADDRESS AND LOCATION INFORMATION

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

Appendix C – Glossary

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

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

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

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

Alternate point of compliance -- An alternative location in the 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 BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated 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, or 5) x 10^n, where n is an integer (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency, December 2007).

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

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

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

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

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a 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.

Transmembrane pressure (TMP) -- Pressure differential across a membrane and sludge layer on the surface of a membrane used in a membrane filtration system, such as in a membrane bioreactor treatment system. The TMP is effectively the driving force required to move water from the mixed liquor in an activated sludge treatment system through the membrane to the clean water permeate.

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

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

Appendix D – Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: https://www.ecy.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (C_{mz}) is based on the following calculation:

$$C_{mz} = Ca + \frac{(Ce - Ca)}{DF}$$

where: Ce = Effluent Concentration
Ca = Ambient Concentration
DF = Dilution Factor

The following table summarize the simple mixing analysis for fecal coliform discharged from the Brightwater outfall.

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	238.0
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	**3**
Difference between mixed and ambient, #/100 ml	2

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

The following table summarizes the expected dissolved oxygen concentration at the edge of the chronic mixing zone for the outfall. The calculations assume simple mixing with minimal amount of BOD_5 decay due to the short residence time in the mixing zone.

Calculation of BOD_5 Oxidation with Temperature Adjustment

INPUT	
Effluent BOD_5 (mg/L)	45
Effluent Dissolved Oxygen (DO) (mg/L)	5.1
Receiving Water Temperature (deg C)	13.951
Receiving Water DO (mg/L)	5.6
DO WQ Standards (mg/L)	7
Chronic Mixing Dilution Factor	238.0
Time for effluent to travel from outfall to chronic mixing boundary (days)	0.027
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)	0.17
BOD oxidized between outfall and chronic mixing zone (mg/L)	0.31
RESULTS	
DO at chronic mixing zone	5.60
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.	

Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Ammonia Criteria Calculation

Ammonia's toxicity depends on that portion which is available in the unionized form. The amount of unionized ammonia depends on the temperature, pH, and salinity of the receiving marine water. To evaluate ammonia toxicity, Ecology uses available ambient data for the critical season. Ecology calculates water quality criteria for the unionized form of ammonia in saltwater using the method specified in EPA 440/5-88-004 (Ambient Water Quality Criteria for Ammonia (Saltwater)-1989).

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-

INPUT	
1. Receiving Water Temperature, deg C (90th percentile):	13.95
2. Receiving Water pH, (90th percentile):	7.7
3. Receiving Water Salinity, g/kg (10th percentile):	29.2
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):	0.599
2. pKa8 at 25 deg C (Whitfield model "B"):	9.314
3. Percent of Total Ammonia Present as Unionized:	1.1%
4. Total Ammonia Criteria (mg/L as NH_3):	
Acute:	21.87
Chronic:	3.28
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	**17.98**
Chronic:	**2.70**

Calculation of Water Quality-Based Effluent Limits:

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

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

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

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

where: DF_a = Acute Dilution Factor

DF_c = Chronic Dilution Factor

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

$LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$

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

$z = 2.326$

CV = coefficient of variation = std. dev/mean

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

where: $\sigma^2 = \ln[(CV^2 \div 4) + 1]$

$z = 2.326$

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

MDL = Maximum Daily Limit

$MDL = LTA \times e^{(Z\sigma - 0.5\sigma^2)}$

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

$z = 2.326$ (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

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

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

n = number of samples/month

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

LTA = Limiting long term average

The following tables present the results of the reasonable potential analysis conducted by Ecology to determine the need for water quality-based limits for toxic pollutants discharged from each outfall. The tables also present the calculated limits for each pollutant if one is needed.

Reasonable Potential Calculation

Facility	Brightwater WWTP
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	115.0	238.0
Human Health Carcinogenic		511.0
Human Health Non-Carcinogenic		415.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ANTIMONY (INORGANIC) 7440361M	ARSENIC (dissolved) 7440382 2M	BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	CADMIUM - 7440439 4M Hardness dependent	CHLOROFORM 67663 11V	CHROMIUM(HEX) 18540299	COPPER - 744058 6M Hardness dependent	DICHLOROBROMOMETHANE 75274 12V	DIETHYLPHTHALATE 84662 24E	DI-n-BUTYL PHTHALATE 84742 26B
Effluent Data	# of Samples (n)		188	10	10	6	10	5	10	10	5	6	6
	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)		2,300	0.75	1.07	1.54	0.15	31.5	0.58	12.1	4.65	0.366	0.21
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		34		1.43		0.0734		0.15	0.617			
	Geo Mean, ug/L			0		0		0			0	0.025	0.057
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	17,983	-	69	-	42	-	1100	4.8	-	-	-
		Chronic	2,701	-	36	-	9.3	-	50	3.1	-	-	-
	WQ Criteria for Protection of Human Health, ug/L		-	90	-	0.046	-	600	-	-	2.8	200	8
	Metal Criteria Translator, decimal	Acute	-	-	1	-	0.994	-	0.993	0.83	-	-	-
		Chronic	-	-	-	-	0.994	-	0.993	0.83	-	-	-
	Carcinogen?		N	N	Y	Y	N	Y	N	N	Y	N	N

Aquatic Life Reasonable Potential

Effluent percentile value			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
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.984		0.741		0.741		0.741	0.741
Multiplier			1.00		1.74		1.74		1.74	1.74
Max concentration (ug/L) at edge of...		Acute	54		1.434		0.075		0.157	0.764
		Chronic	44		1.432		0.074		0.154	0.688
Reasonable Potential? Limit Required?			**NO**		**NO**		**NO**		**NO**	**NO**

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.5545	0.5545	0.5545		0.5545	0.5545	0.5545
Pn	Pn=(1-confidence level)1/n	0.741	0.607	0.549		0.549	0.607	0.607
Multiplier		0.6986	0.8603	0.9336		0.9336	0.8603	0.8603
Dilution Factor		415	511	511		511	415	415
Max Conc. at edge of Chronic Zone, ug/L		0.0013	0.0026	5.8E-02		0.0085	0.0257	0.0573
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**		**NO**	**NO**	**NO**

Reasonable Potential Calculation - Page 2

Facility	Brightwater WWTP
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	115.0	238.0
Human Health Carcinogenic		511.0
Human Health Non-Carcinogenic		415.0

Pollutant, CAS No. & NPDES Application Ref. No.			LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	PHENOL 108952 10A	SELENIUM 7782492 10M	TRICHLOROPHENOL 2,4,6 88062 11A	ZINC- 7440666 13M hardness dependent	CHLORINE (Total Residual) 7782505	ARSENIC (inorganic)		
Effluent Data	# of Samples (n)		10	10	10	6	10	6	10	365	10		
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.51	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		2.97	0.0015	2.93	1.6	0.51	0.06	51	180	1.07		
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L		0.01	0	0.443		0		0.694	0			
	Geo Mean, ug/L			0	0.4	0	0	0	0		0		
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	210	1.8	74	-	290	-	90	13	-		
		Chronic	8.1	0.025	8.2	-	71	-	81	7.5	-		
	WQ Criteria for Protection of Human Health, ug/L		-	0.15	100	70000	200	0.28	1000	-	0.14		
	Metal Criteria Translator, decimal	Acute	0.951	0.85	0.99	-	-	-	0.946	-	-		
		Chronic	0.951	-	0.99	-	-	-	0.946	-	-		
	Carcinogen?		N	N	N	N	N	Y	N	N	Y		

Aquatic Life Reasonable Potential

Effluent percentile value			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	0.481	
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.741	0.741	0.741		0.741		0.741	0.992	
Multiplier			1.74	1.74	1.74		1.74		1.74	1.00	
Max concentration (ug/L) at edge of...		Acute	0.053	0.000	0.483		0.008		1.418	1.565	
		Chronic	0.031	0.000	0.462		0.004		1.044	0.756	
Reasonable Potential? Limit Required?			**NO**	**NO**	**NO**		**NO**		**NO**	**NO**	

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.5545	0.5545	0.5545	0.5545	0.5545	0.5545		0.5545
Pn	Pn=(1-confidence level)1/n	0.741	0.741	0.607	0.741	0.607	0.741		0.741
Multiplier		0.6986	0.6986	0.8603	0.6986	0.8603	0.6986		0.6986
Dilution Factor		415	415	415	415	511	415		511
Max Conc. at edge of Chronic Zone, ug/L		3E-06	0.404	0.0033	0.0009	1.0E-04	8.6E-02		0.0015
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**		**NO**

Temperature Reasonable Potential Analysis

The following tables summarize the calculations Ecology used to determine the reasonable potential for the discharges to violate the temperature standards, as described in the **Evaluation of surface water quality-based effluent limits for numeric criteria** section of this fact sheet.

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	
1. Chronic Dilution Factor at Mixing Zone Boundary	238.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	13.95 °C
3. 1DADMax Effluent Temperature (95th percentile)	23.60 °C
4. Aquatic Life Temperature WQ Criterion	13.00 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	13.99 °C
6. Incremental Temperature Increase or decrease:	0.04 °C
7. Incremental Temperature Increase 12/(T-2) if T≤ crit:	---
8. Maximum Allowable Temperature at Mixing Zone Boundary:	14.25 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	YES
10. Temp increase allowed at mixing zone boundary, if required:	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**
18. Temperature Limit if Required?	**NO LIMIT**

Appendix E – Monitoring Data Summary

The following appendix contains monitoring data reported by the Brightwater WWTP on monthly Discharge Monitoring Reports and in Whole Effluent Toxicity monitoring reports for the period between September 2011and September 2016. Results from baseline sediment monitoring conducted in 2011 are also presented. Between September 2011 and October 2012 the Brightwater WWTP discharged treated effluent back into the County's collection system for disposal through the South WWTP in Renton. The facility began discharging effluent to Puget Sound in November 2012.

Discharge Monitoring Data, 2011-2016

Facility: King County - Brightwater WWTP
Permit No: WA0032247

	Influent									
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd
	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum
September-11	3.7	5.2	315	442	10,238	17,327	275	275	8,892	13,679
October-11	7.0	10.6	374	472	19,463	31,616	327	400	17,233	29,074
November-11	10.0	13.3	311	459	24,191	45,641	255	472	19,933	50,588
December-11	10.8	12.7	258	516	22,060	42,077	226	484	19,458	42,981
January-12	10.1	12.1	323	421	27,143	37,511	279	356	23,452	33,108
February-12	12.1	13.0	287	366	29,023	37,880	277	456	28,037	47,209
March-12	12.5	13.3	295	414	30,776	44,769	256	404	26,783	41,761
April-12	12.5	13.3	328	440	3,164	45,803	292	400	30,472	43,067
May-12	11.7	12.4	366	515	35,628	51,867	354	576	34,490	57,227
June-12	11.7	12.3	357	525	34,985	51,598	353	800	34,448	78,628
July-12	11.4	15.5	513	827	48,953	81,124	709	1,240	**67,305**	116,526
August-12	10.7	11.7	376	458	33,857	42,133	366	692	32,959	63,702
September-12	10.2	11.0	380	480	32,073	41,145	343	343	29,019	38,727
October-12	10.3	11.6	402	460	34,540	42,091	350	460	30,342	38,911
November-12	10.8	14.6	297	433	26,378	37,128	271	414	24,076	36,530
December-12	14.7	18.7	214	304	26,269	38,352	202	298	24,756	37,804
January-13	15.0	19.9	237	303	29,439	38,390	222	270	27,765	43,764
February-13	15.7	18.4	270	355	35,083	51,973	233	282	30,203	41,928
March-13	19.5	27.9	281	351	45,128	57,189	247	298	39,627	46,508
April-13	19.5	22.2	273	351	44,075	52,629	250	290	40,558	47,833
May-13	17.1	19.1	322	389	45,899	54,331	272	306	38,725	43,135
June-13	16.6	18.7	334	421	46,056	58,760	296	438	40,782	50,630
July-13	11.0	15.1	347	483	31,936	43,626	326	574	29,171	47,931
August-13	15.3	16.5	315	412	40,418	53,835	278	342	35,686	44,836
September-13	16.6	18.8	312	407	43,041	52,551	273	342	37,716	49,484
October-13	16.6	18.4	323	395	44,432	53,365	281	316	38,722	44,321
November-13	17.1	18.8	298	356	42,628	50,683	272	318	38,848	47,072
December-13	16.6	18.7	312	363	42,996	48,448	272	298	37,603	42,059
January-14	17.8	23.0	291	354	42,703	51,721	252	300	37,130	43,958
February-14	19.7	26.2	272	348	43,823	50,050	236	294	38,050	44,594
March-14	24.1	31.6	219	312	43,065	55,322	200	276	39,508	46,736
April-14	18.7	21.4	291	377	45,201	56,550	249	294	38,668	41,954
May-14	17.3	21.1	319	462	45,707	63,970	280	322	40,323	52,852
June-14	16.6	18.2	328	424	45,446	58,103	285	340	39,487	47,757
July-14	16.5	18.3	352	446	48,396	68,064	279	346	38,342	52,862
August-14	16.2	18.4	338	563	45,684	75,334	271	346	36,666	47,310
September-14	15.6	18.8	336	424	45,614	58,451	294	374	39,900	58,512
October-14	18.1	26.2	326	473	48,389	62,718	293	372	44,039	65,822
November-14	19.3	25.9	269	328	44,452	62,039	248	312	40,943	49,079
December-14	21.4	26.2	231	309	40,799	51,796	215	316	38,133	50,015
January-15	17.7	22.9	267	333	39,392	51,738	243	286	36,240	45,063
February-15	20.2	25.2	281	387	44,823	59,589	263	390	42,343	77,851
March-15	17.3	19.3	303	381	43,951	55,956	267	352	38,618	49,460
April-15	17.3	19.5	319	406	45,926	57,671	294	342	42,242	52,988
May-15	16.4	17.9	337	398	46,255	55,914	308	352	42,162	56,319
June-15	16.1	17.4	351	451	47,420	60,727	309	358	41,668	50,225
July-15	15.9	16.6	337	421	44,587	57,993	320	374	42,378	50,459
August-15	15.9	16.6	337	421	44,587	57,993	320	374	42,378	50,459
September-15	16.6	17.7	384	443	53,292	63,372	297	342	41,247	48,004
October-15	17.0	19.7	355	452	50,350	66,604	305	356	43,208	49,975
November-15	20.1	28.8	299	389	49,280	57,631	249	312	41,225	50,914
December-15	23.3	32.2	243	349	46,747	66,998	210	278	40,438	57,148
January-16	22.5	31.4	253	382	46,578	64,077	221	332	40,738	55,652
February-16	21.2	23.8	260	304	45,774	51,478	213	262	37,558	42,751
March-16	21.4	25.6	271	343	47,933	57,591	231	266	40,914	46,994
April-16	17.4	19.3	322	421	46,704	60,473	279	348	40,501	47,205
May-16	17.5	19.6	344	442	50,175	63,676	283	356	41,317	51,326
June-16	17.1	18.7	348	419	49,548	62,386	291	324	41,407	47,630
July-16	16.5	17.2	337	402	46,222	54,699	290	324	39,876	44,794
August-16	16.6	18.3	344	391	47,689	55,314	293	330	40,604	46,618
September-16	16.4	17.3	377	439	51,657	59,089	321	358	43,984	49,034
AVE:	15.9	18.9	316	415	40,296	53,425	283	378	36,382	49,038
MIN:	3.7	5.2	214	303	3,164	17,327	200	262	8,892	13,679
MAX:	24.1	32.2	513	827	53,292	81,124	709	1,240	67,305	116,526
Median	16.6	18.7	319	414	44,452	54,699	278	342	38,722	47,630
95th Percentile	21.4	28.8	380	516	50,175	66,998	353	576	43,208	65,822
Standard Deviation	3.96	5.55	50	79	10,145	10,616	68	149	8,450	12,959
CV	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.4	0.2	0.3
DESIGN:	40.9				66,063				61,400	
85% DESIGN:	34.8				56,154				52,190	

approaching design limits (85%)
exceeds design limits

Discharge Monitoring Data, 2011-2016

Facility: King County - Brightwater WWTP
Permit No: WA0032247

	Effluent											
Date	Flow, MGD	Flow, MGD	BOD, mg/L	BOD, mg/L	BOD, ppd	BOD, ppd	BOD, % Removal	TSS, mg/L	TSS, mg/L	TSS, ppd	TSS, ppd	TSS, % Removal
	Monthly Average	Monthly Maximum	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Monthly Average	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Monthly Average
September-11	3.60	5.10	1.4	3.7	43	98	99.0	2.0	2.0	64	85	99.0
October-11	6.40	10.50	1.0	1.0	58	68	100.0	2.0	2.0	116	135	99.0
November-11	9.90	13.30	1.1	1.4	94	148	99.6	2.0	2.0	165	207	99.1
December-11	10.80	12.70	1.0	1.0	90	96	99.5	2.0	2.0	179	193	99.0
January-12	10.10	12.00	1.0	1.0	85	93	99.7	2.0	2.0	168	185	99.3
February-12	12.10	13.00	1.2	1.8	125	185	99.6	2.0	2.0	202	207	99.3
March-12	12.50	13.30	1.1	1.3	114	140	99.6	2.0	2.0	208	211	99.2
April-12	12.50	13.30	1.2	1.4	121	146	99.6	2.0	2.0	208	214	99.3
May-12	11.60	12.40	1.1	1.2	102	118	99.7	2.0	2.0	194	204	99.2
June-12	11.70	12.20	1.1	1.3	104	123	99.7	2.0	2.0	194	197	99.4
July-12	11.40	15.40	<1	<1	96	100	99.8	2.0	2.0	190	198	99.7
August-12	10.60	11.60	1.5	3.1	137	283	99.6	2.0	2.0	177	186	99.4
September-12	10.10	11.00	1.8	3.2	153	272	99.0	2.0	2.0	168	183	99.0
October-12	10.20	11.50	1.3	1.6	109	137	99.7	2.0	2.0	170	183	99.5
November-12	9.60	14.30	<1.5	<2.2	<103	<127	99.6	<2	<2.2	<163	<213	99.3
December-12	13.70	17.90	<1.1	<2	<125	<139	99.5	<2	<2	<229	<252	99.0
January-13	11.60	15.00	<1.1	<2.1	<104	<115	99.6	<2	<2.1	<195	<207	99.3
February-13	12.40	14.30	<1.1	<2	<118	<127	99.7	<2	<2	<207	<218	99.3
March-13	18.70	27.40	<1.6	<2	<270	<596	99.4	<2	<2	<312	<370	99.2
April-13	17.80	20.50	<1.1	<2	<158	<171	99.6	<2	<2	<298	<309	99.3
May-13	13.70	16.30	<1.1	<2	<125	<172	99.7	<2	<2	<229	<262	99.4
June-13	13.10	19.00	<1.5	<2	<156	<159	99.7	<2	<2	<219	<245	99.5
July-13	9.30	12.70	<1.7	<2.1	<103	<124	99.7	<2	<2.1	<155	<186	99.5
August-13	11.70	13.70	<1.3	<2.3	<124	<152	99.7	<2.1	<2.3	<202	<227	99.4
September-13	15.10	20.40	<1.6	<2	<201	250.0	99.5	<2	<2	<253	<262	99.3
October-13	15.20	17.10	<1.5	<2	<192	<300	99.6	<2	<2	<253	<272	99.3
November-13	15.80	17.90	<1.1	<1.1	<139	<141	99.7	<2	<2	<264	<279	99.3
December-13	15.80	18.20	<1.2	<1.4	<157	<203	99.6	<2	<2	<264	<279	99.3
January-14	17.30	22.50	<1.9	<2.1	<277	<314	99.4	<2	<2	<289	<300	99.2
February-14	18.90	25.60	<2.4	4.0	<380	672.0	99.1	<2	<2	<315	<359	99.2
March-14	23.40	31.00	<1.9	<3.2	<674	<640	99.1	<2	<2	<390	<428	99.0
April-14	17.80	20.20	<1.4	<1.7	<206	<268	99.5	<2	<2	<296	<324	99.2
May-14	15.10	20.40	<1.4	<1.9	<182	<242	99.6	<2	<2	<252	<309	99.4
June-14	14.70	16.50	<2	3.2	<249	385.0	99.5	<2	<2	<246	<255	99.4
July-14	14.50	16.60	<2.6	<3.4	<319	<428	99.3	<2	<2	<241	<252	99.4
August-14	14.30	15.90	<1.4	<1.7	<164	<203	99.6	<2	<2	<238	<245	99.3
September-14	13.90	16.70	<1.4	<1.7	<174	<203	99.6	<2	<2	<240	<269	99.4
October-14	17.00	26.10	<1.3	<1.4	<182	<236	99.6	<2	<2	<284	<351	99.4
November-14	18.60	25.50	<1.2	<1.3	<183	<206	99.6	<2	<2	<322	<349	99.2
December-14	21.00	25.80	<1.2	<1.5	<207	<247	99.5	<2	<2	<350	<379	99.1
January-15	17.50	22.60	<1.1	<1.2	<153	<177	99.6	<2	<2	<293	<338	99.2
February-15	19.90	25.10	<1.3	<1.5	<210	<260	99.5	<2	<2	<332	<371	99.2
March-15	17.00	19.30	<1.3	<1.5	<182	<213	99.6	<2	<2	<283	<296	99.2
April-15	16.90	18.90	<1.1	<1.1	<151	<165	99.7	<2	<2.1	<286	<306	99.3
May-15	15.40	16.60	<1.4	<1.7	<178	<222	99.6	<2	<2	<258	<271	99.4
June-15	15.10	16.00	<1.2	<1.4	<156	<182	99.7	<2	<2	<251	<259	99.4
July-15	14.40	16.10	<1.3	<1.5	<154	<186	99.7	<2	<2	<240	<247	99.4
August-15	14.40	16.10	<1.3	<1.5	<154	<186	99.7	<2	<2	<240	<247	99.4
September-15	15.10	16.30	<1.1	<1.2	<134	<148	99.7	<2	<2	<251	<258	99.4
October-15	15.50	18.80	<1.1	<1.1	<138	<148	99.7	<2	<2	<258	<267	99.4
November-15	19.00	28.50	<1	<1	<158	<181	99.7	<2	<2	<316	<362	99.2
December-15	22.80	31.90	<1	<1	<191	<232	99.6	<2	<2	<380	<464	99.1
January-16	21.80	31.30	<1	<1	<181	<216	99.6	<2	<2	<363	<431	99.1
February-16	20.80	23.40	<1	<1	<175	<193	99.6	<2	<2	<347	<374	99.1
March-16	20.90	25.40	<1	<1	<175	<196	99.6	<2	<2	<349	<392	99.1
April-16	16.50	18.10	<1	<1.1	<140	<146	99.7	<2	<2	<276	<289	99.3
May-16	16.30	17.40	<1	<1	<138	<141	99.7	<2	<2	<272	<274	99.3
June-16	15.8	17.9	<1	<1	<133	<138	99.7	<2	<2	<263	<271	99.4
July-16	15.0	15.9	<1	<1	<128	<130	99.7	<2	<2	<251	<254	99.4
August-16	14.7	16.1	<1.1	<1.1	<130	<141	99.7	<2	<2	<246	<252	99.4
September-16	15.4	16.5	<1	<1.1	<132	<137	99.7	<2	<2	<257	<259	99.4
AVE:	16.2	19.9	<1.3	<1.7	<182	<225	99.6	<2	<2	<271	<295	99.3
MIN:	9.3	12.7	<1	<1	<103	<115	99.1	<2	<2	<155	<186	99.0
MAX:	23.4	31.9	<2.6	<4	<674	<672	99.7	<2.1	<2.3	<390	<464	99.5
Median	15.5	18.1	<1.2	<1.5	<158	<186	99.6	<2	<2	<258	<272	99.3
95th Percentile	21.6	30.3	<2	<3.2	<306	<546	99.3	<2	<2.1	<359	<417	99.1
Standard Deviation	3.1	5.0	<0.4	<0.7	<91	<127	0.1	<0	<0.1	<52	<63	0.1
CV	0.2	0.2	<0.3	<0.4	<0.5	<0.6	0.0	<0	<0	<0.2	<0.2	0.0
LIMIT: Effective November 2012			30	45	10,233	15,350	85	30	45	10,233	15,350	85.0

exceeds permit limits

Discharge Monitoring Data, 2011-2016

Facility: King County - Brightwater WWTP
Permit No: WA0032247

	Effluent							
Date	PH	PH	Fecal Coliform, #/100 ml	Fecal Coliform, #/100 ml	Chlorine, mg/L	Chlorine, mg/L	Ammonia, mg/l (as N)	Ammonia, mg/l (as N)
	Monthly Minimum	Monthly Maximum	Monthly Geo-Mean	7-day Geo-Mean	Monthly Average	Weekly Average	Monthly Average	Monthly Maximum
September-11	6.2	8.7	4.9	10.8	0.20	1.20		
October-11	6.0	7.3	0.0	0.0	0.49	0.78		
November-11	5.6	7.3	0.0	0.0	0.34	0.45		
December-11	5.2	7.6	1.2	12.5	0.86	1.27		
January-12	5.6	7.2	1.3	2.0	0.78	0.84		
February-12	5.4	6.9	1.1	1.6	0.90	1.09		
March-12	5.3	7.4	1.3	0.2	0.80	1.06		
April-12	5.3	7.3	1.5	2.2	0.89	1.31		
May-12	5.1	7.3	0.0	0.0	0.77	0.87		
June-12	4.6	6.5	1.0	0.0	0.56	0.87		
July-12	4.5	7.2	0.0	0.0	0.33	0.57		
August-12	4.7	7.5	0.3	0.0	0.61	0.88		
September-12	5.0	6.9	0.3	0.0	0.90	1.00		
October-12	4.8	7.8	1.2	2.0	1.07	1.37		
November-12	6.2	8.2	1.1	<1	<.07	0.09	<.1	<.1
December-12	6.5	7.3	1.0	<1	0.10	0.11	<.1	<.1
January-13	6.2	7.3	0.0	0.0	0.11	0.13	<.1	0.2
February-13	6.6	7.5	0.3	<1	0.12	0.14	<.1	0.2
March-13	6.0	7.5	1.6	<1	<.09	0.15	<.9	2.7
April-13	6.5	7.4	0.3	<1	<.06	0.06	<.2	0.4
May-13	6.5	7.4	0.3	<1	<.05	<.05	<.5	1.3
June-13	6.5	7.7	1.2	1.9	<.05	<.05	<.1	<.1
July-13	6.3	7.6	0.4	1.2	<.06	0.06	<.3	1.0
August-13	6.4	7.3	0.0	1.0	<.11	0.13	<.2	0.3
September-13	6.1	7.3	0.0	0.0	<.1	0.16	<.1	0.2
October-13	6.2	7.3	0.0	0.0	<.15	0.19	<.1	<.1
November-13	6.1	7.2	0.0	0.0	0.17	0.18	<.1	<.1
December-13	6.3	7.2	0.0	0.0	0.10	0.13	<.1	0.1
January-14	6.3	7.2	0.0	0.0	<.07	0.08	<.6	2.2
February-14	6.2	7.1	0.0	0.0	0.07	0.07	<.1	<.1
March-14	6.1	6.9	0.3	0.3	0.07	0.08	<.1	<.1
April-14	6.0	7.0	0.0	0.3	0.09	0.11	<.1	<.1
May-14	6.2	7.3	0.4	0.7	<.05	<.05	<.1	<.1
June-14	6.4	7.2	0.5	0.7	<.05	<.05	<.1	<.1
July-14	6.4	7.2	0.3	0.3	<.08	0.11	<.1	<.1
August-14	6.1	7.3	0.0	0.0	<.09	0.10	<.6	2.2
September-14	6.1	7.2	2.9	17.0	<.07	0.08	<.2	0.4
October-14	6.2	7.4	1.5	5.7	<.1	0.12	<.1	<.1
November-14	**5.8**	7.3	0.0	0.0	0.14	0.17	<.1	<.1
December-14	6.3	7.2	0.0	0.0	<.08	0.11	<.4	1.3
January-15	6.5	7.4	0.6	1.0	<.13	0.19	<.1	<.1
February-15	6.4	7.2	0.0	0.0	0.11	0.14	<.1	<.1
March-15	6.5	7.1	0.0	0.0	0.11	0.15	<.1	<.1
April-15	6.5	7.2	0.7	0.8	<.06	0.08	<.1	<.1
May-15	6.5	7.3	0.4	0.7	<.06	0.06	<.1	<.1
June-15	6.6	7.4	1.2	2.3	<.05	<.05	<.1	<.1
July-15	6.6	7.3	1.1	2.8	<.05	<.05	<.1	<.1
August-15	6.6	7.3	1.1	2.8	<.05	<.05	<.1	<.1
September-15	6.4	7.3	0.9	2.3	<.05	0.05	<.1	<.1
October-15	6.2	7.5	0.0	0.3	<.07	0.11	<.1	<.1
November-15	6.4	7.1	0.0	0.0	0.14	0.15	<.1	<.1
December-15	6.6	7.2	0.0	0.0	0.19	0.26	<.1	<.1
January-16	6.5	7.1	1.0	1.0	0.16	0.22	<.1	<.1
February-16	6.6	7.1	0.0	0.0	0.18	0.23	<.1	<.1
March-16	6.5	7.1	0.0	0.0	0.15	0.21	<.1	<.1
April-16	6.6	7.3	0.3	0.3	0.14	0.21	<.3	0.6
May-16	6.5	7.1	0.9	1.3	<.2	0.28	<.2	0.4
June-16	6.6	7.1	0.0	0.0	0.2	0.2	<.2	0.3
July-16	6.6	7.2	0.0	0.0	0.1	0.1	<.5	1.6
August-16	6.6	7.2	0.5	0.8	<.08	0.1	<.1	<.1
September-16	6.7	7.3	0.5	0.5	<.12	0.2	<.7	1.3
AVE:	6.4	7.3	0.5	1.1	0.13	0.14	<0.2	0.9
MIN:	5.8	6.9	0.0	0.0	0.07	0.05	<0.1	0.1
MAX:	6.7	8.2	2.9	17.0	0.19	0.28	<0.9	2.7
Median	6.4	7.3	0.3	0.3	0.12	0.13	<0.1	0.5
95th Percentile	6.0	7.6	1.4	2.8	0.18	0.23	<0.6	2.3
Standard Deviation	0.2	0.2	0.6	2.8	0.04	0.06	<0.2	0.8
CV	0.0	0.0	1.3	2.5	0.28	0.42	<1	0.9
LIMIT: Effective November 2012	6.0	9.0	200	400	0.50	0.75		

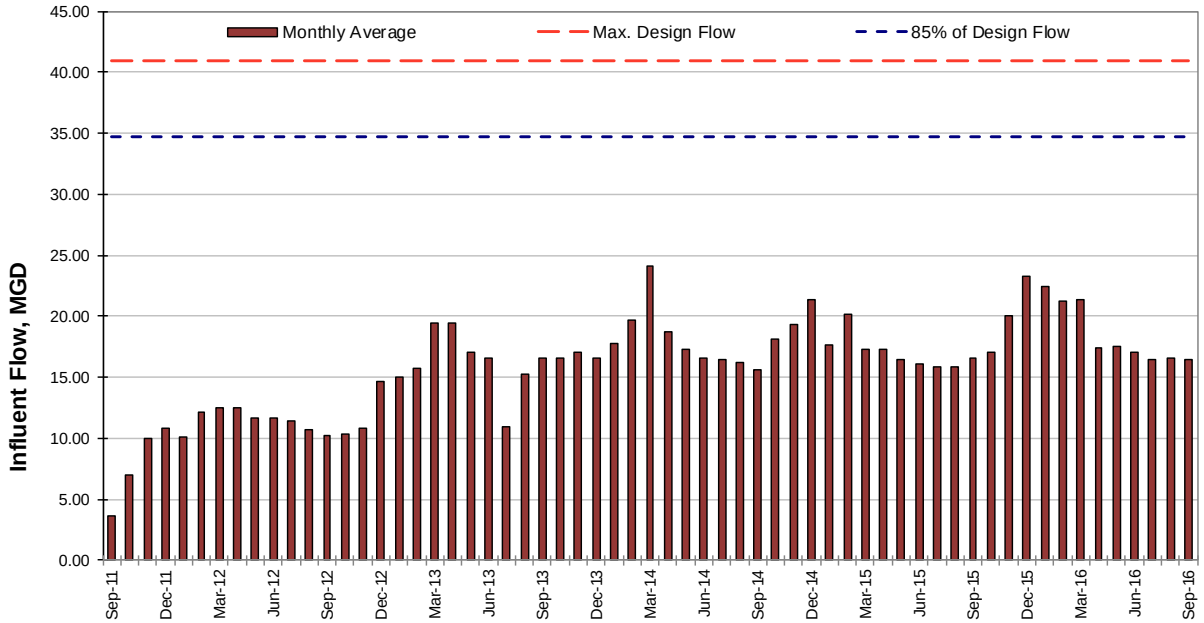
Discharge Monitoring Data, 2011-2016

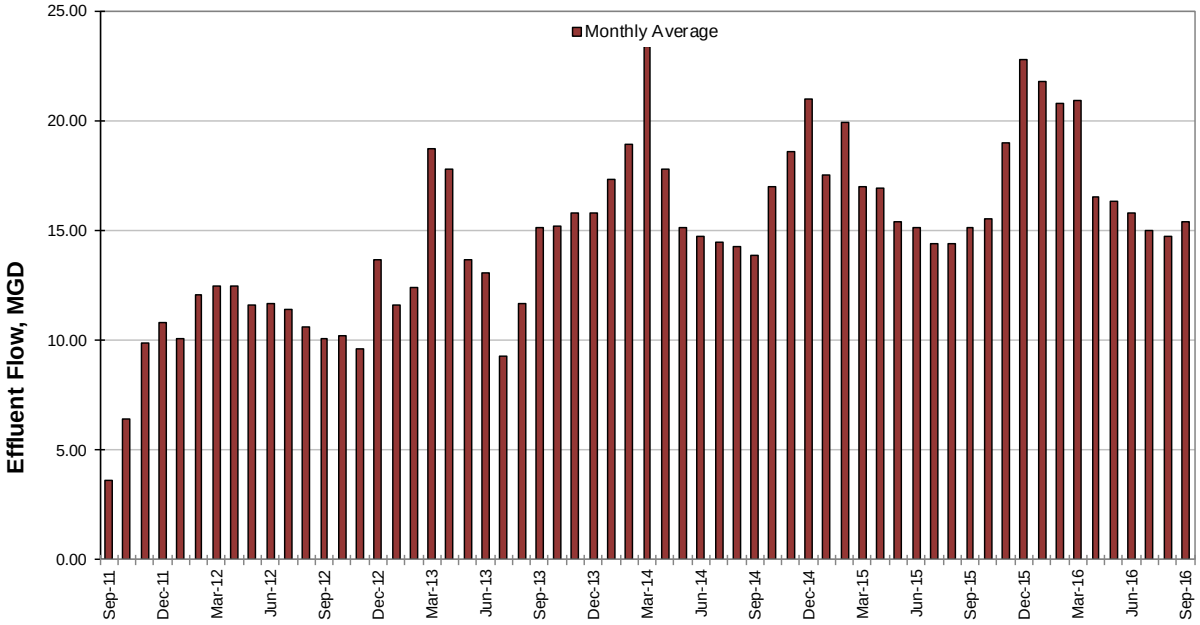
Facility: King County - Brightwater WWTP
Permit No: WA0032247

	Effluent											
Date	Nitrate+Nitirte, mg/L (as N)	Nitrate+Nitirte, mg/L (as N)	Total Kjeldahl Nit., mg/L (as N)	Total Kjeldahl Nit., mg/L (as N)	Ortho-phosph., mg/l (as P)	Ortho-phosph., mg/l (as P)	Total Phosph., mg/l (as P)	Total Phosph., mg/l (as P)	Temperature °C	Temperature °C	Temperature °F	Temperature °F
	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum
September-11												
October-11												
November-11												
December-11												
January-12												
February-12												
March-12												
April-12												
May-12												
June-12												
July-12												
August-12												
September-12												
October-12												
November-12	27.2	33.6	1.4	2.0	3.9	4.8	4.4	5.6	17.0	18.3	62.6	64.9
December-12	27.1	32.0	1.2	1.3	3.5	4.5	3.3	3.9	14.5	15.7	58.1	60.3
January-13	32.3	36.0	1.4	1.8	3.9	4.3	3.7	4.3	13.4	14.2	56.2	57.5
February-13	28.2	31.9	2.5	5.8	3.6	4.0	3.6	3.9	13.7	14.2	56.6	57.6
March-13	21.3	26.4	2.5	4.8	3.6	4.1	3.8	4.2	14.1	14.8	57.4	58.7
April-13	27.9	29.8	1.5	2.1	4.2	5.0	4.2	4.8	14.8	15.5	58.7	59.9
May-13	23.3	26.9	1.8	2.0	4.6	5.0	5.0	5.5	16.5	17.2	61.7	63.0
June-13	22.6	25.2	2.5	4.2	4.8	5.0	4.9	5.1	18.1	18.7	64.5	65.6
July-13	30.1	34.1	2.3	2.8	4.7	5.0	5.3	5.7	19.1	20.1	66.4	68.1
August-13	28.7	32.0	2.1	2.7	5.3	5.8	5.3	5.3	20.3	20.7	68.6	69.3
September-13	28.5	33.3	1.9	2.8	4.4	4.7	4.8	5.4	20.3	20.8	68.5	69.5
October-13	35.4	42.8	1.4	2.0	4.9	5.6	5.6	6.4	18.7	19.2	65.7	66.6
November-13	32.6	37.0	1.9	2.6	4.6	4.7	4.6	4.7	17.1	18.3	62.7	64.9
December-13	34.8	37.8	2.3	3.6	4.6	4.8	4.6	5.1	15.2	16.4	59.3	61.5
January-14	32.5	34.3	1.9	3.3	4.2	4.5	4.2	4.6	14.2	14.7	57.5	58.5
February-14	37.1	42.6	1.4	1.5	3.6	3.9	3.8	4.2	13.1	13.8	55.5	56.8
March-14	28.5	32.0	<1.1	1.8	3.0	3.7	3.2	4.2	12.7	13.6	54.9	56.5
April-14	29.7	41.4	1.9	2.4	4.2	4.4	4.2	4.7	14.3	15.3	57.7	59.5
May-14	34.8	37.5	1.5	1.7	4.3	4.3	4.6	5.0	16.1	17.0	60.9	62.6
June-14	31.4	35.7	1.6	2.0	4.8	5.2	5.7	6.2	17.8	18.6	64.0	65.4
July-14	33.2	36.9	1.5	1.9	5.0	5.2	5.7	6.1	19.4	20.1	67.0	68.1
August-14	28.9	30.7	1.8	2.3	5.3	5.5	5.5	5.9	20.4	20.8	68.7	69.5
September-14	30.4	39.6	2.5	3.8	5.0	5.1	5.2	5.6	20.2	20.6	68.4	69.1
October-14	23.8	26.5	1.2	1.5	4.6	4.6	4.7	5.1	19.2	19.9	66.6	67.9
November-14	29.2	32.3	1.2	1.3	3.9	4.3	3.6	4.1	18.1	19.6	64.6	67.2
December-14	27.5	33.1	1.5	2.5	3.6	4.0	3.7	4.3	17.6	18.6	63.6	65.4
January-15	28.2	33.9	1.4	2.4	3.7	3.9	3.5	4.0	17.0	17.5	62.6	63.5
February-15	31.2	38.9	1.7	2.3	3.5	4.0	3.6	4.4	16.9	17.4	62.4	63.3
March-15	31.5	38.1	1.7	2.0	4.2	4.7	4.3	4.7	17.4	18.1	63.4	64.5
April-15	32.9	36.0	1.6	2.0	4.3	4.7	4.4	4.8	18.2	19.0	64.8	66.2
May-15	35.7	40.0	1.7	2.4	4.8	5.2	5.4	5.6	19.8	20.9	67.6	69.6
June-15	37.3	43.2	1.6	1.9	4.9	5.2	5.1	5.4	21.6	22.8	70.9	73.0
July-15	31.3	34.7	1.3	1.5	5.2	6.1	5.2	6.2	23.2	23.8	73.8	74.8
August-15	31.3	34.7	1.3	1.5	5.2	6.1	5.2	6.2	23.2	23.8	73.8	74.8
September-15	28.7	32.1	1.5	1.9	4.7	5.3	5.4	5.7	23.3	23.7	73.9	74.7
October-15	29.6	33.1	1.3	1.4	5.3	5.8	5.7	6.2	22.3	22.9	72.2	73.2
November-15	30.9	31.0	1.3	1.8	3.9	4.5	4.0	4.8	19.7	21.1	67.4	70.0
December-15	28.7	32.6	0.9	1.1	3.4	3.9	3.5	3.9	17.2	18.9	62.9	66.1
January-16	32.0	36.1	1.0	1.1	4.1	4.4	4.3	4.8	16.2	17.0	61.1	62.6
February-16	34.2	39.3	1.7	1.9	3.9	4.3	3.8	4.5	16.3	16.8	61.3	62.3
March-16	32.1	36.9	1.2	1.3	3.7	4.1	3.9	4.4	16.6	17.4	61.9	63.4
April-16	29.3	34.3	1.5	1.9	4.2	4.5	4.7	5.9	18.4	19.4	65.2	66.9
May-16	40.4	46.3	1.9	2.2	4.9	6.3	5.3	6.0	19.9	20.4	67.8	68.8
June-16	36.6	38.8	1.4	1.8	4.5	5.1	5.6	5.9	21.1	21.7	70.0	71.1
July-16	36.3	40.9	1.9	2.9	4.4	5.0	4.5	0.9	22.2	23.0	71.9	73.4
August-16	34.3	37.6	1.6	1.8	4.4	4.8	4.7	4.8	23.2	23.6	73.7	74.5
September-16	30.0	36.8	2.3	4.0	3.9	4.0	4.1	4.7	22.8	23.3	73.1	73.9
AVE:	30.8	35.2	1.7	2.3	4.3	4.8	4.5	5.0	18.1	18.9	64.6	66.1
MIN:	21.3	25.2	0.9	1.1	3.0	3.7	3.2	0.9	12.7	13.6	54.9	56.5
MAX:	40.4	46.3	2.5	5.8	5.3	6.3	5.7	6.4	23.3	23.8	73.9	74.8
Median	30.9	34.7	1.6	2.0	4.3	4.7	4.6	4.8	18.1	18.9	64.5	66.1
95th Percentile	37.0	42.7	2.5	4.1	5.3	6.0	5.7	6.2	23.2	23.7	73.7	74.6
Standard Deviation	4.0	4.6	0.4	1.0	0.6	0.6	0.7	1.0	3.0	2.9	5.4	5.3
CV	0.1	0.1	0.2	0.4	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1
LIMIT: Effective November 2012												

Discharge Monitoring Data, Influent and Effluent Flow 2011-2016

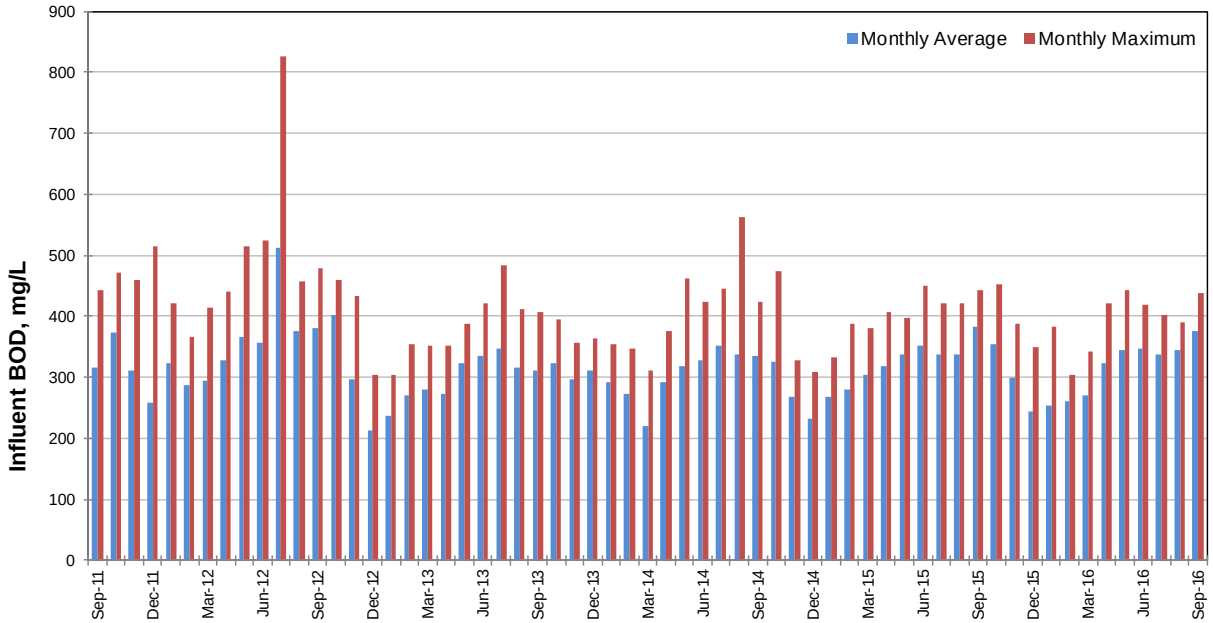
King County - Brightwater WWTP
Permit #WA0032247

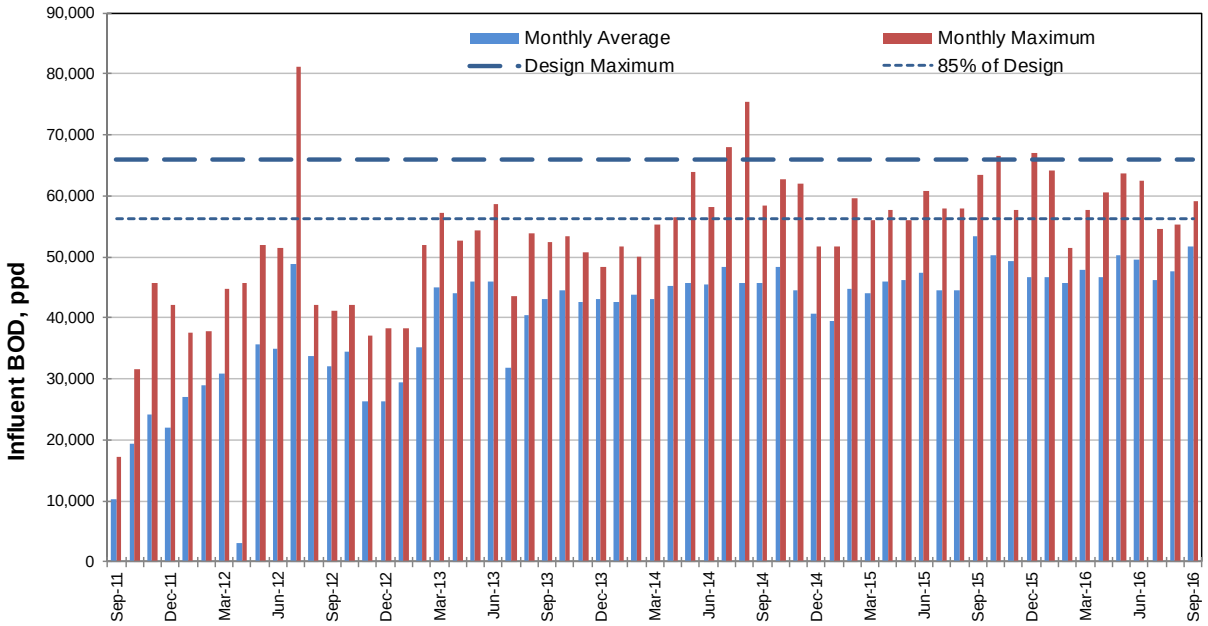




Discharge Monitoring Data, Influent BOD, 2011-2016

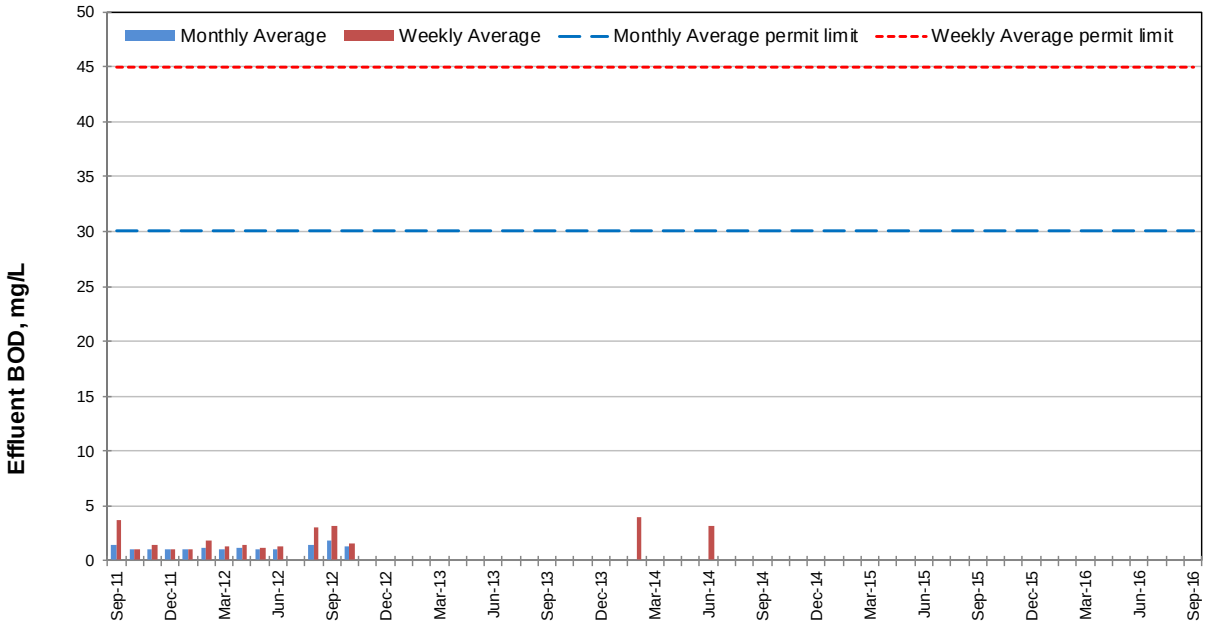
King County - Brightwater WWTP
Permit #WA0032247

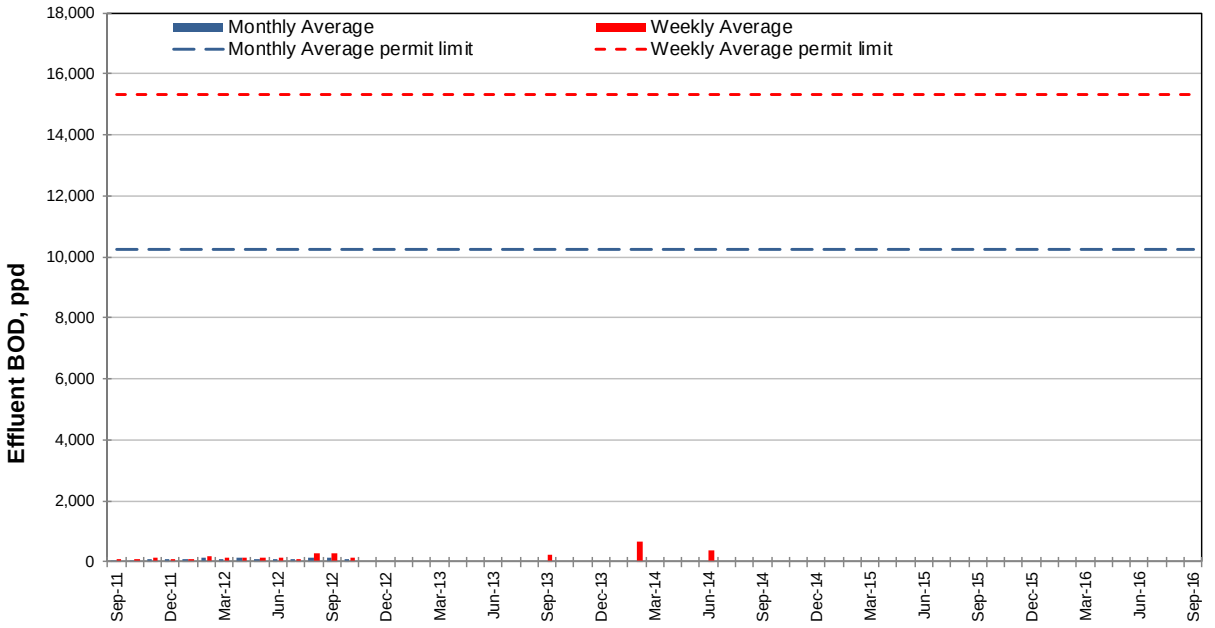




Discharge Monitoring Data, Effluent BOD, 2011-2016

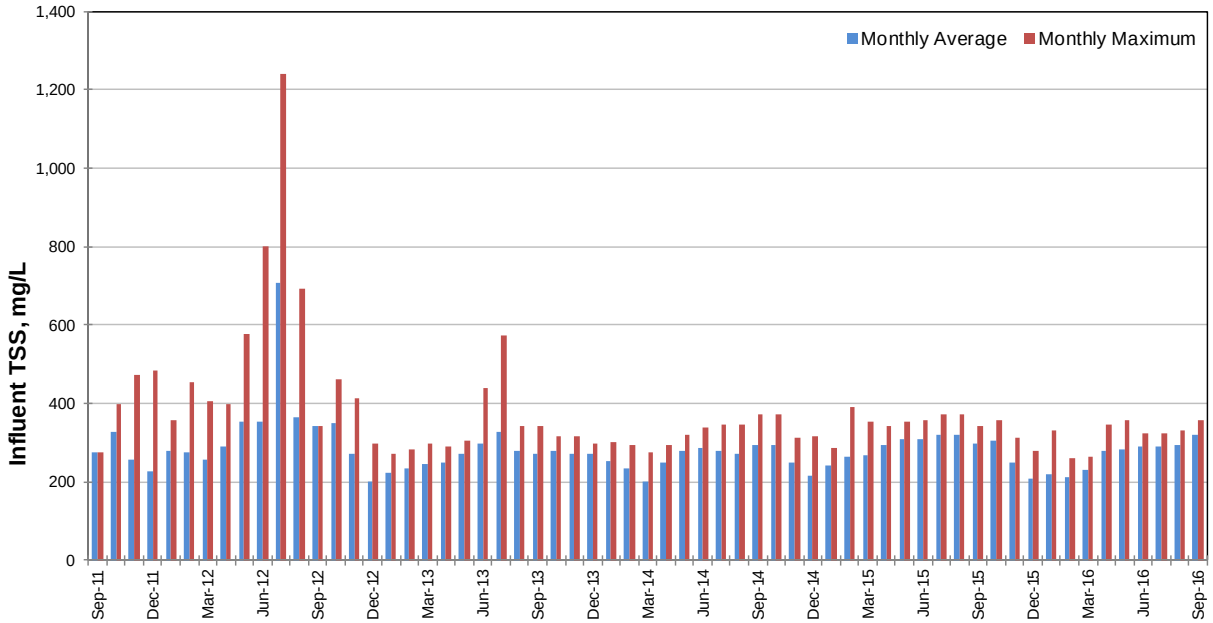
King County - Brightwater WWTP
Permit #WA0032247

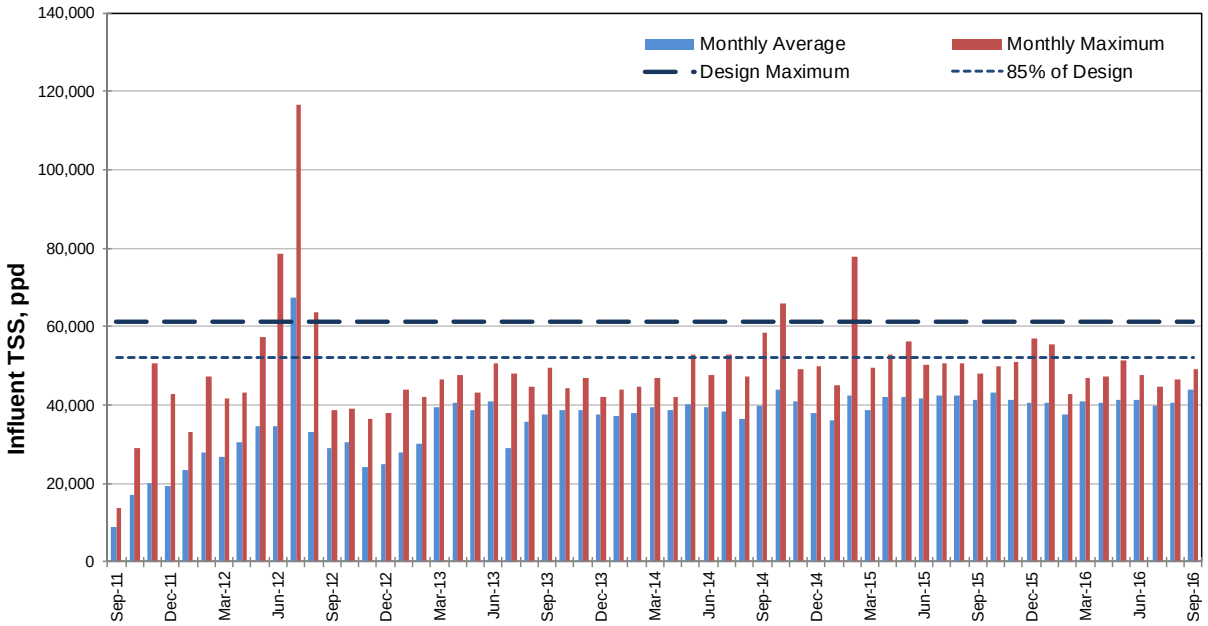




Discharge Monitoring Data, Influent TSS, 2011-2016

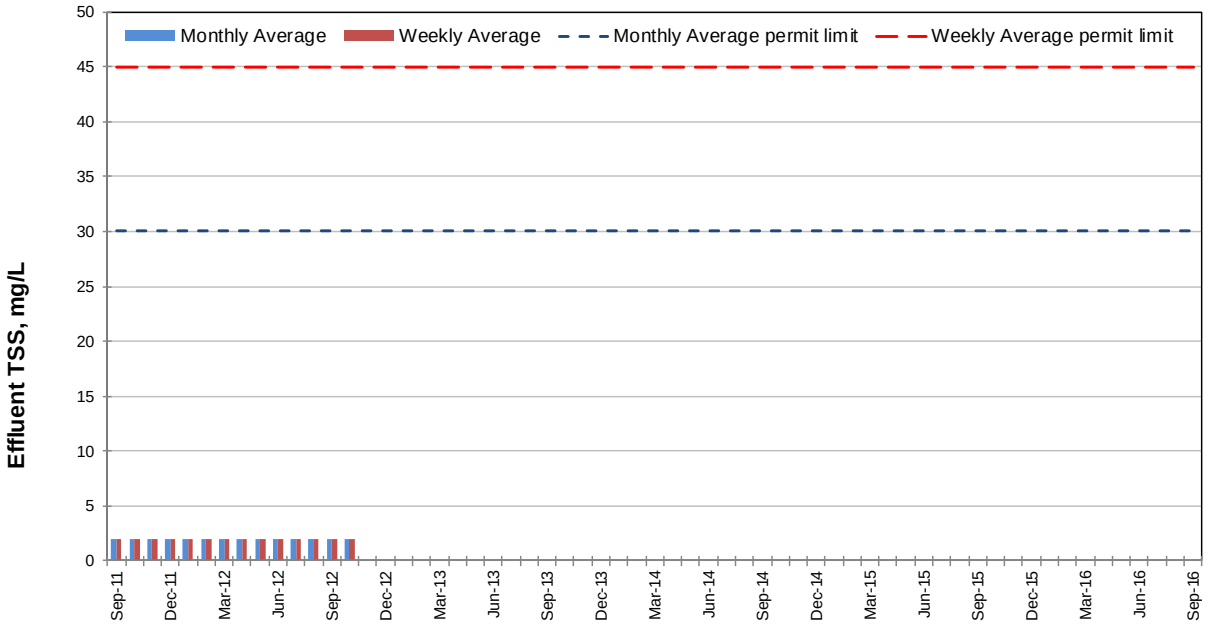
King County - Brightwater WWTP
Permit #WA0032247

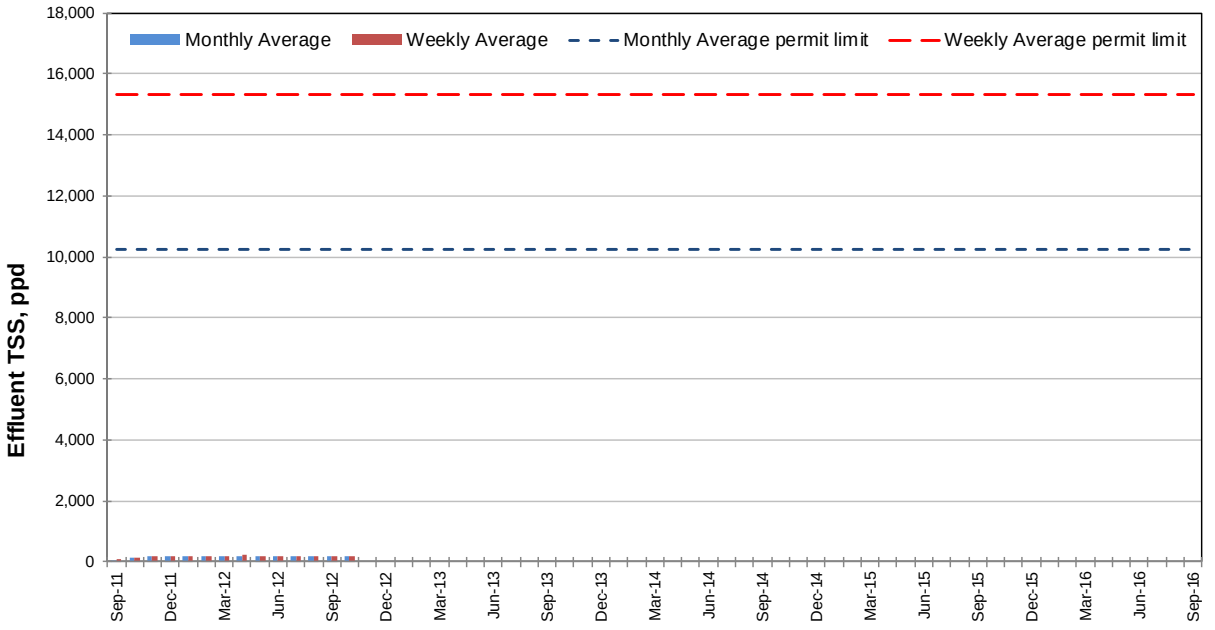




Discharge Monitoring Data, Effluent TSS, 2011-2016

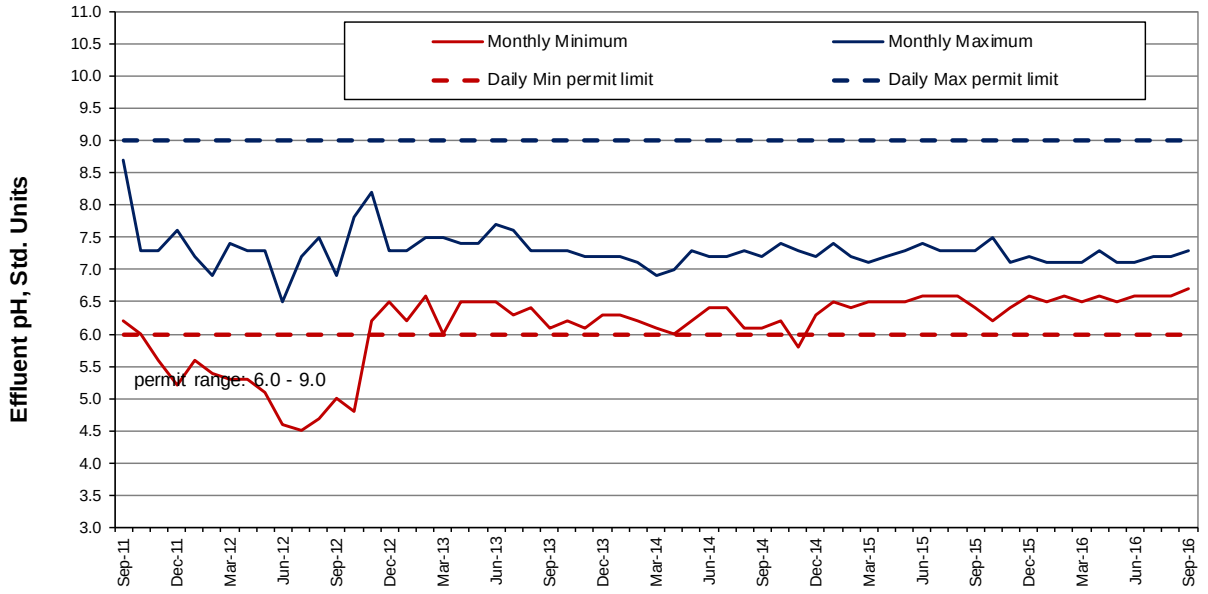
King County - Brightwater WWTP
Permit #WA0032247

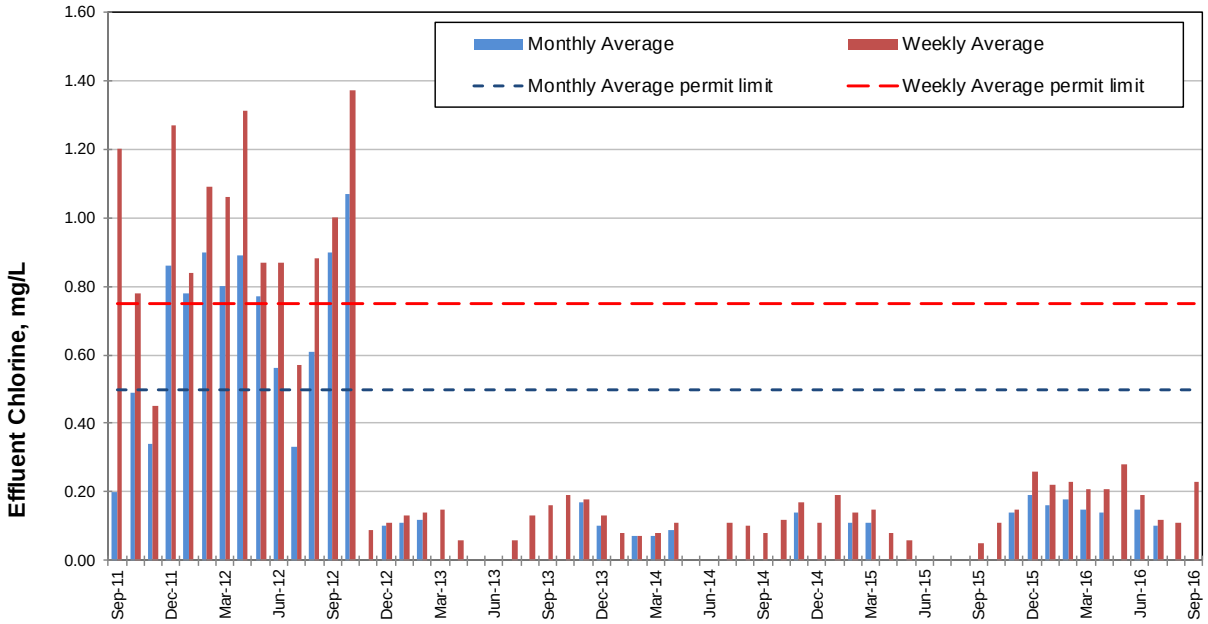




Discharge Monitoring Data, Effluent pH and Chlorine, 2011-2016

King County - Brightwater WWTP
Permit #WA0032247





Whole Effluent Toxicity Data

King Co. Brightwater WWTP Chronic WET Test Results as NOEC/LOEC in % Effluent

Collected	Start Date	Organism	Endpoint	NOEC	LOEC	PMSD
3/13/2013	3/13/2013	Atlantic mysid	7-day Survival	100	> 100	11.4%
			Biomass	100	> 100	15.3%
			Weight	100	> 100	12.7%
3/13/2013	3/13/2013	topsmelt	7-day Survival	100	> 100	13.2%
			Biomass	100	> 100	16.3%
			Weight	100	> 100	14.9%
6/12/2013	6/12/2013	Atlantic mysid	7-day Survival	100	> 100	10.7%
			Biomass	100	> 100	15.2%
			Weight	100	> 100	13.8%
6/12/2013	6/12/2013	topsmelt	7-day Survival	100	> 100	18.8%
			Biomass	100	> 100	22.7%
			Weight	100	> 100	16.0%
9/11/2013	9/12/2013	Atlantic mysid	7-day Survival	100	> 100	11.6%
			Biomass	100	> 100	15.2%
			Weight	100	> 100	12.7%
9/11/2013	9/11/2013	topsmelt	7-day Survival	100	> 100	11.4%
			Biomass	100	> 100	22.2%
			Weight	100	> 100	20.1%
10/30/2013	10/30/2013	Atlantic mysid	7-day Survival	100	> 100	12.4%
			Biomass	100	> 100	16.8%
			Weight	100	> 100	12.1%
10/30/2013	10/30/2013	topsmelt	7-day Survival	100	> 100	8.7%
			Biomass	100	> 100	18.4%
			Weight	100	> 100	14.9%
4/2/2014	4/3/2014	Atlantic mysid	7-day Survival	100	> 100	8.1%
			Biomass	100	> 100	14.0%
			Weight	100	> 100	12.2%
4/2/2014	4/2/2014	topsmelt	7-day Survival	100	> 100	10.0%
			Biomass	100	> 100	14.3%
			Weight	100	> 100	14.0%
9/30/2014	10/2/2014	Atlantic mysid	7-day Survival	100	> 100	18.5%
			Biomass	100	> 100	28.5%
			Weight	100	> 100	25.8%
9/30/2014	10/2/2014	topsmelt	7-day Survival	100	> 100	9.5%
			Biomass	50	100	24.8%
			Weight	50	100	22.0%
12/3/2014	12/3/2014	Atlantic mysid	7-day Survival	100	> 100	14.4%
			Biomass	100	> 100	20.3%
			Weight	100	> 100	15.3%
12/3/2014	12/3/2014	topsmelt	7-day Survival	100	> 100	8.0%
			Biomass	100	> 100	16.1%
			Weight	100	> 100	15.2%

NOEC = Concentration at which testing showed no observable effects

LOEC = Lowest concentration at which test showed an observable effect

PMSD = Percent minimum significant difference calculated for all tests in sampling event

King Co. Brightwater WWTP Acute WET Test Results as NOEC/LOEC in % Effluent

Collected	Start Date	Organism	Endpoint	NOEC	LOEC	PMSD
3/13/2013	3/13/2013	*Daphnia pulex*	48-hour Surviva	100	> 100	15.3%
3/18/2013	3/18/2013	fathead minnov	96-hour Surviva	50	100	24.0%
6/12/2013	6/12/2013	*Daphnia pulex*	48-hour Surviva	100	> 100	13.0%
6/17/2013	6/17/2013	fathead minnov	96-hour Surviva	100	> 100	5.9%
9/11/2013	9/11/2013	*Daphnia pulex*	48-hour Surviva	100	> 100	9.2%
9/16/2013	9/16/2013	fathead minnov	96-hour Surviva	100	> 100	6.6%
10/30/2013	10/30/2013	*Daphnia pulex*	48-hour Surviva	100	> 100	8.3%
11/4/2013	11/4/2013	fathead minnov	96-hour Surviva	100	> 100	8.3%
7/21/2014	7/22/2014	*Daphnia pulex*	48-hour Surviva	100	> 100	
7/21/2014	7/21/2014	fathead minnov	96-hour Surviva	100	> 100	12.5%
9/30/2014	10/1/2014	*Daphnia pulex*	48-hour Surviva	100	> 100	8.0%
9/30/2014	10/1/2014	fathead minnov	96-hour Surviva	100	> 100	12.9%
12/3/2014	12/3/2014	*Daphnia pulex*	48-hour Surviva	100	> 100	8.9%
12/7/2014	12/8/2014	fathead minnov	96-hour Surviva	100	> 100	14.9%
1/13/2015	1/13/2015	*Daphnia pulex*	48-hour Surviva	100	> 100	
1/13/2015	1/13/2015	fathead minnov	96-hour Surviva	100	> 100	13.8%

Outfall 001 ACEC: 0.9%

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

King Co. Brightwater WWTP Acute WET Test Results as % Survival in 100% Effluent

Test Code	Collected	Start Date	Organism	Endpoint	% survival	
RMAR2824	3/13/2013	3/13/2013	*Daphnia pulex*	48-hour Survival	95%	
RMAR2827	3/18/2013	3/18/2013	fathead minnov	96-hour Survival	63%	Anomalous
RMAR3015	6/12/2013	6/12/2013	*Daphnia pulex*	48-hour Survival	100%	
RMAR3013	6/17/2013	6/17/2013	fathead minnov	96-hour Survival	100%	
RMAR3060	9/11/2013	9/11/2013	*Daphnia pulex*	48-hour Survival	100%	
RMAR3062	9/16/2013	9/16/2013	fathead minnov	96-hour Survival	100%	
RMAR3120	10/30/2013	10/30/2013	*Daphnia pulex*	48-hour Survival	100%	
RMAR3121	11/4/2013	11/4/2013	fathead minnov	96-hour Survival	98%	
RMAR3311	7/21/2014	7/22/2014	*Daphnia pulex*	48-hour Survival	100%	
RMAR3310	7/21/2014	7/21/2014	fathead minnov	96-hour Survival	98%	
RMAR3437	9/30/2014	10/1/2014	*Daphnia pulex*	48-hour Survival	100%	
RMAR3436	9/30/2014	10/1/2014	fathead minnov	96-hour Survival	90%	
RMAR3466	12/3/2014	12/3/2014	*Daphnia pulex*	48-hour Survival	100%	
RMAR3467	12/7/2014	12/8/2014	fathead minnov	96-hour Survival	100%	
RMAR3494	1/13/2015	1/13/2015	*Daphnia pulex*	48-hour Survival	100%	
RMAR3493	1/13/2015	1/13/2015	fathead minnov	96-hour Survival	93%	

Median	**100%**

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

WAC 173-205-050

2011 Sediment Monitoring Data

Summary of Sediment Chemistry Analytical Results - 0 to 10 cm Depth Stratum
Comparison with Sediment Management Standards Chemical Criteria
Brightwater Treatment Facility Marine Outfall Pre-Operation Sediment Monitoring - October 2011

Station/Analyte	Average	Minimum	Maximum	SQS
Sediment Conventionals				
Total Organic Carbon (mg/Kg DW)	13,927	13,200	15,000	--
Total Organic Carbon (%)	1.4	1.3	1.5	--
Percent Fines	82.9	77.7	88.1	--
Ammonia Nitrogen (mg/Kg DW)	7.1	4.4	9.8	--
Total Sulfides (mg/Kg DW)	372.7	183.4	559.8	--
Trace Metals				
Arsenic	7.1	6.1	7.8	57
Cadmium	0.5	0.5	0.6	5.1
Chromium	38.2	34.9	39.4	260
Copper	27.3	24.0	28.2	390
Lead	12.9	11.4	13.7	450
Mercury	0.1	0.1	0.1	0.41
Silver	--	--	--	6
Zinc	82.4	76.0	85.2	410
Ionic Organic Compounds				
Benzyl Alcohol	--	--	--	57
Benzoic Acid	412.8	302.8	608.3	650
Phenol	--	--	--	420
2-Methylphenol	--	--	--	63
4-Methylphenol (3+4-MPH)	--	--	--	670
2,4-Dimethylphenol	--	--	--	29
Pentachlorophenol	--	--	--	360
Non-Ionic Organic Compounds				
Acenaphthene	--	--	--	16
Acenaphthylene	--	--	--	66
Anthracene	1.3	1.0	3.0	220
Fluorene	1.2	1.2	1.2	23
2-Methylnaphthalene	--	--	--	38
Naphthalene	--	--	--	99
Phenanthrene	2.6	1.3	9.5	100
Total LPAHs	3.9	1.4	13.7	370
Benzo(a)anthracene	2.1	1.4	4.7	110
Benzo(a)pyrene	3.3	2.4	6.1	99
Benzo(b,j,k)fluoranthene	5.0	3.8	8.8	230
Benzo(g,h,i)perylene	1.9	1.1	3.9	31
Chrysene	2.1	1.1	5.6	110
Dibenzo(a,h)anthracene	1.2	1.2	1.2	12
Fluoranthene	4.2	2.8	10.5	160
Indeno(1,2,3-c,d)pyrene	1.4	0.9	2.8	34
Pyrene	4.2	2.4	11.5	1,000
Total HPAHs	24.0	15.2	55.1	960
Benzyl Butyl Phthalate	--	--	--	4.9
Bis(2-ethylhexyl) Phthalate	--	--	--	47
Di-n-butyl Phthalate	--	--	--	220
Di-n-octyl Phthalate	--	--	--	58
Diethyl Phthalate	2.3	2.2	2.3	61
Dimethyl Phthalate	--	--	--	53
1,2-Dichlorobenzene	--	--	--	2.3
1,4-Dichlorobenzene	--	--	--	3.1
1,2,4-Trichlorobenzene	--	--	--	0.81
Hexachlorobenzene	--	--	--	0.38
Dibenzofuran	--	--	--	15
Hexachlorobutadiene	--	--	--	3.9
N-nitrosodiphenylamine	--	--	--	11
Total PCBs (as Aroclors)	0.25	0.25	0.25	12

"--" = Non-detect at all sample locations

Benthic Community Analysis - October 2011

Brightwater Treatment System Marine Outfall

Baseline Sediment Characterization - Outfall Diffusers

Physical Characteristics

Parameter	BWSD600P	BWND600P	BWSD800S	BWSD800N	BWREF3200N
Percent Fines (Clay plus Silt)	77.7	84.6	84.5	77.9	88.2
Percent Clay	24.1	24.2	24.7	21.1	31.3
Percent Silt	53.6	60.4	59.8	56.8	56.9
Percent Sand	21.6	15.2	22.8	24.7	19.6
Percent Gravel	0	0	0	0	0
Total Organic Carbon (mg/Kg dry weight)	14,200	14,700	13,600	13,600	14,400
Total Organic Carbon (% dry weight)	1.4	1.5	1.4	1.4	1.4
Ammonia (mg/kg dry weight)	6.28	8.40	4.41	9.84	8.07
Total Sulfide (mg/Kg dry weight)	249	560	367	503	304

Benthic Community Indices

Parameter	BWSD600P	BWND600P	BWSD800S	BWSD800N	BWREF3200N
Total Richness (# of species)	**53**	**46**	**45**	**49**	**49**
Annelida Richness	20	16	17	18	19
Crustacea Richness	15	16	16	16	14
Mollusca Richness	13	12	10	11	15
Miscellaneous Taxa Richness	5	2	2	4	1
Total Abundance (# of individuals)	**856**	**975**	**681**	**828**	**1,081**
Annelida Abundance	56	45	43	60	68
Crustacea Abundance	224	180	163	164	187
Mollusca Abundance	570	748	472	599	824
Miscellaneous Taxa Abundance	6	2	3	5	2
Total Biomass (g)	**30.38**	**11.58**	**29.85**	**71.55**	**24.10**
Annelida Biomass	2.62	1.55	2.24	2.62	1.33
Crustacea Biomass	0.32	0.26	0.31	0.23	0.22
Mollusca Biomass	5.54	6.84	4.32	3.93	9.79
Miscellaneous Taxa Biomass	21.90	2.93	22.98	64.77	12.76
Shannon-Wiener Diversity Index	**2.83**	**2.47**	**2.70**	**2.60**	**2.31**
Pielou's Evenness Index	**0.49**	**0.45**	**0.49**	**0.46**	**0.41**
Swartz's Dominance Index (SDI)	**4**	**3**	**3**	**3**	**2**

Notes

Macoma carlottensis - Phylum Mollusca (Bivalve)

Euphilomedes charcharodonta and Euphilomedes producta - Phylum Crustacea (Ostracod)

Parvilucina tenuisculpta - Phylum Mollusca (Bivalve)

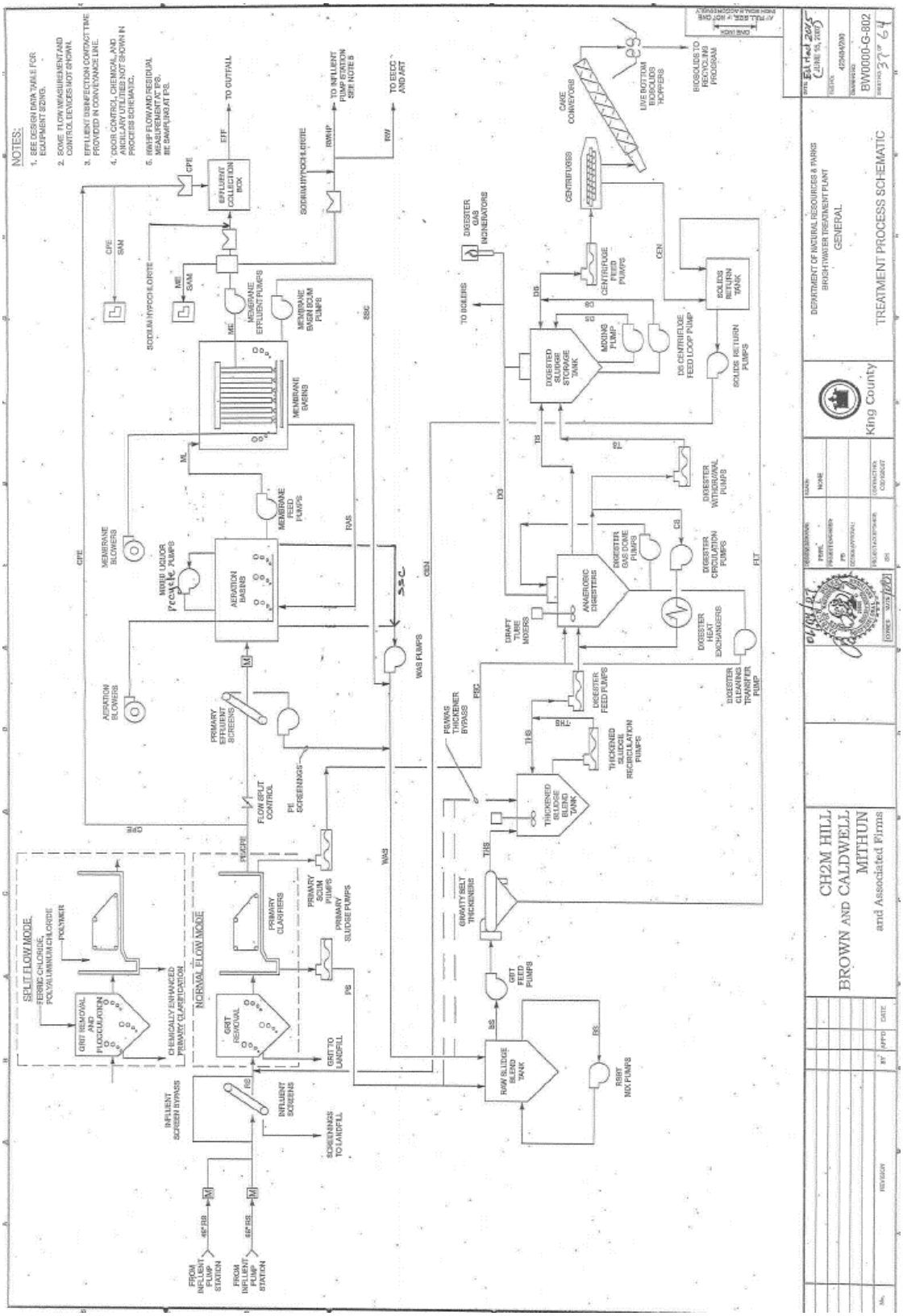
Photis lacia - Phylum Crustacea (Amphipod)

Benthic Indices at Brightwater Marine Outfall

Aggregate Data from All Stations in Four Sampling Years

	2001 (n = 6)				2006 (n = 4)				2007 (n = 4)				2011 (n = 5)			
Benthic Community Index	**Min**	**Max**	**Mean**	**StDev**	**Min**	**Max**	**Mean**	**StDev**	**Min**	**Max**	**Mean**	**StDev**	**Min**	**Max**	**Mean**	**StDev**
Total Abundance	930	1,343	1,136	154	509	593	557	40	1,347	1,790	1,592	199	681	1,081	884	152
Annelida Abundance	23	48	36	10	44	69	54	11	44	83	66	17	43	68	54	10
Crustacea Abundance	112	155	135	18	82	124	97	19	143	223	179	35	163	224	184	25
Mollusca Abundance	779	1,136	962	133	378	435	403	24	1,155	1,561	1,341	180	472	824	643	142
Total Richness	42	49	45	2.6	36	46	40	4.2	48	53	51	2.2	45	53	48	3.1
Annelida Richness	12	19	17	2.7	13	16	15	1.3	17	20	18	1.5	16	20	18	1.6
Crustacea Richness	12	16	14	1.6	11	15	13	2.0	15	17	16	0.8	14	16	15	0.9
Mollusca Richness	11	13	12	0.8	9	12	10	1.1	12	14	13	1.0	10	15	12	1.9
Shannon-Wiener Diversity Index	1.43	1.67	1.56	0.08	2.42	2.94	2.60	0.23	1.45	1.88	1.68	0.22	2.31	2.83	2.58	0.20
Pielou's Evenness Index	0.26	0.30	0.29	0.02	0.47	0.53	0.49	0.03	0.25	0.33	0.30	0.04	0.41	0.49	0.46	0.03
Swartz's Dominance Index	1	1	1	0	2	4	3	0.8	1	1	1	0	2	4	3	0.7

Appendix F – Process Flow Diagram



Appendix G – Wet Weather Operations

Ecology approved a facility design and operating strategy for the Brightwater WWTP that relies on flow-blending of peak wet weather flows that exceed the capacity of membranes installed at the facility. The strategy diverts wet weather flows in excess of membrane capacity to chemically enhanced primary treatment and disinfection. The diverted flow then blends with membrane effluent before final disinfection and discharge to Puget Sound. This appendix describes Ecology's review process and rationale for authorizing the bypass and blending.

Table G-1 shows the chronology of events involved in the planning and design of the Brightwater WWTP. Much of this work was done while EPA actively worked to develop proposed rules for peak wet weather discharges. Since significant work on Brightwater's MBR split flow concept was completed prior to and throughout the time that EPA sought public comment on its draft policy, Ecology based its review and approval of the Brightwater facility on concepts embedded in that draft policy.

Table G-1. Chronology of Brightwater Planning and Permitting Activities

Date	Activity/Action
November 1999	King County issues Regional Wastewater Services Plan (RWSP) document comparing alternatives for treatment for projected future flows. King County decides to build a new treatment plant as opposed to expanding existing treatment plants.
September 2001	Ecology approves the RWSP as King County's Updated General Sewer Plan.
November 2003	EPA seeks public comment on proposed wet weather diversion policy, which includes statements supporting the use of advanced treatment, such as MBR and advanced primary treatment.
June 2004	Ecology Program Management Team approves interim flow blending procedure.
June 2005	Ecology formally approves the Brightwater Facility Plan, which includes the MBR split peak flow concept and calculates the NEB relative to CAS.
July 2005	U.S. Congress enacts an act disallowing funds to be used to finalize EPA's proposed wet weather diversion policy.
August 2005	Notice to proceed for Brightwater Final Design is issued.
December 2005	EPA issues proposed draft rules for NPDES permit peak wet weather discharge from POTWs serving separate collection systems for public comment.
May 2006	Brightwater construction begins.
July 2009	EPA issues a draft guidance for preparing a Utility Analysis.
November 2010	King County submitted a Utility Analysis as requested by Ecology.
February 2011	Substantial completion of Brightwater WWTP.
April 2011	Ecology drafts NPDES permit and fact sheet for Brightwater and makes available for public comment.
August 2011	Brightwater interim commissioning to begin.
November 2012	Outfall conveyance line completion and started discharging to Puget Sound.

Treatment Plant Alternatives Analysis

During the development of the Brightwater Facilities Plan, the County developed, screened, and evaluated numerous treatment alternatives. They ultimately selected two alternatives for the final analysis are the following: a conventional activated sludge (CAS) alternative and a membrane bioreactor alternative. The CAS alternative proposed a design that would process all flows through conventional secondary treatment units (biological treatment with aeration basins and separation with clarifiers). The MBR alternative proposed treating 98% of the flow volume through a system consisting of biological treatment and membrane filtration. The remaining 2% of the flow volume during peak wet weather periods would receive chemically enhanced primary treatment (CEPT) through split stream treatment (SST). The second alternative recognized that the membranes impart a physical barrier to flow that creates hydraulic limitations. The Brightwater SST concept was necessary to prevent "loss of property" due to potential damage to the membranes that would result if the membranes were operated beyond their design capabilities.

For very large scale MBR projects such as Brightwater, sizing the MBR system to treat the peak hour flow, with a 1 in 20-year recurrence interval, would require construction of MBR facilities that would see limited use and be cost prohibitive compared to other alternatives. At the same time, the pollutant reduction benefits of advanced secondary MBR treatment employing the SST concept would be lost if Ecology disallowed the SST alternative. In the split flow treatment approach, peak wet weather flows exceeding a calculated secondary treatment flow threshold (i.e. flows above the MBR capacity) undergo advanced primary treatment and blend with the membrane effluent prior to discharge.

The Wastewater Facilities Plan selected the MBR with CEPT as the preferred alternative for the following reasons:

- The MBR alternative provides a net environmental benefit (NEB) because it discharges significantly less pollutant mass compared to the CAS alternative even though peak flows receive only enhanced primary treatment and disinfection.
- The MBR alternative provides for year-round nitrification thereby reducing the amount of ammonia- nitrogen discharged to Puget Sound. The CAS alternative did not provide nitrogen treatment. During design development, the County estimated that the CAS plant alternative, sized for 36 MGD flow, would discharge 2.35 million pounds of ammonia-nitrogen per year in comparison to only 0.25 million pounds per year for the MBR split flow treatment process.
- The MBR alternative produces Class A reclaimed water quality effluent ready for distribution and use. The CAS alternative did not include an additional filtration process and therefore did not produce reclaimed water quality without additional treatment and extra cost. By producing reclaimed water, the Brightwater WWTP will reduce the volume and pollutant load of treated wastewater to Puget Sound.
- The capital and operating costs of the two alternatives were approximately equal. However, the costs for the CAS alternative would have been more than the MBR alternative had the CAS alternative included costs for a filter for reclaimed water production and additional aeration tanks for nitrification.

- The MBR process uses a longer solids retention time than conventional CAS. Longer sludge-age processes have shown the potential for providing better reduction in concentrations of contaminants of emerging concern, such as endocrine disrupting compounds, in wastewater effluents.
- Studies have shown that treatment systems incorporating biological nutrient removal and associated long solids retention times had a greater reduction in pathogenic organisms than activated sludge systems without nutrient removal.[3] The MBR alternative employs a biological nutrient removal treatment system which corresponds to greater reductions in indicator bacteria (Total Coliform, Fecal Coliform, Enterococci, *Clostridium*, and coliphages), protozoan pathogens (*Cryptosporidium* and *Giardia*) and enteric viruses in the treated effluent when compared to the CAS alternative.

Ecology, in consultation with EPA, approved the Wastewater Facilities Plan with the MBR system as the preferred alternative. The original facility plan alternative approved in June 2005 included MBR design peak flow capacities necessary to protect the membranes. Those capacities would become the basis for flow set points for initiating split stream events. Table G-2 contains the originally-approved MBR design peak flow capacities. The County amended the facility plan in October 2016 to revise the operating strategy for the split stream treatment. The amendment proposed using a membrane capacity calculated daily based on automated performance testing rather than the fixed rates in the original facility plan. The revision recognized that actual membrane performance during winter seasons differed significantly from design expectations.

The County's alternative analysis predicted 35 split flow events for an average weather year with an anticipated duration of each ranging between a few hours to a full day. The analysis estimated the total split flow volume for an average weather year at less than 2 percent or 200 million gallons (MG) of the total plant flow processed for a given year. The remainder of the flow (greater than 98% or 11,315 MG) receives full MBR treatment.

Table G-2. MBR Design Peak Flow Capacities

Flow Duration [4]	Phase 1 – Initial (2011-2016) 30 MGD Nominal MBR Capacity	Phase 1 – Final (2016-2040) 39 MGD Nominal MBR Capacity
Maximum hour	44	57
Maximum 4-Hour	44	57
Maximum 8-hour	44	57
Maximum 16-hour	41	53
Maximum 24-hour	35	45
Maximum 7 days	35	45
Maximum 31 days	30	39

[3] Water Environment Research Foundation. 2004. Reduction of Pathogens, Indicator Bacteria, and Alternative Indicators by Wastewater Treatment and Reclamation Processes.

[4] Flow Duration is the maximum amount of time that the membrane manufacturer has specified that indicated flow can pass through the membranes without causing permanent damage.

Net Environmental Benefit (NEB)

On December 22, 2005, EPA published in the *Federal Register* the Proposed Peak Wet Weather Policy[5] regarding NPDES permit requirements for peak wet weather discharges from publicly owned treatment works (POTWs). The proposed policy included language that encouraged the NPDES permitting authorities to consider advance treatment when considering the approval of flow bypasses. Ecology's review and approval of the County's facility plan for the Brightwater treatment plant considered the projected environmental benefits presented in the plan. Ecology concluded that the Brightwater split flow treatment configuration demonstrated a Net Environmental Benefit (NEB) in terms of the percentage reduction in the mass of pollutants (BOD_5 and TSS) discharged to Puget Sound when compared to that of a conventional activated sludge treatment plant that does not divert peak flows around the secondary process.

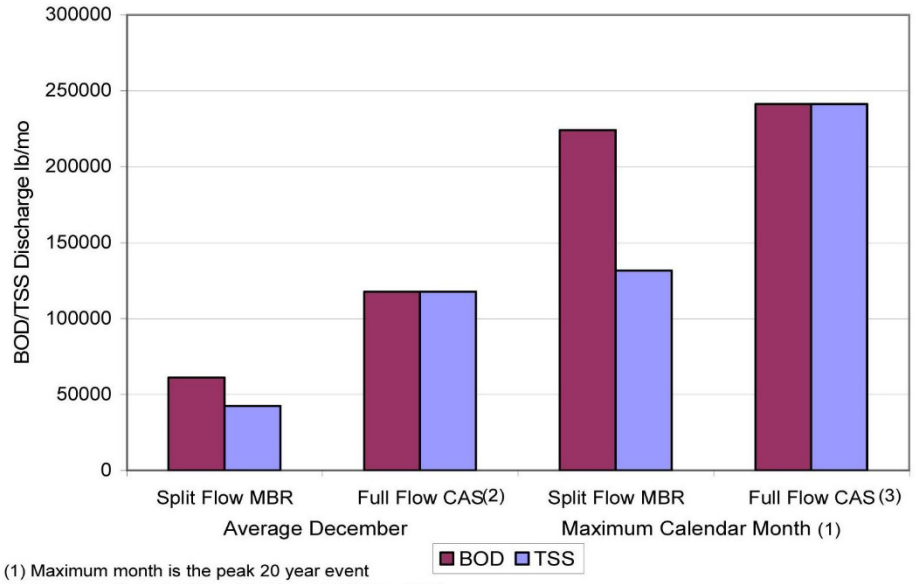
Excerpt from Proposed Policy

EPA recognizes that some POTW treatment plants may be implementing technologies more advanced than or supplementary to secondary treatment. The Agency encourages the use and permitting of such technologies (e.g., membrane, tertiary) where they produce a higher quality effluent. In the case where a POTW treatment plant is using, or plans to use, technology that is more effective in baseline pollutant removal than is required to meet secondary treatment-based permit limits, the NPDES authority should take that improved baseline performance into consideration when determining whether peak flow diversions at a POTW treatment plant are approved and under what conditions.

The following graphs compare the predicted mass of BOD_5 and TSS discharged from the Brightwater split flow MBR process to a conventional activated sludge process. The graphs show discharges on an annual and monthly basis. The facility plan analysis predicted in all cases that the MBR process would discharge significantly less mass of pollutants compared to a conventional activated sludge plant of the same capacity. The analysis assumed a modern conventional activated sludge treatment plant achieving monthly average concentrations of BOD_5 and TSS of 15 mg/L.

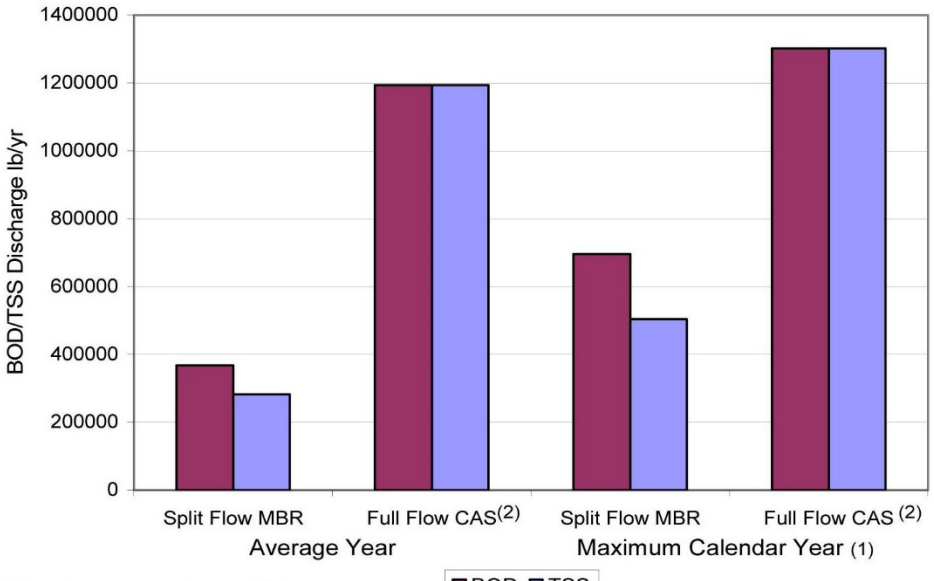
[5] U.S. Environmental Protection Agency (USEPA), 2005. Federal register, Proposed Rules, 40 CFR Parts 122 and 123, NPDES Permit Requirements for Peak Wet Weather Discharges from POTW Treatment Plants Serving Separate Sanitary Sewer Collection systems. http://cfpub.epa.gov/npdes/wetweather.cfm

Figure G-1. Net Environmental Benefit – Annual Discharge



(1) Maximum month is the peak 20 year event
(2) Assumes 15 mg/L Effluent BOD and TSS from CAS
(3) Assumes 25 mg/L Effluent BOD and TSS from CAS

Figure G-2. Net Environmental Benefit – Monthly Discharge



(1) Maximum year is the peak 20 year event
(2) Assumes 15 mg/L Effluent BOD and TSS from CAS

No Feasible Alternative to Bypass – Utility Analysis

Ecology reviewed and approved the facility plan for the Brightwater WWTP in June 2005. At the time of the plant's planning and initial design there was a national debate regarding the use of bypassing to manage peak wet weather flows. Although the federal "bypass regulation" prohibits the bypass of waste streams from any portion of the treatment process except under certain conditions [40 CFR §122.41(m)], NPDES permitting authorities throughout the county had varying interpretations and inconsistent application of the bypass regulation.

EPA's proposed Peak Wet Weather policy attempted to provide national consistency to the interpretations and application of the bypass regulation. It provided detailed requirements needed to address whether an anticipated bypass has "no feasible alternatives", as provided for in 40 CFR 122.41(m)(4)(i)(B). The language in the proposed policy, as follows, required that the POTW provide a utility analysis that would allow the permitting authority (Ecology) to determine if the conditions of the bypass regulation have been met.

No Feasible Alternatives Analysis Process per EPA's Proposed Policy

An authority's determination as to whether or not there is a feasible alternative to peak wet weather diversions at a POTW treatment plant serving a separate sanitary sewer collection system should be made using the following inputs and criteria, which are based on 40 CFR §122.41(m)(4)(i)(A)-(C) and 40 CFR §122.21(j) [application requirement for new and existing POTWs]. At the time of NPDES permit application or NPDES permit renewal:

1. POTW treatment plant operators seeking approval of peak wet weather diversions at a treatment plant as an anticipated bypass should submit a comprehensive analysis (utility analysis) to the NPDES authority that:

[*The proposed policy goes on to details the requirements of the utility analysis.*]

The federal bypass regulation allows for approval of an anticipated bypass, after considering its adverse effects [40 CFR §122.41(m)(4)(ii)] and when three conditions [40 CFR §122.41(m)(4)(i)(A-C)] are met. Although EPA did not finalize the proposed peak wet weather policy, Ecology used the concepts it contained when reviewing the County's split stream treatment proposal for the Brightwater WWTP. In particular Ecology relied on the proposed policy's requirements for and description of a Utility Analysis as a tool for demonstrating that the County has no feasible alternative for the anticipated wet weather bypassing at the Brightwater WWTP Ecology took the following factors into consideration in reviewing the County's proposed split stream treatment at the Brightwater WWTP.

Adverse Effects - 40 CFR §122.41(m)(4)(ii)

Ecology believes the MBR split flow design has numerous positive environmental benefits as opposed to adverse effects. An outlined the environmental benefits of the MBR split flow plant appears in the **Treatment Plant Alternatives Analysis** section**.** Ecology approved the Brightwater MBR and split-flow CEPT plant design on the basis of the significant reduction in total pollutant load to the environment as compared to conventional activated sludge, as discussed in the **Net Environmental Benefit** section.

Ecology's original analysis evaluated whether the intermittent bypasses would have measurable effects on the environment or health risk. Ecology considered existing and approved guidance, and determined that Ecology's Tier 2 Antidegradation Guidance[6] was most relevant for this purpose. It should be noted that a Tier 2 analysis for this permit is not required.

Tier 2 Guidance defines the level of allowable change in a pollutant parameter at the edge of an approved mixing zone that represents "no measureable change". Table G-3 includes the list of pollutants for which Ecology has numeric or narrative standards and is addressed under Tier 2 Guidance.

Ecology used the following assumptions for this evaluation:

- Chronic Dilution Factor = 238 (minimum dilution expected during permit cycle based on maximum flows including CEPT flows).
- The worst case level of bypass is based on the approved facility plan estimates of approximately 3 to 1 ratio of CEPT to MBR effluent.
- CEPT pilot tests showed 85% removal TSS prior to blending with the highly treated membrane effluent.

Table G-3. Demonstration of 'No Measurable Change' at edge of chronic mixing zone

Parameter	Definition of 'Measurable Change'	Estimated Change at Edge of Chronic Mixing Zone
Temperature	Increase of 0.3°C or greater	The temperature of the CEPT effluent will be similar to the MBR effluent temperature; therefore, Ecology expects no measurable change in temperature at the edge of the mixing zone during bypass events.
Dissolved oxygen (DO)	Decrease of 0.2 mg/L or greater	The CEPT effluent is anticipated to have higher BOD_5 than the MBR effluent. BOD_5 is the pollutant that most directly affects DO in the water body. However, due to the very high dilution achieved by the deep water outfall, Ecology expects no measurable change in DO at the edge of the mixing zone.
Bacteria level (fecal coliform)	Increase of 2 cfu/100 mL or greater	The treatment process provides dual disinfection for CEPT effluent: once prior to blending with membrane effluent than again when the combined effluent is discharged from the facility. Ecology does not expect effluent bacteria levels during a bypass event to differ from disinfected MBR effluent and, therefore, does not expect a measurable change at the edge of the mixing zone.
pH	Change of 0.1 units or greater	Both the MBR and CEPT effluent comply with the technology-based limits of 6.0 to 9.0. This will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water. The MBR and CEPT effluent will have a similar pH resulting in no measurable pH change during bypass events.

[6] As defined by Ecology, 2005: *Supplementary Guidance*, *Implementing the Tier II Antidegradation Rules*, page 6. Concentrations at Chronic Mixing Zone.

Parameter	Definition of 'Measurable Change'	Estimated Change at Edge of Chronic Mixing Zone
Turbidity	Increase of 0.5 NTU or greater	Turbidity is not monitored in wastewater treatment plant effluents. TSS is used as a surrogate parameter to evaluate solids. Pilot testing has shown CEPT to be highly effective in reducing TSS by 85% or greater. TSS in the MBR effluent will be less than 5 mg/L and the TSS in the CEPT effluent will be less than 30 mg/L. Given the high degree of dilution in the mixing zone, Ecology does not expect the small increase in TSS to result in a measureable change in turbidity.
Toxic or radioactive substances	Any detectable increase	Sections III.G and H of this fact sheet identifies pollutants detected in the plant's effluent that have numeric water quality criteria to protect aquatic life and human health. Ecology conducted a reasonable potential analysis (See Appendix D) on these parameters to determine whether it would require effluent limits in this permit. Due to the high dilution, no detectable increase is anticipated due to the anticipated bypass.

Based on the above evaluation, Ecology concluded that approval of the intermittent bypass and treatment by CEPT presents no added risk to human health or the environment.

Three conditions - 40 CFR §122.41(m)(4)(i)(A-C):

A. **Severe property damage** would result if peak flows where not diverted around the membrane portion of the plant. Damage to the membranes occurs if excessive flows, above the design capacities, are processed through the system. This damage would irreparably harm the membrane material, adversely affect the filtering capability of the membranes, cause a decrease in water quality, and cost millions of dollars to replace. In addition, attempting to process all excessive flows through the membranes may result in wastewater backups in the unit processes, potential damage to other process equipment, and/or result in sanitary sewer overflows in the collection system.

B. There are **no additional feasible alternatives** beyond the alternative installed. King County installed a chemically enhanced primary treatment (CEPT) system to treat bypassed flows. King County prepared a Utility Analysis to explore options beyond the selected option (see discussion below)

C. The Permittee will **provide notice** consistent with the requirements of S16.B of the permit.

Therefore, the Brightwater MBR split flow design meets the requirements of 40 CFR §122.41(m)(4)(i)(A-C)] and 40 CFR §122.41(m)(4)(ii). It is on this basis that Ecology has approved the anticipated bypasses under S16 of the proposed permit and has determined that such bypasses are consistent with 40 CFR §122.41(m).

Utility Analysis

King County prepared a Utility Analysis for the Brightwater WWTP and associated split stream concept in accordance with EPA's proposed policy and guidance[7]. KC-WTD submitted the original analysis in 2010 with the first NPDES permit application for the Brightwater WWTP. An updated analysis was submitted in 2016 to support KC-WTD's permit renewal application. Copies of the 2010 utility analysis and updated analysis are available through Ecology's PARIS database.

https://fortress.wa.gov/ecy/paris/DocumentSearch.aspx?PermitNumber=32247&FacilityName=&City=&County=&Region=0&PermitType=0&DocumentType=0

Ecology has taken the overwhelming net environmental benefits of the MBR split stream approach into consideration and has approved the peak flow diversions only when the MBR design peak flow capacities are exceeded. Ecology has reviewed the County's Utility Analysis and has deemed it acceptable as part of the administrative record and as justification for approving bypasses around the MBR process during peak wet weather events.

[7] USEPA, 2009. Draft Guidance on Preparing a Utility Analysis.

Appendix H – Response to Comments

Ecology received comments from the Cascade Water Alliance and King County Wastewater Treatment Division during the 30-day public notice period. A summary of each comment and Ecology's responses can be found on the following pages. The full comment letter from each entity is also included.

Cascade Water Alliance

Comment: Ecology's decision to issue separate NPDES and reclaimed water permits to King County for the Brightwater facility obscures the broader outlook of how the NPDES and reclaimed water permits interact at the Brightwater facility. Separating the timing and documentation for the Brightwater permits is contrary to the newly adopted rule (WAC 173-219-140).

Response: This comment primarily relates to the production and distribution of reclaimed water from the Brightwater facility, which is not regulated by the proposed NPDES permit. As such, Ecology has determined that the comment is not substantive to this draft permit. The commenter will receive a notice when the draft reclaimed water permit for the Brightwater facility (permit ST0045498) is available for public comment. They may submit comments on that permit at that time.

While the new reclaimed water rule states that Ecology will streamline the permit requirements under WAC 173-219 and under NPDES permit requirements under WAC 173-220, it does not obligate issuance of a single permit. Paragraph three of WAC 173-219-140 states: "The lead agency may issue a separate reclaimed water permit with an associated wastewater permit on a case-by-case basis when determined by the lead agency to improve implementation of chapter 90.46 RCW and this chapter." The terms and conditions in each permit derive from separate, independent legal authorities and, therefore, do not need to be contained in a single permit or issued at the same time.

King County Wastewater Treatment Division

Comments #1 and #2: The comments identify that the monitoring schedule in special condition S2 contains typographical errors in footnote references for mercury monitoring of wet weather bypasses and for manual composite sampling to monitor for volatile organic compounds.

Response: Ecology corrected the errors. The correct footnotes are footnote "p" for mercury monitoring and footnote "q" for manual composite sampling.

Comments #3 and #4: The comments identify minor errors in the fact sheet. Comment #3 relates to the process description of for disinfection during the CEPT mode of operation on page 13. It updates the description based on changes made in 2014 that Ecology did not originally include in the fact sheet. Comment #4 identifies that the word "are" was inadvertently used instead of "area" on page 40.

Response: Ecology corrected these errors in the fact sheet.

Comment #5: The comment notes that Appendix A lists both hardness and magnesium in the list of "Non-conventional Pollutants", but does not list calcium. It further notes that both calcium and magnesium are required to complete the [hardness] calculation.

Response: Ecology uses Appendix A to provide a statewide baseline for acceptable monitoring methods and detection levels for compliance monitoring that it may include in a NPDES or State Waste Discharge permit. It is not intended to list specific monitoring required by the permit and may include extraneous parameters. Special condition S2 of the permit lists the specific pollutant parameters King County must monitor for in the Brightwater WWTP effluent and report in discharge monitoring reports. That condition does not require monitoring or reporting of calcium or magnesium as district pollutants. Although calcium and magnesium are the primary components of hardness and the recommended method in Appendix A (Standard Method 2340-B) relies on the concentrations of each to calculate hardness, the permit only requires monitoring and reporting of total hardness. According to Table IB of 40 CFR 136.3, when determining hardness according to Standard Method 2340-B, the County may use any approved method for determining calcium and magnesium as long as the combined detection limits of the two parameters is less than the detection limit for hardness listed in Appendix A. The County may also use the approved colorimetric method (EPA Method 130.1) or titrimetric method (Standard Method 2340-C) to determine hardness as long as the methods meet the same detection limit.

Comment #6: This comment encourages Ecology to reevaluate and change the detection limits listed in Appendix A of the permit. It requests that Ecology consider the ability of labs to meet the detection limits using currently available analytical technology and to evaluate whether the detection limits are overly conservative relative to environmentally relevant concentrations of any potential concern. The comment specifically lists concerns with the detection limits for the following parameters: thallium, aldrin, alpha-BHC, gamma-BHC, 4,4'-DDE, dieldrin, beta-endosulfan and heptachlor.

Response: Ecology includes Appendix A in the permit to provide a consistent, statewide baseline for expected quantitation and detection levels from labs doing permit-related testing. The goal is to make sure that labs use appropriately sensitive methods for required analyses. The levels were developed using input from several labs in the state, including King County's environmental lab. In many cases the detection limits and quantitation levels are taken directly from 40 CFR 136.

We acknowledge that labs may not always meet all of the listed detection limits or quantitation levels due to matrix effects or other interferences. As such, Appendix A includes language that allows for deviation from the listed detection limits and quantitation levels by documenting a matrix-specific detection limit. The County must report the actual detection limits on discharge monitoring reports for the required priority pollutant monitoring it performs. If actual detection limits for a given round of monitoring exceed the levels listed in Appendix A, the County must submit documentation of the matrix-specific detection limit with the DMR. Ecology's Lab Accreditation Unit can assist the County's lab in developing matrix-specific detection limits. We did not change the values in this permit, but may alter the values in future permits as new information becomes available.

Comment #7: The comment identified that the recommended analytical methods listed in Appendix A for certain parameters are not consistent with methods approved in 40 CFR 136. Methods listed as "624" or "625" should instead be listed as methods 624.1 or 625.1, respectively.

Response: Ecology compared the recommended methods for each priority pollutant parameter listed in Appendix A with the approved method numbers listed in Table IC of 40 CFR 136.3. Appropriate changes were made to some of the recommended methods to reflect the approved method numbers.

Comment #8: The comment notes that the analyses for benzo (b, j, and k) fluoranthene can be reported as total of the three compounds and requests clarification of the appropriate DL and QL for the combined parameter.

Response: Ecology treats the detection limits and quantitation levels for each benzofluoranthene isomer as additive. Therefore, the detection limit and quantitation level for Total Benzofluoranthenes are the sum of the detection limits and quantitation levels for the b, j, and k isomers: DL = 7.8 µg/L; QL = 22.9 µg/L. We added these values to the Base/Neutral Compounds table in Appendix A as "benzo(b,j,k) fluoranthene. Alternatively, the analytical lab should report matrix-specific quantitation levels according to the procedures described in EPA Method 625.1.

Comment 9: The comment states that the definition of Quantitation Level (QL) or Minimum Level (ML) in footnote 2 of Appendix A does not agree with definitions used in 40 CFR 136. The County recommends replacing the definition with the definition used in EPA Methods 624.1 and 625.1.

Response: Ecology reviewed the source of the definition originally included in footnote 2 and found that the language comes from the definition of ML used in EPA Method 1631E, which is specific for the analysis of mercury. Ecology agrees that the ML definition from method 1631E is not necessarily appropriate for methods used to analyze other pollutants. Likewise, the ML definition from methods 624.1 and 625.1 is also not necessarily appropriate. Therefore, Ecology has changed the footnote 2 definition to require the permittee to ensure the analytical lab uses the ML definition documented in the specific analytical methods it uses for each analyte.

CASCADE
WATER ALLIANCE

February 8, 2018

VIA U.S. MAIL & EMAIL:

Washington State Department of Ecology
Northwest Regional Office
3190 - 160th Avenue SE
Bellevue, WA 98008-5452
Attention: Permit Coordinator
tmil461@ecy.wa.gov

Re: Cascade Water Alliance's Comments on the King County Brightwater Wastewater Treatment Plant Draft NPDES Permit (No. WA0032247)

Dear Permit Coordinator:

Thank you for the opportunity for informal comment on the Department of Ecology's (Ecology) Draft National Pollutant Discharge Elimination System (NPDES) Permit for the King County Brightwater Wastewater Treatment Plant, No. WA0032247, for which public notice was issued on January 10, 2018. Please accept this comment on behalf of Cascade Water Alliance (Cascade).

Cascade Water Alliance is a municipal corporation that provides safe, clean and reliable drinking water to its seven members, the cities of Bellevue, Kirkland, Redmond, Issaquah and Tukwila, Sammamish Plateau Water, and the Skyway Water and Sewer District. Cascade, which was formed in 1999, today serves more than 380,000 residences and 20,000 businesses.

Over the past year, Cascade has been an active participant in the reclaimed water rulemaking process with the goals of ensuring protection for groundwater bodies that are sources of drinking water and promoting the involvement and substantive input of drinking water utilities in the decision-making process, planning coordination, and establishment of a system of reclaimed water use that takes into account the larger public interest and is regulated by a comprehensive program. Cascade and its members seek to protect their interests through participation in the public process for renewal of the reclaimed water permit for the Brightwater facility.

It is our understanding that Ecology has previously issued the currently effective NPDES Permit, No. WA0032247, and Reclaimed Water Permit, No. ST0045498, for the King County Brightwater Wastewater Treatment Plant (Brightwater) as two separate standalone permits and that Ecology's intention is to again issue separate permits for the Brightwater facility for both

NPDES and reclaimed water. It is our further understanding that Ecology intends to issue a draft reclaimed water permit for the Brightwater facility in the near future to include standards in the new Reclaimed Water Rule, Ch. 173-219 WAC.

Due to the timing of the Reclaimed Water Rule's imminent effective date, this is a seemingly logical approach. However, this approach also obscures the broader outlook of how the NPDES and reclaimed water permits interact at Brightwater. The currently effective Reclaimed Water Permit, No. ST0045498, references the currently effective NPDES Permit, No. WA0032247, for certain regulatory provisions; if this practice continues with the new Brightwater permits, then the public and interested parties will not have the opportunity to review and comment on the two permits in tandem and the entire regulatory program. *See Reclaimed Water Permit Number ST0045498* (issued June 10, 2011) at 6 ("Monitor influent loadings to the facility as required by NPDES permit number WA0032247."); *see id.* at 13 ("Re-treat reclaimed water such that it meets all reclaimed water permit limits or discharge it through an approved NPDES outfall."); *see id.* at 15 ("The Permittee must handle any residuals generated from the reclamation process as described in NPDES permit No. WA0032247 and the Brightwater Facilities Plan approved by Ecology.").

Separating the timing and the documentation for the Brightwater permits is contrary to the recently adopted rule. *See* WAC 173-219-140 ("Ecology will streamline permit requirements under this chapter and chapters 173-216 and 173-220 WAC, and NPDES permit requirements under the Federal Water Pollution Control Act into a single permit document issued by ecology."). In particular, this piecemealing of the permits raises concerns under the State Environmental Policy Act (SEPA). For the reasons noted above, Cascade is keenly interested in the terms and conditions of the upcoming proposed draft reclaimed water permit for the Brightwater facility. We look forward to reviewing and commenting on the draft reclaimed water permit when it is released.

Reclaimed water will continue to be a key element of the region's water future and Cascade appreciates the opportunity to comment on the scope and implementation of the legislature's intent with regard to reclaimed water.

Chuck Clarke
Chief Executive Officer
Cascade Water Alliance

King County
Department of Natural Resources and Parks
Wastewater Treatment Division
King Street Center, KSC-NR-0500
201 South Jackson Street
Seattle, WA 98104-3855

February 8, 2018

Shawn McKone, NPDES Permit Manager
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

Comments on Draft NPDES Permit for the Brightwater Wastewater Treatment Plant

Dear Mr. McKone:

King County Department of Natural Resources and Parks (DNRP) Wastewater Treatment Division (WTD) staff have reviewed the January 10, 2018 Draft NPDES Permit for its Brightwater Wastewater Treatment Plant (WA0032247). We have identified several factual and technical comments (attached) and would appreciate your consideration of appropriate modifications to the draft permit and accompanying fact sheet.

Please contact me if you have any questions regarding these comments.

Sincerely,

Jeff Lafer
NPDES Permit Administrator

cc: Matt Nolan, Assistant Manager, Operations and Maintenance Section, Wastewater Treatment Division (WTD), Department of Natural Resources and Parks (DNRP)

Comments on Draft NPDES Permit - Brightwater Wastewater Treatment Plant

No.	Permit or Fact Sheet	Page	Comment
1	Permit	7/8	The footnote "r", which is missing from the list of notes, is first used in the table for mercury in reference to a grab sample type. The notes do not include the definition of a grab sample.
2	Permit	7/8	The sample type for PP-Volatile Organics is footnoted with "r", but refers to a manual composite type. This footnote should be "q" that defines the manual composite.
3	Fact Sheet	13	The description of disinfection in the CEPT mode in the Fact Sheet (p. 13, 2nd paragraph, 4th and 5th sentences, starting with "Diverted flow receiving CEPT treatment.....") do not accurately describe the current operation. In October 2014, King County completed installation of additional hypochlorite injection and diffuser equipment in the effluent collection box, which now is the location where CEPT flow receives disinfection. The sentences should be replaced with the following text to accurately describe the operation: "The CEPT collection channel conveys the bypassed flow to the effluent collection box where it receives a dose of sodium hypochlorite for disinfection before discharge to Puget Sound." Likewise, Fact Sheet (p. 13, 3rd paragraph, 5th and 6th sentences starting with "During wet weather operation.....") should be replaced with the following text: "During wet weather conditions with CEPT operations, the CEPT flow blends with membrane effluent in the effluent collection box where additional sodium hypochlorite is added to the blended effluent prior to discharge to the effluent tunnel. The sodium hypochlorite dose also is increased as CEPT operations begin."
4	Fact Sheet	40	In the fourth line from the bottom, "are" should be "area" as underlined: "Brightwater service area in October 2017..."
5	Permit Appendix A	43	Hardness is requested along with Magnesium in the "Nonconventional Pollutants", but Calcium is not listed. Calcium and Magnesium are required to complete the calculation.
6	Permit Appendix A	43 to 47	General Comment on Detection Limits: As labs implement the new procedure for determining detection limits (40 CFR 136 App B), it is possible they may no longer meet the DL values in Appendix A. We would like to encourage Ecology to re-evaluate how well labs are able to meet the DL limits in the near future. In September, 2018, one year will have passed since the promulgation of the updated 40CFR136 and labs should have complied enough data to determine new detection limits for the methods cited in Appendix A. The King County Environmental Lab conducts analyses with appropriate analytical equipment and procedures and find that for some of the parameters listed, the minimum detection limits listed in Appendix A are lower than what can be routinely achieved. Consequently, we request Ecology consider the ability of labs to meet the detection limits with respect to the currently available analytical technology, as well as whether the detection limits are overly conservative relative to environmentally relevant concentrations of any potential concern. Examples of detection limits in Appendix A that are very low compared to the County's findings of routine analytical performance include thallium with a DL of 0.3 ppb. Our lab has found issues with carryover at such a low level and currently have a DL of 0.1 ppb for thallium. Our current detection limits for Aldrin, alpha-BHC, gamma-BHC, 4,4'-DDE, Dieldrin, beta-Endosulfan and Heptachlor also are above the respective detection limit values in Appendix A, and we would recommend changing the DL values for these parameters to 5 ng/L.

Comments on Draft NPDES Permit for the Brightwater Treatment Plant
February 8, 2018
Page 3

Comments on Draft NPDES Permit - Brightwater Wastewater Treatment Plant cont.			
No.	**Permit or Fact Sheet**	**Page**	**Comment**
7	Permit Appendix A	45 to 47	The recommended analytical protocol listed in Appendix A should match the methods approved in 40CFR136, where applicable. Methods such as 624 and 625 should therefore not be listed, only 624.1 and 625.1
8	Permit Appendix A	46	The analyses for benzo (b,j, and k) fluoranthene can be reported as total of the three compounds, as provided in footnote 7. What are the applicable DL and QL values to report when the sum of these is reported?
9	Permit Appendix A	48	Footnote 2: The definition of the Quantitation Level (QL) or Minimum Level (ML) in this footnote is different than the reference methods listed in the tables. Since many of the QL values shown in these tables are taken from these reference methods, the definition of QL in this footnote should be revised to match the reference method definition. Please replace the second and third sentence with "Quantitation levels may be obtained in several ways: They may be published in a method; they may be based on the lowest acceptable calibration point used by a laboratory; or they may be calculated by multiplying the MDL in a method, or the MDL determined by a laboratory, by a factor of 3.".