Fact Sheet for NPDES Permit WA0029181

West Point Wastewater Treatment Plant
and
Combined Sewer Overflows

Date of Public Notice: April 5, 2023

Permit Effective Date: xx/xx/xxxx

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 Department of Natural Resources and Parks – Wastewater Treatment Division's (KC-WTD) West Point Wastewater Treatment Plant (WWTP). The permit also regulates and authorizes discharges from five combined sewer overflow (CSO) treatment plants and 38 untreated CSO outfalls that operate within the combined sewer system associated with the West Point WWTP.

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

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for KC-WTD's West Point WWTP and CSOs, NPDES permit WA0029181, is available for public review and comment from April 5, 2023 until June 5, 2023. For more details on preparing and filing comments about these documents, please see Appendix A - Public Involvement Information.

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

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

Summary

The proposed permit regulates discharges of domestic wastewater from King County's West Point WWTP, five CSO treatment facilities that provide at least primary treatment and disinfection at the site of CSO discharges (Alki, Carkeek, Elliott West, Henderson/MLK, and Georgetown), and 38 CSO outfalls that discharge untreated combined sewage during large rain events.

The West Point WWTP treats wastewaters from domestic, commercial, and industrial sources as well as stormwater runoff from portions of the greater Seattle. The plant uses a high rate oxygenated activated sludge biological treatment process with chlorine disinfection before discharging the treated effluent to central Puget Sound. The proposed permit contains the same effluent limits as the permit

issued in 2014 for 5-day Carbonaceous Biochemical Oxygen Demand, total suspended solids, fecal coliform bacteria, pH, and total residual chlorine for discharges from the West Point WWTP. The proposed permit also retains limited authorization for KC-WTD to bypass primary-treated effluent around the secondary process at the West Point WWTP during wet weather. The diverted excess flow must receive full disinfection prior to discharge.

In addition to regulating discharges from the West Point WWTP, the proposed permit regulates discharges from five treatment plants that provide at least primary treatment and disinfection of excess combined sewage at the site of the CSO discharge. The permit retains the same limits as the previous permit for average settleable solids concentrations, fecal coliform bacteria concentrations, and pH. Although the permit includes the same numeric limit for annual total suspended solids removal efficiency, the permit changes the method for calculating compliance with the limit. The permit retains the same limit for total residual chlorine at the Carkeek CSO treatment plant but imposes more stringent limits at the other CSO treatment plants due to reduced dilution. The permit also includes a new copper limit for the Henderson/MLK CSO treatment plant and new copper and zinc limits at the Elliott West CSO treatment plant.

The proposed permit includes a new authorization for KC-WTD to discharge treated combined sewage from the new Georgetown CSO treatment plant. KC-WTD completed construction of this CSO treatment plant in late 2022 to control untreated CSO discharges from two outfalls discharging into the lower Duwamish River. This permit imposes technology-based limits on this discharge similar to the limits set at the other CSO treatment plants. The permit does not include a chlorine limit for this facility since it uses ultraviolet light for disinfection instead of chlorine.

Due to the history of poor performance of the Elliott West CSO treatment plant, the proposed permit includes a compliance schedule that requires KC-WTD to complete planning and design for a replacement facility. The permit also requires KC-WTD to perform monitoring of solids discharged through certain CSO outfalls to aid in characterizing the potential for these solids to impact sediments near the outfalls.

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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 (CWA) 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)

The following additional regulations apply to communities operating collection systems with Combined Sewer Overflows:

- Submission of plans and reports for construction and operation of combined sewer overflow reduction facilities (chapter 173-245 WAC)
- US EPA CSO control policy (59 FR 18688)

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

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

II. Background Information

Table 1 – Main Facility Information and Permit Contacts

Applicant:	King County Department of Natural Resources and Parks (DNRP) – Wastewater Treatment Division (KC-WTD),
Main Facility Name, Address, and Location	West Point Wastewater Treatment Plant (WWTP) 1400 Discovery Park Blvd, Seattle, WA 98199 Lat: 47.661465˚, Long: -122.430693˚
Permit Administration Contact	Name: Jeff Lafer Title: NPDES Permit Administrator Telephone #: 206-477-6315 Email: jeff.lafer@kingcounty.gov
Operations Contact	Name: Chapin Brackett Title: WTD Assistant Manager – Process & Environmental Compliance Telephone #: 206-477-3347 Email: cbrackett@kingcounty.gov
Responsible Official	Name: Christie True Title: Director, King County DNRP Address: 201 S. Jackson St., KSC-NR-0700 Seattle, WA 98104-3855 Telephone #: 206-477-4550 Email: christie.true@kingcounty.gov
Type of Treatment	Secondary treatment with (High rate oxygenated activated sludge)
Receiving Water and Discharge Location	Puget Sound (Central Basin) Lat: 47.661111˚, Long: -122.446389˚

Note: all coordinates use NAD83/WGS84 reference datum.

Permit Status

Renewal Date of Previous Permit: February 1, 2015

Application for Permit Renewal Submittal Date: January 31, 2019

Date of Ecology Acceptance of Application: January 22, 2020

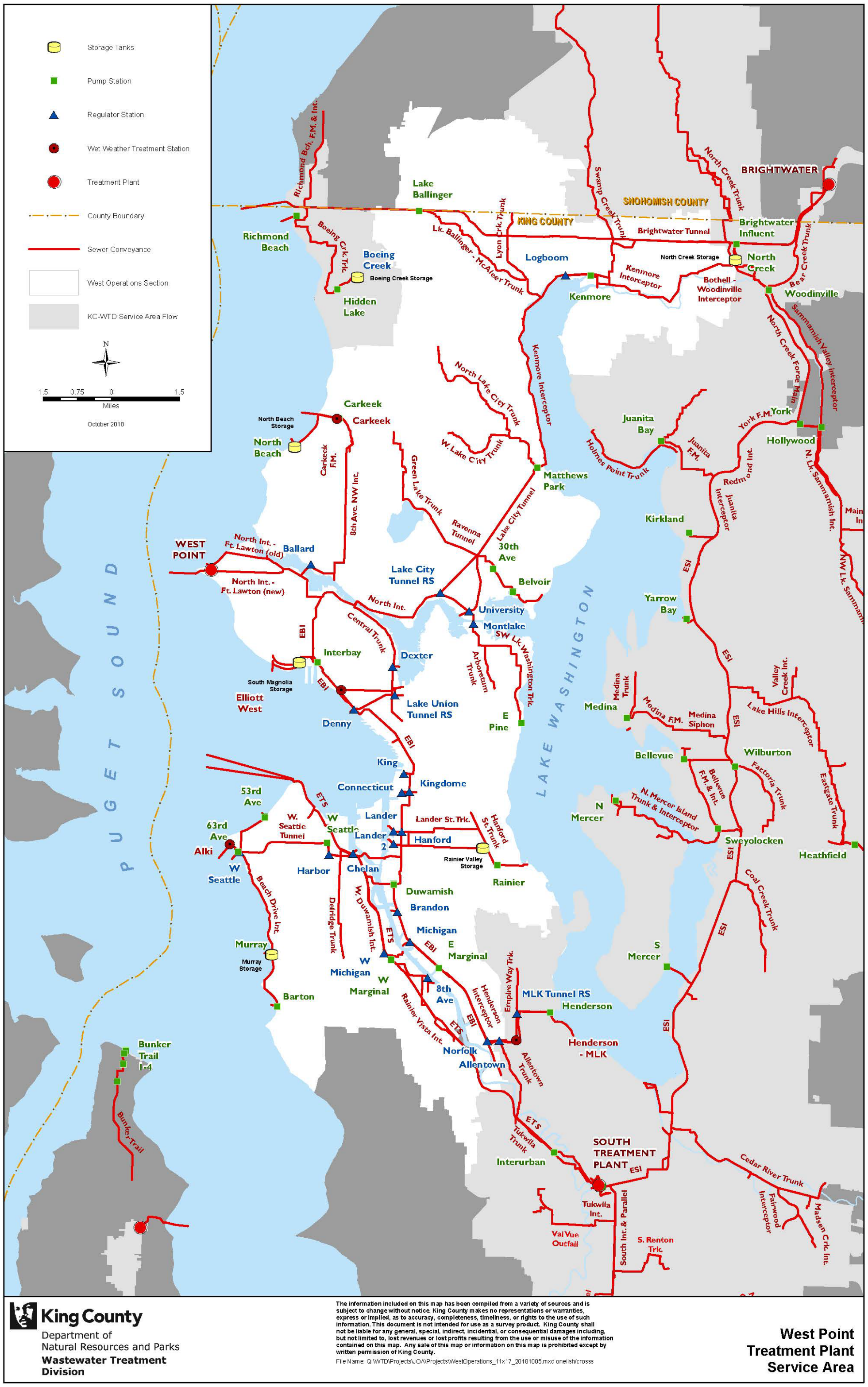
Inspection Status

Date of Last Non-sampling Inspection: April 14, 2021

Table 2 – CSO Treatment Plant Information

Facility Name Address Location Type of Treatment Receiving Water Discharge Location	Carkeek CSO Treatment Plant 1201 NW Carkeek Park Road, Seattle, WA 98177-4640 Lat: 47.710869˚, Long: -122.370723˚ Screening, Grit Removal, Primary Sedimentation, and Chlorine Disinfection Puget Sound (Central Basin) Lat: 47.71264˚, Long: -122.38789˚
Facility Name Address Location Type of Treatment Receiving Water Discharge Location	Alki CSO Treatment Plant 3380 Beach Drive SW, Seattle, WA 98116-2616 Lat: 47.574605˚, Long: -122.417348˚ Screening, Primary Clarification, and Chlorine Disinfection Puget Sound (Central Basin) Lat: 47.570247˚, Long: -122.422499˚
Facility Name Address Location Type of Treatment Receiving Water Discharge Location	Elliott West CSO Treatment Plant 545 Elliott Avenue West, Seattle, WA 98119 Lat: 47.624603˚, Long: -122.366339˚ Solids Settling, Screening, and Chlorine Disinfection Elliott Bay Lat: 47.61755˚, Long: -122.36186˚
Facility Name Address Location Type of Treatment Receiving Water Discharge Location	Georgetown CSO Treatment Plant 6185 4th Ave S, Seattle, 98108 Lat: 47.545579°, Long: -122.329959 Screening, Ballasted Sedimentation, and UV Disinfection Duwamish River Lat: 47.54279°, Long: -122.33484°
Facility Name Address Location Type of Treatment Receiving Water Discharge Location	Henderson/MLK CSO Treatment Plant 9829 42nd Avenue South, Seattle, WA 98118 Lat: 47.514003˚, Long: -122.280776˚ Screening, Solids Settling, Fine Screening, and Chlorine Disinfection Duwamish River Lat: 47.51194˚, Long: -122.29736˚

Figure 1 – Facility Location Map



II.A. Facility description

King County's Department of Natural Resources and Parks (DNRP) – Wastewater Treatment Division (KC-WTD) owns and operates the West Point Wastewater Treatment Plant (WWTP) and associated regional facilities. Figure 1 shows the location of the West Point WWTP along with the five combined sewer overflow (CSO) treatment plants and 38 CSO outfalls that are also regulated by the proposed permit. The West Point WWTP is part of King County's regional system that collects and treats wastewater from homes, businesses, and industries in and around the Seattle Metropolitan Area. King County's other regional wastewater treatment plants include the South WWTP in Renton and the Brightwater WWTP in Woodinville. KC-WTD also owns and operates two small community wastewater treatment plans on Vashon Island (Vashon Village) and in the City of Carnation. The West Point WWTP is located on the Puget Sound at the western tip of Discovery Park between Shilshole Bay and Elliott Bay. King County owns approximately 80 acres of land at the West Point site; twenty of these acres are considered subtidal.

II.A.1. History

The Municipality of Metropolitan Seattle (Metro) originally constructed the West Point WWTP in 1965 as a primary treatment plant. In 1972, the amended Federal Water Pollution Control Act (PL 92-500) established the NPDES and pretreatment programs. Federal law provided that all sewage treatment plants were to meet secondary treatment requirements by July 1, 1977. During the period 1976-1977, Metro, the agency having ownership of the plant at the time, prepared a draft facility plan and Environmental Impact Statement (EIS) and submitted a request for federal funding through EPA Grant No C0530816-01 to meet secondary treatment requirements at West Point.

In 1979, Metro applied to the USEPA for a Clean Water Act Section 301(h) Waiver from secondary treatment at West Point, Richmond Beach, and Carkeek treatment plants. Metro also planned to apply for a waiver for the Alki treatment plant. Metro withdrew from the 301(h) waiver process on September 7, 1984, which resolved this process.

On September 24, 1984, Ecology issued Metro an Administrative Order, Docket No. DE 84 577, which directed Metro to proceed with planning for secondary treatment at West Point and to set a schedule for attaining secondary treatment no later than February 1, 1991. In November 1987, Ecology amended the Order by Consent Decree No. 87-2-05395-4 that changed, among other things, the final compliance date to December 31, 1995. On January 1, 1994, King County assumed control of Metro's assets and obligations under the existing NPDES permits issued by Ecology. On December 8, 1995, Ecology certified that the West Point WWTP achieved the secondary treatment level.

In February 2017, a power disruption at the West Point WWTP during a large storm event initiated a chain of events that ultimately led to catastrophic flooding of the facility and complete bypassing of the treatment plant for 18 hours. The damaged caused by the flooding rendered large portions of the treatment plant inoperable. Although plant operators were able to restore partial operation within hours of the flooding, the extensive damage caused KC-WTD to limit the amount of flow the facility could accept and to take the secondary treatment systems offline for several months. The plant remained operating at diminished capacity for 77 days and did not return to normal operation until mid-May 2017, a total of 89 days after the flooding. The capacity restrictions during the recovery period resulted in KC-WTD employing a flow management strategy that increased the use of storage within the collection system and more frequent operation of the CSO treatment plants. As part of the flow management strategy, KC-WTD also diverted some flows from the typical West Point service area to the Brightwater and South WWTPs as well as collaborating with the City of Edmonds to incase the amount of flow diverted from the Lake Ballinger pump station to the Edmonds WWTP.

The state legislature amended Washington's Water Pollution Control Act in 1985 to require the development of plans to achieve "the greatest reasonable reduction of combined sewer overflows…at the earliest possible date". In 1994, the USEPA finalized the federal Combined Sewer Overflow Control Policy to establish nation-wide guidelines for reducing the discharge of pollutants from combined sewers. Although King County had made steady progress in reducing untreated CSOs since 1988, a 2007 field audit by the USEPA concluded that King County's CSOs violated state and federal regulations. To resolve allegations from this audit, King County entered into a consent decree in 2013 with Ecology, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Justice (DOJ) that outlined actions necessary to bring King County's CSO program into compliance with the CWA.

II.A.2. West Point Service Area

King County provides wholesale wastewater treatment services to 18 cities, 15 local sewer utilities, and one Indian tribe. The complex regional wastewater system owned and operated by KC-WTD includes three regional wastewater treatment plants that serve about 1.9 million people within a 424-square-mile service area. The regional service area includes most urban areas of King County and parts of south Snohomish County and northeast Pierce County. Within the regional service area, the local agencies own and operate independent collection systems, which include pipelines and pump stations to collect and convey wastewater flows in their service area to King County's regional system for treatment and disposal. The local agencies have long-term agreements with King County for this service. KC-WTD 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 areas.

The West Point WWTP service area serves approximately 755,000 people (based on 2018 data) in an area that encompasses approximately 98 square miles in the northwestern portion of the regional service area. As shown in Figure 1, West Point service area lies predominantly west of Lake Washington and stretches approximately from the border between King and Snohomish counties south to approximately the border between the Cities of Seattle and Tukwila. Municipalities and utility districts that contribute wastewater to the West Point WWTP include: City of Seattle, Highlands Sewer District, and Valley View Sewer District. In addition, portions of the following jurisdictions contribute flow: cities of Brier, Lake Forest Park, Edmonds, Montlake Terrace, Shoreline (formerly Ronald Sewer District), Alderwood Water and Sewer District, Northshore Utility District, Olympic View Water and Sewer District, and Southwest Suburban Sewer District.

The West administrative section manages all conveyance and treatment system operations in areas tributary to the West Point WWTP, including the five combined sewer overflow treatment facilities and 38 untreated CSO outfalls. Developments within the north Lake Washington area were constructed with separate sanitary and storm sewers. Within the City of Seattle, approximately 42,000 acres or 75 percent of the total area is constructed with combined sewers. Sanitary and combined flows from Seattle are merged prior to arriving at the West Point WWTP.

West Point WWTP receives wastewater from a series of pump and regulator stations and related trunks and interceptors located in the west section. All sewage flows in the West Section ultimately converge in the North Interceptor, which generally follows the south shoreline of the Lake Washington Ship Canal to the Interbay area of Seattle. The North Interceptor then bifurcates near the Ballard Locks into two influent tunnels – the 144-inch (12-ft) diameter “Ft. Lawton Tunnel” and the 84-inch (7-ft) diameter “Old Ft. Lawton Tunnel”. The Old Ft. Lawton tunnel conveys wastewater around the north end of Discovery Park while the newer Ft. Lawton Tunnel lies underneath the park.

The County’s supervisory control and data acquisition (SCADA) computer systems located at the West Point WWTP control center automatically monitors and controls the flow through the west division collection system. The control system minimizes surges, maximizes flow to the plant, and maximizes use of collection system storage to limit combined sewer overflows. On duty operators can remotely control the operations of the 20 pump stations within the West section to manage the flow of wastewater to the treatment plant. The operators also monitor for problems and dispatch off-site operators whenever they receive alarm conditions at any of the West section facilities. The West Point WWTP operators also monitor operations of the Richmond Beach Pump Station, which serves the northwest region of the City of Shoreline and connects to the City of Edmonds’ WWTP for treatment.

In addition to the domestic and commercial wastewater, nearly all of Seattle’s industrial areas discharge to the West Point WWTP including 37 significant industrial users (SIUs). Based on King County’s permit application, the West Point WWTP receives an estimated daily flow of 2.6 million gallons per day (MGD) of pretreated industrial wastewater from 25 non-categorical SIUs and 16 categorical industrial users (CIUs). The County’s Industrial Waste (IW) Program issues pretreatment permits to these industries under an Ecology-delegated pretreatment program. Table 3 lists the permitted industrial dischargers.

Table 3 – Permitted SIUs and CIUs discharging to West Point WWTP

Name	City	Industrial Process	Permitted Flow (gpd)
Alaskan Copper Works - 6th Ave.	Seattle	Metal finishing	5,200
Art Brass Plating Inc.	Seattle	Metal finishing	38,900
ASKO Processing Inc.	Seattle	Metal finishing	48,500
BNSF Railway Company - Interbay Facility	Seattle	Transportation facility	393,000
Boeing Commercial Airplane - North Field	Seattle	Metal finishing	527,000
Boeing Company - Plant 2 Facility	Seattle	Metal finishing	38,500
Carsoe US Inc.	Seattle	Metal finishing	500
Ceradyne Inc., a 3M Company - Seattle	Seattle	Glass manufacturing	9,000
Darigold Inc. - Rainier Plant	Seattle	Food processing - dairy	240,000
Emerald Services Inc. - Airport Way Facility	Seattle	Centralized waste treatment	170,000
Foss Maritime Company	Seattle	Boat/shipyard	426,000
Glacier Northwest Inc. - Kenmore Facility	Kenmore	Cement/readymix	110,000
GM Nameplate Inc.	Seattle	Metal finishing	5,280
Industrial Container Services - WA LLC	Seattle	Barrel cleaning	360,000
Kerry, Inc.	Seattle	Food processing – other	56,000
Lafarge - Seattle Plant	Seattle	Solid waste –transfer facility	118,500
Machinists, Inc. Plant 5	Seattle	Metal finishing	3,000
Magnetic and Penetrant Services Co. (MAPSCO)	Seattle	Metal finishing	18,000
Marine Vacuum Service Inc.	Seattle	Centralized waste treatment	326,400
Mastercraft Metal Finishing Inc.	Seattle	Electroplating	1,000
National Products Inc.	Seattle	Metal finishing	4,900
Pacific Iron & Metal Co.	Seattle	Metals recycling	60,000
Rabanco Recycling Co.	Seattle	Solid waste – transfer facility	254,400
Rainier Commons LLC - Old Rainier Brewery Site	Seattle	General type	135,000
Seattle Barrel Co.	Seattle	Barrel cleaning	12,000
Trident Seafoods Corp.	Seattle	Food processing – seafood	90,000
TLP Management Services LLC	Seattle	Fueling facility	67,200
University of Washington Seattle Campus	Seattle	Electronic components	255,000
Vigor Shipyards Inc.	Seattle	Boat/shipyard	1,600,280
Waste Management National Services - Duwamish	Seattle	Solid waste – transfer facility	144,000

II.A.3. Inflow and Infiltration

The NPDES permit application estimates that approximately 17.5 MGD of dry weather flow to the West Point WWTP and approximately 27.5 MGD of non-storm wet weather flow results from inflow and infiltration (I/I). Based on historical flow records, I/I accounts for approximately 25% of the total flow treated at the facility. While KC-WTD continues to work with the connected local jurisdictions on identifying I/I control strategies, these efforts focus primarily on impacts to the collection system and not on impacts to the treatment plants. The current service agreements between KC-WTD and their contributing jurisdictions do not restrict the amount of flow each jurisdiction may convey to the County and do not generally provide incentives for the local jurisdictions to reduce overall flows by correcting excessive I/I.

KC-WTD created a Regional I/I Control Program as part of the 1999 Regional Wastewater Services Plan (RWSP) to explore the feasibility of regional I/I control. Although reducing I/I may prevent sanitary sewer overflows and decrease the costs of conveying and treating extraneous flows this program focuses mainly on reducing I/I in collection system areas with flow capacity shortages as a possible cost-effective alternative to increasing pipe and/or pump station capacities. As a result of comprehensive studies completed under the I/I Control Program, the King County Executive issued a recommendation in 2006 to implement three demonstration projects that KC-WTD would use to further develop a comprehensive I/I reduction program. KC-WTD completed one project (in Skyway) in 2014 and canceled the two other projects in 2010 due to budget limitations.

In an effort to use prior work to explore building a more comprehensive I/I program, KC-WTD convened a task force in 2015 that included representatives from Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC). As a follow up to the task force's work, KC-WTD contracted with an engineering consultant in 2016 to develop frameworks for potential programs that implement I/I reduction concepts recommended by the task force. The recommended concepts primarily focus on the design, inspection, and maintenance of private side sewers. In December 2021, KC-WTD published two technical reports and a best management practices toolkit that provide guidance the MWPAAC agencies can use to help manage I/I from private side sewer connections.

II.A.4. West Point Treatment Plant

As discussed in Section II.A.2, wastewater from a 98 square mile area of northwestern King County flows to the West Point WWTP for secondary treatment and disinfection prior to discharge to Puget Sound. The current facility occupies approximately 25 acres of land along the western edge of Discovery Park in Seattle's Magnolia neighborhood. The facility's service area includes significant areas of combined sewer systems in the City of Seattle.

The West Point WWTP is designed to treat a monthly average flow of 215 MGD (maximum month design flow) using a high-rate oxygen activated sludge process. Metro designed the plant to provide secondary treatment of peak flows up to 300 MGD and the plant can handle a maximum peak hydraulic flow of 440 MGD. Peak flows in excess of 300 MGD divert around the secondary treatment system during wet weather. This diverted flow receives primary treatment and disinfection. See Section V.G of this fact sheet for additional discussion about wet weather operations.

Table 4 presents a summary of the flow, BOD, and TSS projections, as described in the County's NPDES permit application and waste load assessment analysis. The population projections take into account planned changes in apportionment of flows between the West Point, South Plant, and Brightwater WWTPs.

Table 4 – Summary of West Point WWTP's Flow, BOD, and TSS Projections

Year	Res. Population + Employment[1]	Percent Increase	Average Annual Flow (MGD)[2]	Influent BOD Loading (lb/day)	Influent TSS Loading (lb/day)
2010	1,169,845	-	95	131,000	153,000
2020	1,497,461	28.00%	105	162,600	186,500
2030	1,617,008	8.00%	107	172,900	198000
2040	1,767,463	9.30%	113	186,400	211,200
2050	1,942,242	9.90%	120	201,700	227,100
2060	2,125,714	9.40%	127	217,400	243,300
Design	*1,251,888*		*215*	*254,000*	*274,000*

[1]"Residential Population + Employment" combines the number of people living in the service area with the equivalent population impact of people that work at businesses located in the service area.

[2]Annual flow projections are based on average rainfall.

The following sections briefly describe the treatment processes and outfalls at the West Point WWTP. A schematic of the treatment process is presented in Appendix F.

West Point WWTP Treatment Process

Wastewater from the West Point Service Area is conveyed through the Ft. Lawton and Old Ft. Lawton tunnels to the West Point WWTP's influent control structure (ICS), which distributes flow to the influent screens and Raw Sewage Pump Station. The Raw Sewage Pumps transfer the wastewater to aerated grit chambers and sedimentation basins for primary treatment. Primary-treated effluent then enters a Flow Diversion Structure (FDS), which regulates flow to the Intermediate Pump Station (IPS) and secondary treatment processes. During normal operations, pumps in the IPS transfer all primary effluent to aeration basins that use high-purity oxygen for secondary digestion. Secondary clarifiers separate the secondary-treated effluent from the activated sludge solids and discharges the effluent to the hypochlorite contact channel for disinfection. Disinfected effluent then flows into the Effluent Pump Station (EPS) wet well where sodium bisulfite is added to reduce residual chorine concentrations to permitted levels. Effluent discharges to Puget Sound either by gravity flow or with the aid of pumping during high tide conditions.

During wet weather, flow through the West Point WWTP can exceed the design capacity of the secondary treatment processes. When instantaneous internal flow rates reach 300 MGD, level sensors in the FDS activate diversion gates that allow excess primary effluent to divert around the IPS, aeration basins, and secondary clarifiers. The diverted primary effluent flows directly to the hypochlorite contact channel where it mixes with secondary effluent for disinfection.

The design of the ICS includes a hydraulicly-operated bypass gate that can divert influent flow to a bypass outfall during emergency situations when diversion is necessary to protect the treatment plant and its operators. KC-WTD is in the process of redesigning this bypass to rely on passive weirs to allow emergency bypasses rather than the hydraulicly-operated gates. Ecology's review of the passive weir project concluded that the redesign improves overall protection of the plant during emergency conditions without increasing the potential for inadvertent bypasses. Although Ecology recognizes the need for this safety feature to protect against catastrophic conditions that may risk operator safety or severe property damage, the proposed permit considers any discharge through the emergency outfall as an unpermitted bypass.

For flows above 300 MGD and up to 440 MGD, the treatment process consists of screening, de-gritting, primary sedimentation in clarifiers, disinfection with sodium hypochlorite in a chlorine contact channel, and dechlorination.

The West Point WWTP removes residual solids at multiple steps in the treatment process. Solids removed by the influent screens and grit classifiers are collected and disposed of as solid waste. Solids removed through primary sedimentation and as waste activated sludge are blended in a tank and co-thickened via gravity belt thickeners. The thickened sludge is anaerobically digested, then dewatered by centrifuges. The plant produces several residual byproducts, including biosolids used in agriculture and forestry and methane that fuels the raw sewage pump engines and power generation system. The West Point WWTP also reuses secondary-treated effluent on site for miscellaneous non-potable uses, such as equipment cleaning and on-site irrigation.

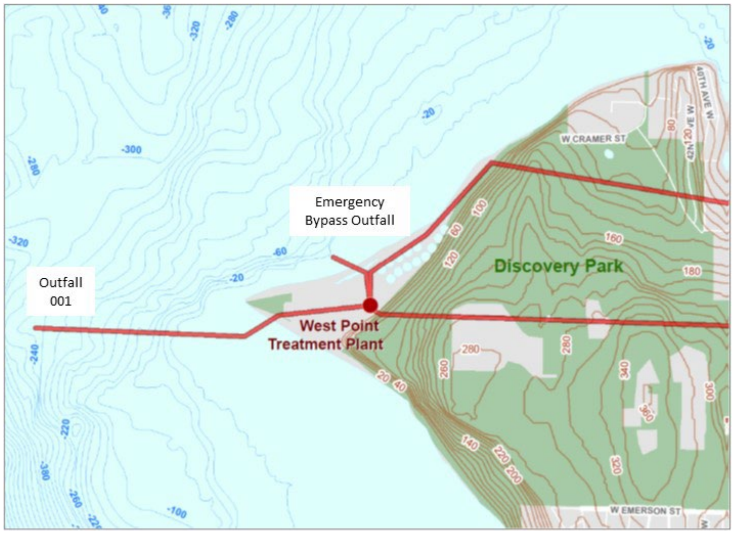
The West Point WWTP is rated as a Class IV plant. The West Section employs personnel in operations, maintenance, facilities, process control, laboratory analysis, administration, and off-site operations and maintenance. The section consists of approximately 156 full time employees (FTEs) with 10 to 15 vacancies at any given time. Operations staff consists of about 70 employees with the following operator certification levels: 21 at the Group IV level, 21 at the Group III level, 13 at the Group II level, and 11 at the Group I or lower level.

West Point WWTP Outfalls

Disinfected effluent discharges to Puget Sound through outfall 001, which consists of an eight-foot diameter, reinforced concrete pipe equipped with a multi-port diffuser located about 3,600 feet offshore at a depth of about 240 feet below mean lower low water. The diffuser section consists of 600 feet of pipeline with 200 ports that run on the north and south sides of the pipe. The 4.5 to 5.75-inch diameter ports are located about one foot above the pipe's spring line. Figure 2 shows the location of outfall 001 in relation to the treatment plant.

As discussed above, the West Point WWTP has the potential to discharge untreated wastewater to Puget Sound through an emergency bypass outfall when necessary to protect the treatment plant and its operators. The emergency outfall consists of a 12-ft by 12-ft square pipe located approximately 600 feet offshore of West Point's north beach. The outfall discharges at a depth of approximately 40 feet. While Ecology recognizes the importance of this outfall to protect the facility and its operators, the proposed permit does not consider the outfall as a permitted discharge location. Ecology may take enforcement actions for discharges through this outfall. Figure 2 also shows the location of this outfall.

Figure 2 – West Point WWTP Outfall Locations



A 2004 outfall inspection revealed that all external components of the outfall appeared to be in good condition with no physical damage or lack of flow coming from the diffusers. The inspectors found minimal marine growth along the outfall alignment with slightly more located in the diffuser area.

KC-WTD inspected the West Point outfall and diffuser again on September 14, 2011 and provided Ecology with a report and video. The inspectors observed that the outfall line was completely buried from a rock pile at 196 feet of water to the shoreline. The inspectors found gaps in the pipeline around station 30 but they noted that no effluent appeared to be discharging from these gaps. Overall, they found the outfall pipe in good condition with heavy sea anemone growth along the deeper sections. No remedial actions were recommended.

The most recent inspection of the outfall was conducted on October 11, 2018. Inspectors found the structure (pipe and outfall) to be in good condition, clear of debris, and with good flow. However, near the gate end of the outfall, flow appeared to be reduced and there is a single joint separation with flow coming out of the north side of the joint.

II.A.5. Carkeek CSO Treatment Plant

Metro constructed the Carkeek treatment plant, located at 1201 NW Carkeek Park Road, in 1962 as a primary treatment plant to serve the Carkeek Basin. In 1994, the County constructed a pumping station and converted the plant to a CSO treatment plant. The facility began operation as a CSO treatment plant on November 1, 1994, and Ecology initially regulated the facility under the NPDES permit that was in place for the previous primary treatment plant. Ecology began regulating the facility as CSO treatment plant under the West Point WWTP's NPDES permit beginning in January 1996.

The Carkeek Pump Station and CSO Treatment Plant serves a 4,200-acre area in northwest Seattle. During dry weather, the Carkeek facility operates as a pump station that conveys wastewater to the West Point WWTP. King County's West Section off-site operations crew inspects the facility three times a week. Ecology does not authorize this facility to discharge to Puget Sound during dry weather.

During wet-weather, off-site operators staff the plant during plant start up and shut down periods, as well as between treatment events to provide preventative maintenance and operational checks. The Carkeek CSO Treatment Plant uses a grit tank, sedimentation basin, and chlorine contact channel to provide primary treatment of excess combined sewage during wet weather. A weir in the pump station allows excess flow to divert to the treatment basins when the water level exceeds the station's capacity. KC-WTD's preferred operating strategy uses the treatment basins for storage with flow rerouted back to the pump station once water levels subside. When water levels in the pump station wet well start to crest the influent weir, treatment at Carkeek CSO plant starts automatically. Offsite operators are dispatched to the facility to confirm treatment and start sampling according to permit and O & M manual requirements. Once in treatment operation, the plant discharges primary-treated and disinfected effluent to Puget Sound until the flow rates at the pump station subside. Solids removed in the treatment process are returned to the Carkeek Pump Station for conveyance to the West Point WWTP for further treatment.

The 1995 design to convert the facility to a CSO treatment plant anticipated that the facility would operate for storage only an average of 20 times per year and would discharge to Puget Sound an average of 10 times per year. The design also anticipated discharge events lasting 10 hours. Between 2015 and 2021, the Carkeek CSO Treatment Plant discharged an average of 4.7 times per year with an average annual volume of 21.4 million gallons (MG) and an average duration of 18.8 hours per discharge event. Table 5 summarizes the performance of the Carkeek CSO treatment plant for the period between January 2015 and December 2021. Volume and duration of discharges in 2017 were higher than normal because of the flow management strategy KC-WTD used following flooding of the West Point WWTP in February 2017.

Table 5 – Carkeek CSO Treatment Plant Performance

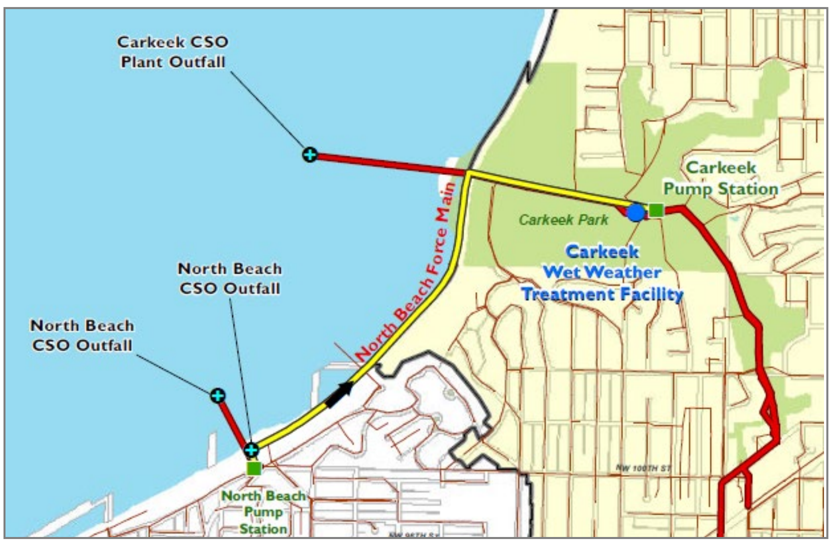
Year	Annual Number of Discharge Events	Annual Discharge Volume (MG)	Annual Discharge Duration (Hours)	Annual Average Settleable Solids (ml/L)	Annual Average %TSS Removal (Percent)
2015	3	9.88	57.84	0.09	51.3
2016	8	17.68	96.62	0.09	49.4
2017	10	79.59	268.26	0.16	28.2
2018	4	1.78	19.70	0.10	79.5
2019	1	13.73	33.68	0.20	55.2
2020	3	9.00	49.87	0.28	62.1
2021	4	18.42	93.25	0.07	73.3

Carkeek CSO Treatment Plant Outfall

The Carkeek CSO treatment plant discharges primary treated and disinfected CSO effluent to the Puget Sound via a 33-inch diameter 4,200-foot outfall, which extends approximately 2,200 feet offshore and terminates at a depth of 195 feet below mean lower low water. The outfall consists of a 50-foot diffuser with 13 ports. Figure 3 illustrates the outfall's location in relation to the treatment plant and the nearby North Beach CSO outfall (untreated CSO discharge).

KC-WTD commissioned Globe Diving & Salvage to inspect the offshore portion of the outfall in October 2018. The inspection found the majority of the pipe completely buried with the diffuser ports all above the mudline. Twelve of the 13 diffusers appeared in good condition and unobstructed. One diffuser port, located at the end of the diffuser section, appeared completely plugged by marine growth.

Figure 3 – Carkeek CSO Treatment Plant Outfall Location



II.A.6. Alki CSO Treatment Plant

Metro constructed the Alki treatment plant, located in West Seattle at the intersection of Beach Drive and Benton Place, in 1958 as a primary treatment plant to serve the 4,095-acre Alki Basin. The service area is largely residential with a projected saturation population of 43,700. Commercial activity is concentrated along portions of California Avenue and SW Alaska Street. Metro overhauled the facility's mechanical and electrical systems in 1987 and added architectural enclosures. In 1998, the County remodeled the facility to operate as a near fully automated CSO treatment plant and added flow transfer components, such as the West Seattle Pump Station and the West Seattle Tunnel. In 1999, Ecology incorporated the Alki CSO treatment plant into the NPDES permit for the West Point WWTP.

Hydraulic capacity at Alki CSO treatment plant is 45 to 65 MGD, depending on tide level. During dry weather, all flows from the Alki basin route through the West Seattle Tunnel to the West Seattle Pump Station and ultimately to the West Point WWTP for secondary treatment. The plant operates as needed during storm events to manage flows that exceed the 7.2 MG storage capacity of the West Seattle Trunk. Flow that backs up in the tunnel is routed through the Alki regulator station to the 63rd Avenue Pump Station, which transfers flow to the Alki CSO Treatment Plant through two force mains. To protect the Alki plant, KC-WTD discharges flows in excess of the treatment plant's capacity at the 63rd Avenue Pump Station outfall, a permitted untreated CSO location.

Combined sewage flow from the 63rd Avenue Pump Station enters the Alki CSO treatment plant through bar screens for preliminary treatment. Chemical dosing pumps add sodium hypochlorite to the flow prior to the screens to start the disinfection process. The flow then routes through primary clarifiers for primary treatment before entering the chlorine contact basin where the disinfection process continues. When the water level overtops the effluent weir at the end of the contact chamber, pumps add sodium bisulfite for dichlorination before the treated wastewater discharge to Puget Sound. Once a storm passes and the treatment plant stops discharging, pumps drain the remaining water from the facility back to the collection system for conveyance to the West Point WWTP. Solids removed by the primary clarifiers are also discharge to the collection system for treatment at West Point. The plant design provides operators with the option to either put the plant into recirculation mode to minimize startup for the next storm, or to drain and clean the facility when another storm is not in the near-term weather forecast.

Between 2015 and 2021, the Alki CSO Treatment Plant discharged an average of 4.9 times per year with an average annual volume of 88.4 MG and an average duration of 14.2 hours per discharge event. Table 6 summarizes the performance of the Alki CSO treatment plant for the period between January 2015 and December 2021. Similar to the Carkeek CSO Treatment Plant, volume and duration of discharges in 2017 were higher than normal because of the flow management strategy KC-WTD used following flooding of the West Point WWTP in February 2017.

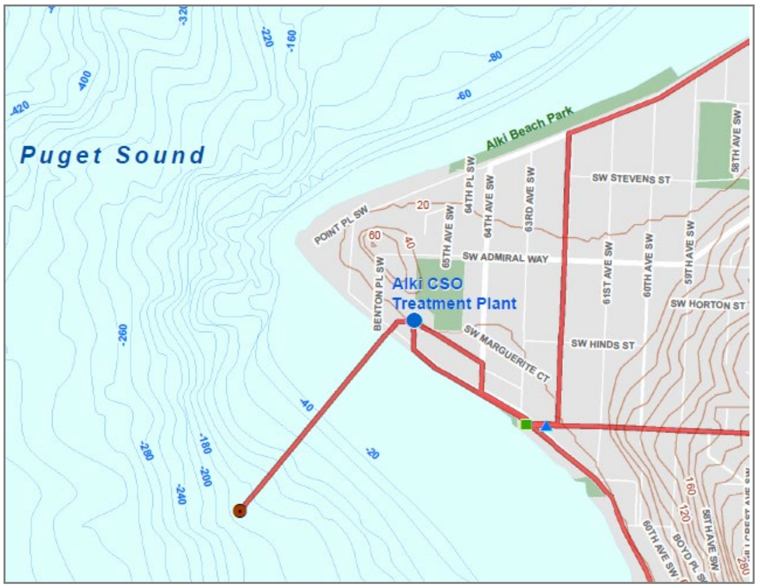
Table 6 – Alki CSO Treatment Plant Performance

Year	Annual Number of Discharge Events	Annual Discharge Volume (MG)	Annual Discharge Duration (Hours)	Annual Average Settleable Solids (ml/L)	Annual Average %TSS Removal (Percent)
2015	4	159.69	92.23	0.09	33.7
2016	6	70.02	51.65	0.09	42.8
2017	11	227.10	192.00	0.13	24.5
2018	5	19.72	17.73	0.12	39.5
2019	1	47.70	40.50	0.10	42.8
2020	3	30.58	25.88	0.15	58.2
2021	4	63.67	62.04	0.09	36.0

Alki CSO Treatment Plant Outfall

The Alki CSO treatment plant discharges primary treated and disinfected CSO effluent to the Puget Sound via a 42-inch diameter pipe, which extends approximately 2,000 feet offshore and terminates at a depth of approximately 143 feet below mean lower low water. The diffuser is fitted with eight 12-inch diameter risers/ports, with rubber check valves, spaced 20 feet apart in alternating directions. The two end ports discharge at an angle of 135° with respect to the other risers/ports. Engineers rated the outfall capacity at 45 MGD at mean higher high water and 65 MGD at mean lower low water. Flows in excess of these values discharge as untreated CSOs via the 63rd Avenue Pump Station outfall. Figure 4 illustrates the outfall's location in relation to the treatment plant.

Figure 4 – Alki CSO Treatment Plant Outfall Location



KC-WTD commissioned Tinnea & Associates to inspect the offshore portion of the outfall in May 2018. The inspection primarily examined the condition of cathodic protection installed on the coated steel pipeline, but also performed an overall condition assessment. It found the pipeline covered in marine growth and some portions of the anodes were either covered or deteriorated. However, the inspection did not identify areas of concern or a need for more than routine maintenance.

II.A.7. Elliott West CSO Treatment Plant

KC-WTD completed construction of the Elliott West CSO Treatment Plant in May 2005 as part of the Denny Way/Lake Union CSO project. This project was jointly developed by King County and the City of Seattle to control untreated CSOs from Seattle's Lake Union outfalls as well as control CSOs from the County's Dexter outfall to Lake Union and their Denny Way outfall to Elliott Bay. The project relies primarily on storage to control untreated CSOs with treatment applied to any excess combined sewage. The project consisted of four major elements: the East Portal, which captures flow from a number of sewer lines in the South Lake Union area; the 14-foot-diameter Mercer Street Storage and Treatment Tunnel; and the Elliott West CSO treatment plant located on Elliott Bay; and the transition and dechlorination facilities adjacent to the Denny Way regulator station. Ecology modified the West Point NPDES Permit in 2005 to include the Elliott West CSO treatment plant.

Unlike the Carkeek and Alki facilities that use re-purposed primary treatment plants for CSO treatment, the Elliott West facility relies on passive settling of solids in the storage facility to achieve primary treatment. During most storm events, the Mercer Tunnel provides storage for up to 7.2 MG of combined sewage. Stored flow transfers to the West Point WWTP via the Elliott Bay Interceptor (EBI) once system flows reduce after a storm. When the Mercer Tunnel fills during a large storm event, pumps at the Elliott West CSO Treatment Plant begin to transfer the excess to screens to remove floatable materials. Passive settling of solids in the Mercer Tunnel provides primary solids removal prior to screening. After screening, water flows into a mixing chamber when sodium hypochlorite is injected for disinfection. Sodium bisulfite is added for dichlorination prior to discharge to Elliott Bay. After storm events, the tunnel and wet well are emptied by pumping these stored flows and settled solids to West Point WWTP.

Performance standards for the Elliott West CSO Treatment Plant design anticipated that the facility would provide treatment for 90% of the storm events that generated more than 30 MG of combined runoff. Based on historical flow records, this standard would result in discharges of treated CSOs between 1 and 30 times per year. Between 2015 and 2021, the Elliott West CSO Treatment Plant discharged an average of 8.7 times per year with an average annual volume of 246 MG and an average duration of 10.4 hours per discharge event. Table 7 summarizes the performance of the Elliott West CSO treatment plant for the period between January 2015 and December 2021. Similar to the Carkeek and Alki CSO Treatment Plants, volume and duration of discharges in 2017 were higher than normal because of the flow management strategy KC-WTD used following flooding of the West Point WWTP in February 2017.

Table 7 – Elliott West CSO Treatment Plant Performance

Year	Annual Number of Discharge Events	Annual Discharge Volume (MG)	Annual Discharge Duration (Hours)	Annual Average Settleable Solids (ml/L)	Annual Average %TSS Removal (Percent)
2015	14	251.3	105.9	2.0	57.7
2016	9	172.5	80.3	2.3	52.8
2017	17	917.4	253.6	3.0	21.4
2018	7	95.6	55.3	2.6	49.4
2019	1	121.6	46.5	0.5	62
2020	6	69.7	40.2	1.7	60.9
2021	7	91.4	53.7	2.8	58.3

Elliott West CSO Treatment Plant Outfall

The Denny Way/Lake Union CSO project constructed two new CSO outfalls in Elliott Bay. One outfall replaced the outfall structure at the Denny Way Regulator and discharges untreated CSOs from the Denny Regulator. The other outfall discharges treated CSOs from the Elliott West CSO treatment plant. The Elliott West outfall consists of a 96-inch diameter outfall pipe that extends 400 feet offshore and terminates at a depth of 60 feet below mean lower low water. Figure 5 shows the location of the Elliott West outfall in relation to the Denny Way outfall.

Figure 5 – Elliott West CSO Treatment Plant Outfall Location

KC-WTD commissioned Globe Diving & Salvage to inspect the offshore portion of the outfall in October 2018. The inspection concluded that the outfall was in good condition and found the outfall pipe covered by concrete mats along most of its length. The mats appeared in good condition with minimal gaps and light sediment buildup. The outfall structure was intact and the outfall pipe was accessible inside the structure. The divers found some debris lying beneath the pipe exit but concluded that the debris was not obstructing flow.

II.A.8. Georgetown CSO Treatment Plant

Construction of the Georgetown CSO treatment plant commenced in March 2018 and reached substantial completion in late November 2022. KC-WTD designed the new facility to treat up to 70 MGD of combined sewage that would have otherwise discharged directly to the Lower Duwamish Waterway without treatment during storm events. The treatment facilities include the following major elements:

- Preliminary treatment (screening): Multirake screens and grit washer-compactors
- Equalization basin and influent pump station: Storage for small wet-weather events that can be pumped back to the EBI for treatment at West Point WWTP and pump station to convey flows from the equalization basin to the Georgetown CSO treatment plant for treatment
- Ballasted sedimentation: High-rate solids removal
- Solids handling: Holding tank for temporary storage of removed solids which will be pumped back to the EBI after wet-weather events
- Disinfection: Ultraviolet (UV) disinfection

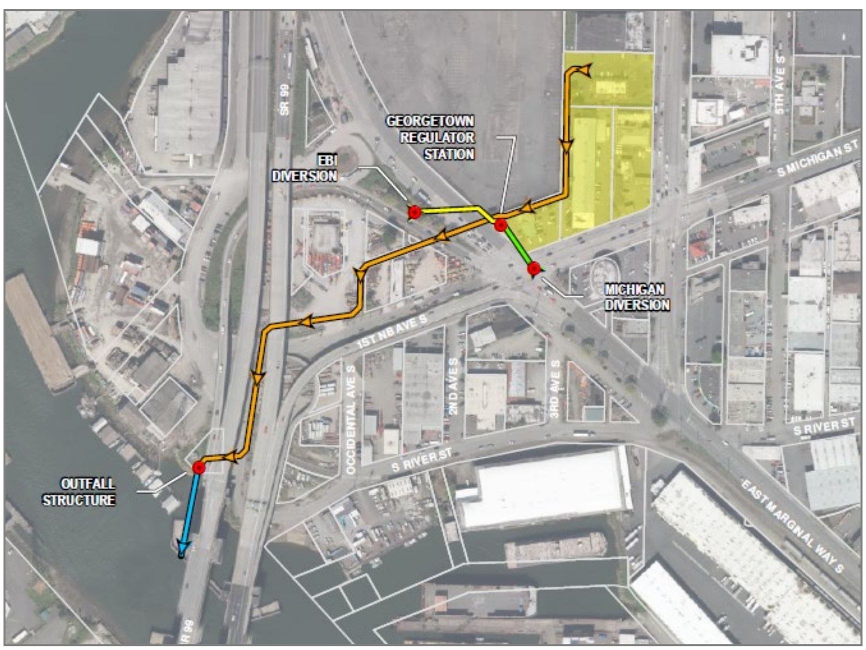
- Ancillary facilities, including odor control, chemical storage, electrical/operations and maintenance support buildings, and standby power

The Georgetown CSO Treatment Plant design anticipates that the facility will operate 20 times per year and discharge an average of 69 MG of primary-treated combined sewage each year. The ballasted sedimentation process used at the facility can generally achieve 85% removal of total suspended solids on an annual average basis. This high level of solids removal allows for the use of UV disinfection, which eliminates the need for chlorine. Since the Georgetown CSO Treatment Plant has not started operation, no historical performance date is available.

Georgetown CSO Treatment Plant Outfall

The Georgetown CSO Treatment Plant project included the construction of an outfall structure (completed in March 2020) The outfall structure is located within and adjacent to the Washington State Department of Transportation right-of-way area of the State Route (SR) 99/SR 509 bridge, also referred to as the First Avenue South Bridge. The outfall structure begins at an onshore air management structure, extending out to a multiport diffuser, terminating at the face of a fender structure on the bridge. The diffuser ports consist of flanged risers from the outfall structure pipeline fitted with elastomeric duckbill valves. Figure 6 shows the location of the outfall in relation to the treatment facility and the First Avenue South Bridge.

Figure 6 – Georgetown CSO Treatment Plant Outfall Location



II.A.9. Henderson/MLK CSO Treatment Facility

KC-WTD completed construction of the Henderson/MLK CSO Treatment Plant in 2005 as part of a project to control untreated CSOs to Lake Washington from the Henderson Pump

Station. Similar in concept to the Elliott West CSO Treatment Plant, the Henderson/MLK plant relies primarily on storage to control untreated CSOs with treatment applied to any excess combined sewage. The control project consisted of the following basic elements: upgrades to the Henderson Street Pump Station, construction of the 42nd Avenue South Storage/Treatment Tunnel, and construction of a 72-inch overflow tunnel to connect to the existing Norfolk outfall in the Duwamish River. Ecology modified the West Point NPDES Permit in 2005 to include the Henderson/MLK CSO treatment plant.

During dry weather, wastewater from the Henderson Pump Station normally flows to the South Treatment Plant in Renton for secondary treatment. During wet weather peak flow events, a portion of the wastewater that normally flows from the MLK Trunk to the Henderson Pump Station is diverted by the MLK Diversion Structure to the 42nd Avenue Tunnel. Pumps at the MLK Diversion Structure inject sodium hypochlorite as excess combined sewage enters the storage tunnel to provide disinfection and odor control. During most storm events, the tunnel provides storage for up to 3.5 MG of combined sewage. Stored flow and any removed solids transfer back to the Henderson Trunk at South Norfolk Street and then flow either to the South Treatment Plant (via the Allentown Trunk) or to the West Point WWTP (via the Norfolk Regulator and Elliott Bay Interceptor) once system flows reduce after a storm.

When the 42nd Avenue Tunnel fills during a large storm event, excess flow passes over weirs in the Tunnel Outlet Regulator located near the intersection of South Norfolk Street and 42nd Avenue South. At this point, settling in the tunnel has removed settleable solids and the chlorine added at the beginning of the tunnel has provided disinfection. The treated CSO passing over the outlet weir receives dichlorination with sodium bisulfate before flowing through screens for floatable solids removal. Flow then enters a pipeline that conveys the treated CSO to a connection with the Norfolk Outfall near South Norfolk Street and East Marginal Way.

Modeling performed as part of the Henderson/MLK CSO Treatment Plant design predicted different levels of performance based on the amount of flow operators could divert to the Allentown Trunk. The modeling predicted that the facility would operate for storage only between 6 and 20 times per year and would discharge to the Norfolk Outfall between 0.6 and 4.8 times per year. The modeling also predicted that the facility would discharge between 6 and 27 MG of treated CSOs to the Norfolk outfall each year. Between 2015 and 2021, the Henderson/MLK CSO Treatment Plant discharged an average of 1.6 times per year with an average annual volume of 11.1 MG and an average duration of 13.7 hours per discharge event. Table 8 summarizes the performance of the Henderson/MLK CSO treatment plant for the period between January 2015 and December 2021. Unlike the other CSO Treatment plants, the 2017 flooding at the West Point WWTP did not result in higher discharge frequency or volume in 2017 since the base flows in this area typically flow to the county’s South Treatment Plant.

Table 8 – Henderson/MLK CSO Treatment Plant Performance

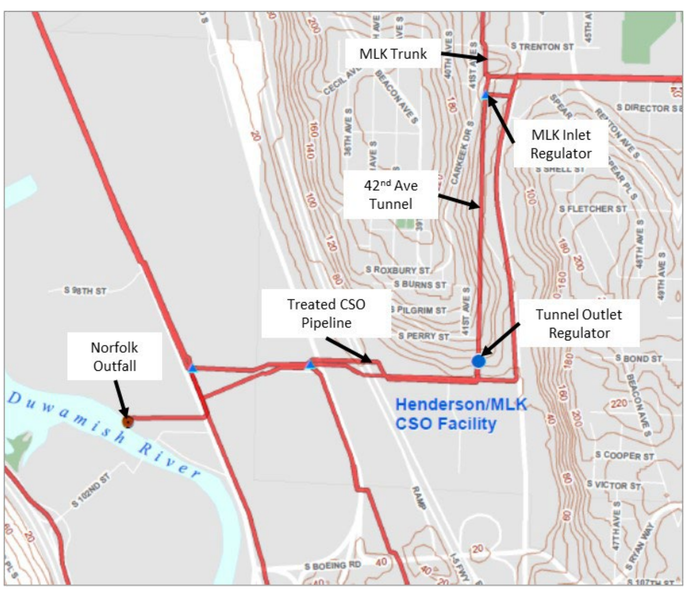
Year	Annual Number of Discharge Events	Annual Discharge Volume (MG)	Annual Discharge Duration (Hours)	Annual Average Settleable Solids (ml/L)	Annual Average %TSS Removal (Percent)
2015	3	14.99	35.72	0.12	59.8
2016	0	No Discharge	No Discharge	No Discharge	No Discharge
2017	3	18.61	29.36	0.10	46
2018	1	3.60	7.90	0.30	86.4
2019	1	16.90	32.60	0.10	60
2020	1	1.72	5.47	0.40	78
2021	2	10.49	18.80	0.10	64

Henderson/MLK CSO Treatment and Storage Outfall

The Henderson/MLK CSO facility discharges primary treated and disinfected CSO effluent to the Duwamish River through the existing Norfolk outfall. The Norfolk outfall is located on the north bank of the Duwamish River at approximately river km 10.5. The 84-inch diameter outfall approaches the river bank at a 90 degree angle to the river flow and is flush with the bank. The outfall terminates with a flap gate that is assumed to be completely open during discharge events.

The Norfolk outfall discharges both treated and untreated CSOs from King County's system along with stormwater runoff from multiple jurisdictions. Other municipal jurisdictions that discharge stormwater through the outfall include the City of Tukwila, the City of Seattle, and the King County Airport (Boeing Field). Figure 7 shows the outfall location along with the overall distribution of facilities that make up the full Henderson/MLK CSO Treatment Plant.

Figure 7 – Henderson/MLK CSO treatment plant outfall location



II.A.10. Combined sewer overflows

King County has 38 combined sewer overflow outfalls, which are designed to discharge untreated sewage and stormwater during periods of heavy precipitation. The collection system, as configured in 1983, discharged more than 2.3 billion gallons per year of untreated sewage and stormwater from a total of 431 overflow events. Between 2015 and 2021, King County's CSO outfalls discharged an average of 1.2 billion gallons of untreated combined sewage to area waterways each year. This represents a of 49.6% reduction in discharge volume compared to the 1983 baseline condition.

Table 9 lists the 38 combined sewer overflows outfalls connected to King County's regional collection system that have the potential to discharge untreated sewage and stormwater during precipitation events. Based on monitoring data in King County's 2021 Annual CSO Report, 18 of the 38 CSO outfalls meet the state's performance standard for the "greatest reasonable reduction" as defined in chapter WAC 173-245-020(22). Since 2015, two outfalls identified as controlled in the last permit (Belvoir Pump Station/#012 and 63rd Avenue/#054) drifted out of compliance and no longer meet the state's performance standard for control. Section V.H of this fact sheet provides details about the requirements the proposed permit will contain for managing CSOs.

Table 9 – Combined Sewer Overflow Outfalls

Outfall No.	Outfall Name	Location (Latitude, Longitude)	Receiving Water	Control Status
003	Ballard Siphon Regulator	47.66391, -122.38233	Lk. Washington Ship Canal	Controlled
004	11th Av. NW (East Ballard Overflow)	47.65949, -122.37077	Lk. Washington Ship Canal	Uncontrolled
006	Magnolia South Overflow	47.63018, -122.39901	Elliott Bay/Puget Sound	Uncontrolled
007	Canal Street Overflow	47.65185, -122.35811	Lk. Washington Ship Canal	Controlled
008	3rd Avenue West Overflow	47.65208, -122.36005	Lk. Washington Ship Canal	Uncontrolled
009	Dexter Avenue Regulator	47.63227, -122.33923	Lake Union	Controlled
011	E. Pine St. PS Overflow	47.61492, -122.2803	Lake Washington	Controlled
012	Belvoir PS Overflow	47.65669, -122.28759	Lk. Washington (Union Bay)	Uncontrolled
013	Martin Luther King Way Trunkline Overflow	47.52328, -122.26294	Lake Washington	Controlled
014	Montlake Overflow	47.6471, -122.30486	Lk. Washington Ship Canal	Uncontrolled
015	University Regulator	47.64892, -122.31129	Lk. Union (Portage Bay)	Uncontrolled
018	Matthews Park PS Overflow	47.69745, -122.27265	Lake Washington	Controlled
027a	Denny Way Regulator	47.61813, -122.3608	Elliott Bay/Puget Sound	Uncontrolled
028	King Street Regulator	47.599, -122.33742	Elliott Bay/Puget Sound	Uncontrolled
029	Kingdome (Connecticut St Regulator)	47.59253, -122.3421	Elliott Bay/Puget Sound	Uncontrolled
030	Lander Street Regulator	47.58147, -122.34299	Duwamish River – East Waterway	Uncontrolled
031	Hanford #1 Regulator	47.5631, -122.34531	Duwamish River	Uncontrolled

Outfall No.	Outfall Name	Location (Latitude, Longitude)	Receiving Water	Control Status
032	Hanford #2 Regulator	47.57722, -122.34278	Duwamish River – East Waterway	Uncontrolled
033	Rainier Avenue PS Overflow	47.57137, -122.27552	Lake Washington	Controlled
034	E. Duwamish Siphon/ Duwamish PS Overflow	47.56298, -122.34526	Duwamish River	Controlled
035	W. Duwamish Siphon/ Duwamish PS Overflow	47.56322, -122.34825	Duwamish River	Controlled
036	Chelan Avenue Regulator	47.57366, -122.35778	Duwamish River – West Waterway	Uncontrolled
037	Harbor Avenue Regulator	47.5737, -122.36116	Duwamish River – West Waterway	Uncontrolled
038	Terminal 115 Overflow	47.54825, -122.34049	Duwamish River	Uncontrolled
039	Michigan S. Regulator	47.54352, -122.33496	Duwamish River	Uncontrolled
040	8th Ave. South Regulator (W. Marginal Way PS Overflow)	47.53364, -122.32263	Duwamish River	Controlled
041	Brandon Street Regulator	47.55466, -122.34083	Duwamish River	Uncontrolled
042	Michigan W. Regulator	47.54156, -122.33499	Duwamish River	Uncontrolled
043	East Marginal Way PS Overflow	47.53704, -122.31848	Duwamish River	Controlled
044a	Norfolk Street Regulator	47.51194, -122.29735	Duwamish River	Controlled
045	Henderson St. PS Overflow	47.52328, -122.26294	Lake Washington	Controlled
048[1]	a. North Beach PS Overflow b. North Beach Inlet	47.704, -122.39233 47.70214, -122.39070	Puget Sound	Controlled
049	30th Ave. N.E. PS Overflow	47.65669, -122.28759	Lk. Washington (Union Bay)	Controlled
052	53rd St SW PS Overflow	47.5848, -122.40254	Puget Sound	Controlled
054	63rd St SW PS Overflow	47.57001, -122.41629	Puget Sound	Uncontrolled
055	S.W. Alaska Street Overflow	47.55944, -122.40694	Puget Sound	Controlled
056	Murray St PS Overflow	47.54027, -122.4	Puget Sound	Controlled
057	Barton St PS Overflow	47.52388, -122.39639	Puget Sound	Uncontrolled

[1]The North Beach Pump CSO facility design approved by Ecology identifies that excess combined sewage may discharge from the pump station wet well as well as from an overflow manhole located upstream of the control facility. Although each overflow location discharged through separate outfalls, Ecology regulates these outfalls as a single outfall.

Status of CSO Program

Since 1988, the Metro/County has completed a number of projects to reduce the volume and frequency of CSOs. Between 1995 and 2005, Metro and then King County completed four CSO treatment plant projects to reduce the amount of untreated CSOs. Two projects converted local primary treatment plants to CSO treatment plants (Carkeek and Alki) while the other two projects constructed the Elliott West and Henderson/MLK facilities. Early control projects also included construction of the New Fort Lawton Tunnel to increase flows to the West Point WWTP, control system improvements to maximize the use of pipeline storage, and completion of projects to build storage tanks and to separate stormwater and sanitary systems in multiple locations. Control projects completed since 2005 included:

- Ballard Siphon Replacement Project (completed in 2013): Replacement of a 100-year-old wood stave pipe under Salmon Bay with an 85-inch siphon pipe to accommodate growth and to control overflows from the Ballard outfall (#003).
- North Beach Wet Weather Storage Project (completed in 2015): Construction of a pipeline near Seattle's Blue Ridge Park to store approximately 380,000 gallons combined sewage prior to the North Beach Pump Station and control overflows from the North Beach outfall (#048).
- Barton Roadside Rain Garden Project (completed in 2016): Construction of 91 roadside rain gardens along 15 blocks in West Seattle to reduce peak flows entering the combined system and control overflows from the Barton CSO outfall (#057)
- Murray Avenue Wet Weather Storage Project (completed in 2016): Construction of a 1-million-gallon storage tank near Seattle's Lowman Beach Park to retain flows that exceed the capacity of the Murray Pump Station and reduce overflows from the Murray Ave. outfall (#056).
- Rainer Valley Wet Weather Storage Project (completed in 2018): Construction of a 340,000-gallon storage tank and system modifications to control overflows to the Duwamish River from the Hanford #1 outfall (#031).
- South Magnolia Wet Weather Storage Pipeline (completed in 2019): Construction of a storage facility and 3,000-foot-long pipeline under Magnolia Bluff to provide approximately 1.5 million gallons of storage of excess combined sewage and control overflows from the Magnolia outfall (#006).
- Georgetown Wet Weather Treatment Facility (completed 2022): Construction of an equalization and 70 MGD enhanced primary treatment facility to control untreated discharges of combined sewage to the Duwamish River from the South Michigan and Brandon outfalls (#039 & #041).

As of 2021, the Barton, Rainer, and South Magnolia projects did not achieve the project goals of controlling their respective outfalls. In addition, previous projects intended to control the Harbor Avenue outfall in West Seattle (#037) and the Denny Way Regulator Station outfall in Seattle (#027a) continue to not meet the performance standard for control. KC-WTD submitted supplemental compliance plans that identify actions they will take to improve performance of the projects. The supplemental plans also include additional monitoring and modeling to assist with performance troubleshooting.

Thirteen of the 20 outfalls listed as "uncontrolled" in Table 9 require KC-WTD to complete CSO control projects to meet the state's performance standard. Ecology anticipates that the recently completed Georgetown project will control the Brandon and South Michigan outfalls once the facility becomes fully operational in 2023. In addition, KC-WTD is partnering with Seattle Public Utilities to construct the Ship Canal Tunnel Project to control the 11th avenue (#004) and 3rd Avenue (#008) outfalls along with five City of Seattle outfalls that discharge into the Lake Washington Ship Canal. This project started construction in

2019 and is scheduled for completion in 2025. Projects to control nine outfalls are currently in the planning or design phase. Ecology and EPA continue to use the timelines established in the 2013 CSO consent decree as the deadlines for completing the necessary control projects. The proposed permit will not include requirements related to these projects.

II.A.11. Unpermitted outfalls

Table 10 – Unpermitted outfalls

Outfall No.	Outfall Name	Location (Latitude, Longitude)	Receiving Water
002	West Point Emergency Bypass Outfall	47.663712, -122.431056	Puget Sound
050	Lake Ballinger Pump Station	47.780684, -122.322353	McAleer Creek
No Number	Richmond Beach Pump Station	47.773226, -122.399110	Puget Sound

The West Point WWTP permit application identified three outfall locations that Ecology does not recognize as authorized discharge locations. These outfalls are in place for emergency purposes only. Ecology considers discharges from these outfalls as unpermitted sanitary sewer overflows that KC-WTD must report according to the procedures for reporting permit violations. Table 10 identifies the location of these emergency outfalls.

II.A.12. Solid wastes/residual solids

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit, screenings, debris, rags), and at the primary and secondary clarifiers, in addition to incidental solids (rags and other debris) removed as part of the routine maintenance of the equipment. The plant generates approximately 3,500 tons of grit annually. Grit, rags, and screenings are drained and recycled or disposed of as solid waste. The County installed new influent screens with 3/8-inch openings in 2014.

Primary sludge and waste-activated sludge are blended together and thickened by gravity belt thickeners. The thickened sludge is then pumped to one-of-six anaerobic, mesophilic digesters. From the digesters, the digested sludge is withdrawn and dewatered by one-of-four centrifuges. Polymers are used in the gravity belt thickeners and centrifuges to aid sludge thickening/dewatering. The digestion process produces nutrient-rich, organic byproducts called biosolids.

Biosolids are regulated under both state and federal regulations (WAC 173-308 and 40 CFR Part 503). King County routinely monitors its biosolids for physical, chemical, and microbial characteristics, to examine changes over time, and to determine appropriate application rates for biosolids at reuse sites. The County's West Point biosolids continue to meet quality standards for metals, pathogen reduction (Class B), and vector attraction reduction, which means it is safe for all land application projects. Ecology regulates biosolids produced by the West Point WWTP under a separate Statewide General Permit for Biosolids Management.

II.B. Description of the receiving waters

This proposed permit authorizes discharges of treated domestic wastewater to various locations in central Puget Sound, Elliott Bay, and the Lower Duwamish Waterway. Ecology relied on data collected at multiple locations to characterize the ambient receiving water conditions in the vicinity of the treatment facility outfalls described in Section II.A. Data sources included routine and project-based monitoring performed by King County's Marine and Sediment Assessment Group. Ecology also used data from sampling conducted by Windward Environmental for baseline surface water monitoring commissioned by the Lower Duwamish Waterway Group (Port of Seattle, City of Seattle, King County, and the Boeing Company). Raw data for each monitoring location is available through Ecology's Environmental Information Management (EIM) database (https://apps.ecology.wa.gov/eim/search/default.aspx).

The following sections describe the conditions for four general receiving water areas where King County treatment facility outfalls are located. The tables below summarize data from discrete sampling events at the various locations in each region. When sampling events collected multiple samples at various depths on the same date, Ecology averaged all results for a specific parameter to obtain a single values representative of the entire water column. Metals data included in the following tables represent the dissolved fraction of each metal, except for mercury at the North-central Puget Sound and Elliott Bay regions. Only total mercury was available from these regions.

II.B.1. North-Central Puget Sound

Outfalls from the West Point WWTP and Carkeek CSO Treatment Plant discharge into the northern region of central Puget Sound. This region generally extends from a line drawn between Magnolia Bluff and Yeomalt Point on Bainbridge Island north to a line drawn between Point Wells and Kingston. Other point source outfalls discharging to this region include King County's Brightwater WWTP, the Kingston WWTP, the Bainbridge Island – Winslow WWTP, and Paramount Petroleum Asphalt and Marine Fuels Terminal remediation cleanup site. King County and Seattle Public Utilities also own and maintain multiple CSO outfalls in this region. Significant nearby non-point sources of pollutants include stormwater runoff, industrial runoff, and maritime uses. Water quality impairments for this waterbody are discussed in Section III.E of this fact sheet.

Ecology used data from the monitoring stations listed in Table 10 to represent ambient water quality listed in Table 11 for this region. Figure 8 shows the location of each monitoring station in relation to the West Point and Carkeek outfalls.

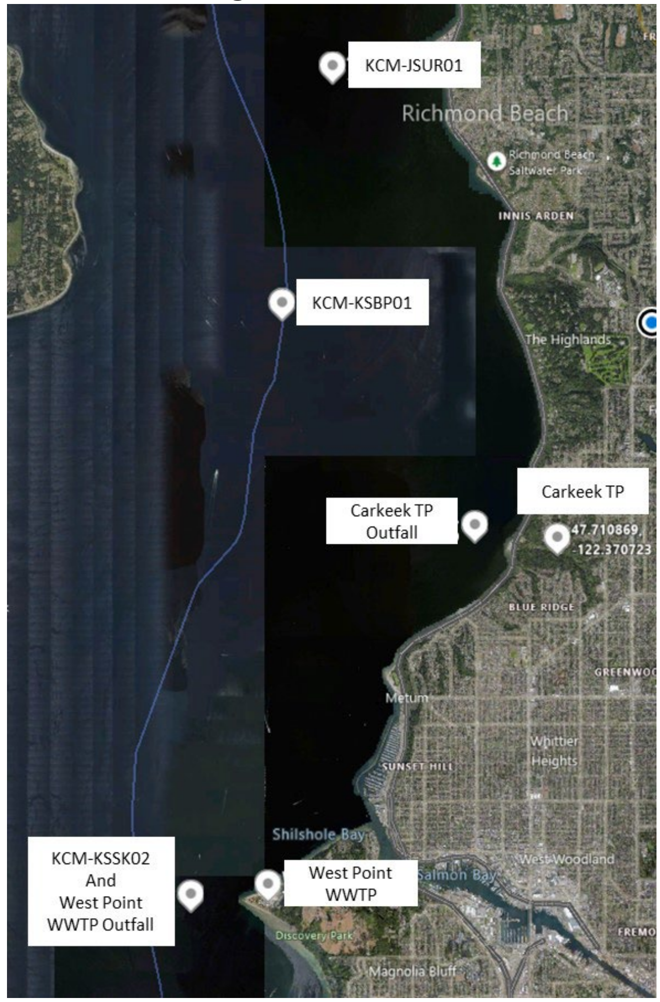
Table 10 – North Central Puget Sound Monitoring Stations

Station ID	Location Description	Latitude	Longitude	Monitoring Date Range
KCM-KSSK02	Puget Sound offshore of West Point near West Point WWTP Outfall	47.660557	-122.447211	1/20/2004 – 12/6/2021
KCM-KSBP01	Puget Sound offshore of Innis Arden	47.743960	-122.428169	1/21/2004 – 12/6/2021
KCM-JSUR01	Puget Sound offshore of Point Wells	47.777398	-122.417612	1/24/2005 – 12/6/2021

Table 11 – North Central Puget Sound Ambient Background Data

Parameter	Average	Geomean	90th Percentile
Temperature (deg C)	10.6	10.5	12.8
pH (Std. Unit)	7.7	7.7	7.8
Salinity (PSU)	29.6	29.6	30.5
Dissolved Oxygen (mg/L)	7.6	7.5	9.1
Total Suspended Solids (mg/L)	2.1	2.0	2.9
Fecal Coliform (cfu/100mL)	1.8	1.2	2.7
Enterococci (cfu/100mL)	2.3	1.7	4.8
Ammonia as N (mg/L)	0.0285	0.0204	0.0566
Nitrate + Nitrite as N (mg/L)	0.3275	0.3134	0.4304
Total Phosphorus (mg/L)	0.0722	0.0715	0.0846
Ortho-Phosphate (mg/L)	0.0626	0.0611	0.0760
Arsenic (ug/L)	1.3267	1.3253	1.3873
Cadmium (ug/L)	0.0664	0.0663	0.0711
Chromium (ug/L)	0.1137	0.1125	0.1322
Copper (ug/L)	0.3223	0.3187	0.3781
Lead (ug/L)	0.0100	0.0100	0.0100
Mercury, Total (ug/L)	0.00031	0.00030	0.00038
Nickel (ug/L)	0.4083	0.4080	0.4233
Silver (ug/L)	0.0233	0.0229	0.0268
Zinc (ug/L)	0.4383	0.4073	0.6000

Figure 8 – North Central Puget Sound Monitoring Station Locations



II.B.2. Mid-central Puget Sound

The Outfall from the Alki CSO Treatment Plant discharge into the middle region of central Puget Sound. This region generally extends south from a line drawn between Alki Point and Restoration Point to the northern end of Vashon Island. Other point source outfalls discharging to this region include the Kitsap County - Manchester WWTP. King County and Seattle Public Utilities also own and maintain multiple CSO outfalls in this region. Significant nearby non-point sources of pollutants include stormwater runoff, industrial runoff, and maritime uses. Water quality impairments for this waterbody are discussed in Section III.E of this fact sheet.

Ecology used data from the monitoring stations listed in Table 12 to represent ambient water quality listed in Table 13 for this region. Figure 9 shows the location of each monitoring station in relation to the Alki CSO Treatment Plant outfall.

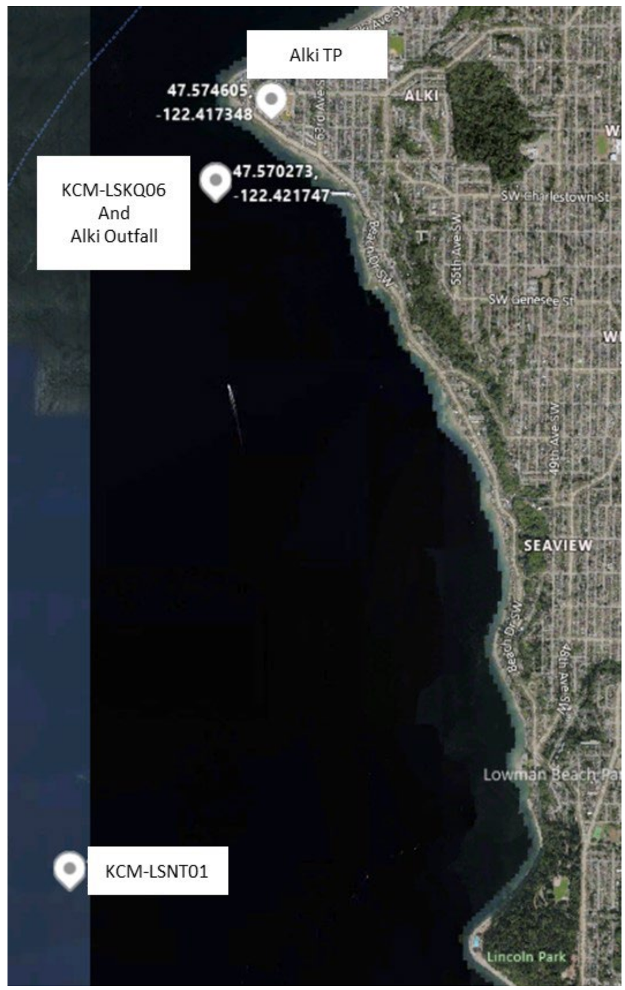
Table 12 – Mid Central Puget Sound Monitoring Stations

Station ID	Location Description	Latitude	Longitude	Monitoring Date Range
KCM-LSKQ06	Puget Sound offshore of Alki	47.570273	-122.421747	1/20/2004 – 12/7/2021
KCM-LSNT01	Puget Sound offshore of Fauntleroy	47.533333	-122.433333	1/20/2004 – 12/7/2021

Table 13 – Mid Central Puget Ambient Background Data

Parameter	Average	Geomean	90th Percentile
Temperature, water (deg C)	10.7	10.5	12.8
pH (Std. Unit)	7.6	7.6	7.8
Salinity (PSU)	29.7	29.7	30.5
Dissolved Oxygen (mg/L)	7.3	7.2	8.7
Alkalinity, Total as CaCO3 (mg/L)	100.3	100.3	101.5
Total Suspended Solids (mg/L)	2.2	1.9	2.9
Fecal Coliform (cfu/100mL)	1.2	1.0	2.0
Enterococci (cfu/100mL)	1.9	1.5	3.0
Ammonia as N (mg/L)	0.0193	0.0124	0.0443
Nitrate + Nitrite as N (mg/L)	0.3306	0.3204	0.4306
Total Phosphorus (mg/L)	0.0721	0.0714	0.0834
Ortho-Phosphate (mg/L)	0.0638	0.0627	0.0773
Antimony (ug/L)	0.1586	0.1583	0.1689
Arsenic (ug/L)	1.3663	1.3643	1.4225
Cadmium (ug/L)	0.0699	0.0699	0.0727
Chromium (ug/L)	0.1124	0.1102	0.1386
Copper (ug/L)	0.2990	0.2984	0.3184
Lead (ug/L)	0.0070	0.0070	0.0076
Mercury (ug/L)	0.00023	0.00023	0.00023
Nickel (ug/L)	0.4111	0.4109	0.4249
Silver (ug/L)	0.0179	0.0169	0.0240
Zinc (ug/L)	0.4472	0.4366	0.5635

Figure 9 – Mid Central Puget Sound Monitoring Station Locations



II.B.3. Elliott Bay

The outfall from the Elliott West CSO Treatment Plant discharges into Elliott Bay, which lies east of a line drawn between Magnolia Bluff and Duwamish Head. Other point sources discharging to this region include Todd Pacific Shipyard and CenTrio Energy/Seattle Steam Plant. In addition, King County's South Treatment Plant discharges to Central Puget Sound west of Elliott Bay. King County and Seattle Public Utilities also own and maintain multiple CSO outfalls in this region. Significant nearby non-point sources of pollutants include stormwater runoff, industrial runoff, and maritime uses. Water quality impairments for this waterbody are discussed in Section III.E of this fact sheet.

Ecology used data from the monitoring stations listed in Table 14 to represent ambient water quality listed in Table 15 for this region. Figure 10 shows the location of each monitoring station in relation to the Alki CSO Treatment Plant outfall.

Table 14 – Elliott Bay Monitoring Stations

Station ID	Location Description	Latitude	Longitude	Monitoring Date Range
KCM-LSCW02	Outer Elliott Bay	47.611950	-122.390848	9/14/1992 – 6/12/2019
KCM-LTED04	Central Elliott Bay	47.603648	-122.356529	1/20/2004 – 12/6/2021

Figure 10 – Elliott Bay Monitoring Station Locations

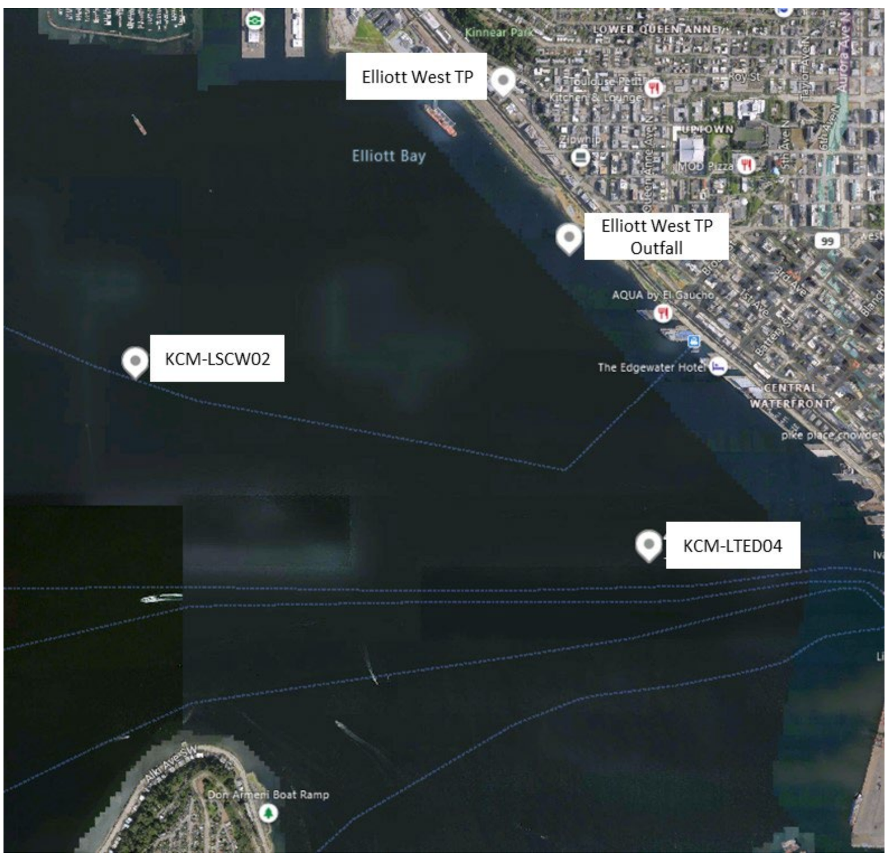


Table 15 – Elliott Bay Ambient Background Data

Parameter	Average	Geomean	90th Percentile
Temperature, water (deg C)	10.7	10.6	12.9

pH (Std. Unit)	7.6	7.6	7.8
Salinity (PSU)	29.4	29.4	30.4
Dissolved Oxygen (mg/L)	7.3	7.2	8.7
Total Suspended Solids (mg/L)	2.1	1.9	3.0
Fecal Coliform (cfu/100mL)	9.2	3.4	15.4
Enterococci (cfu/100mL)	11.5	3.8	23.0
Ammonia as N (mg/L)	0.0198	0.0121	0.0531
Nitrate + Nitrite as N (mg/L)	0.3410	0.3313	0.4362
Total Phosphorus (mg/L)	0.0727	0.0720	0.0848
Ortho-Phosphate (mg/L)	0.0650	0.0642	0.0771
Arsenic (ug/L)	1.3108	1.3091	1.3693
Cadmium (ug/L)	0.0682	0.0681	0.0724
Chromium (ug/L)	0.1089	0.1078	0.1266
Copper (ug/L)	0.3736	0.3724	0.4048
Lead (ug/L)	0.0164	0.0120	0.0254
Mercury, Total (ug/L)	0.00028	0.00027	0.00036
Nickel (ug/L)	0.4101	0.4099	0.4216
Silver (ug/L)	0.0237	0.0233	0.0271
Zinc (ug/L)	0.6110	0.5945	0.7689
Total PCBs (pg/L)	79.0	76.5	98.7

II.B.4. Lower Duwamish Waterway

The outfalls from the Henderson/MLK CSO Treatment Plant and the Georgetown CSO Treatment Plant discharge into the lower five mile reach of the Duwamish Waterway between Harbor Island and the South 102nd Street bridge. Other point sources discharging to this region include Lafarge North America (cement manufacturing), General Recycling (metals recycling), and Seattle Iron and Metals (metals recycling), and the following sand and gravel operations: Stoneway Concrete, JA Jack & Sons, Cadman Seattle, and Glacier Northwest. King County and Seattle Public Utilities also own and maintain multiple CSO outfalls in this region. Significant nearby non-point sources of pollutants include stormwater runoff from multiple major industrial facilities, including King County Airport, Boeing, and Port of Seattle. Water quality impairments for this waterbody are discussed in Section III.E of this fact sheet.

Ecology used data from the monitoring stations listed in Table 16 to represent ambient water quality listed in Table 17 for this region. Figure 11 shows the location of each monitoring station in relation to the Henderson/MLK and GWWTS outfalls.

Table 16 – Lower Duwamish Waterway Monitoring Stations

Station ID	Location Description	Latitude	Longitude	Monitoring Date Range
KCM-LTKE03	Duwamish @ Spokane St Bridge	47.569475	-122.350683	1/24/2005 – 12/6/2021
LDW17-SW1	Duwamish @ Kellogg Island	47.559055	-122.344777	8/28/2017 – 7/30/2018

LDW17-SW2	Duwamish @ South Park Bridge	47.529392	-122.314189	8/28/2017 – 7/30/2018
KCM-LTUM03	Duwamish @ South Park Bridge	47.529399	-122.314199	1/26/2004 – 12/6/2021
KCM-LTXQ01	Duwamish @ Boeing Pedestrian Bridge	47.512269	-122.299701	5/19/2009 – 12/8/2021

Figure 11 – Lower Duwamish Waterway Monitoring Station Locations

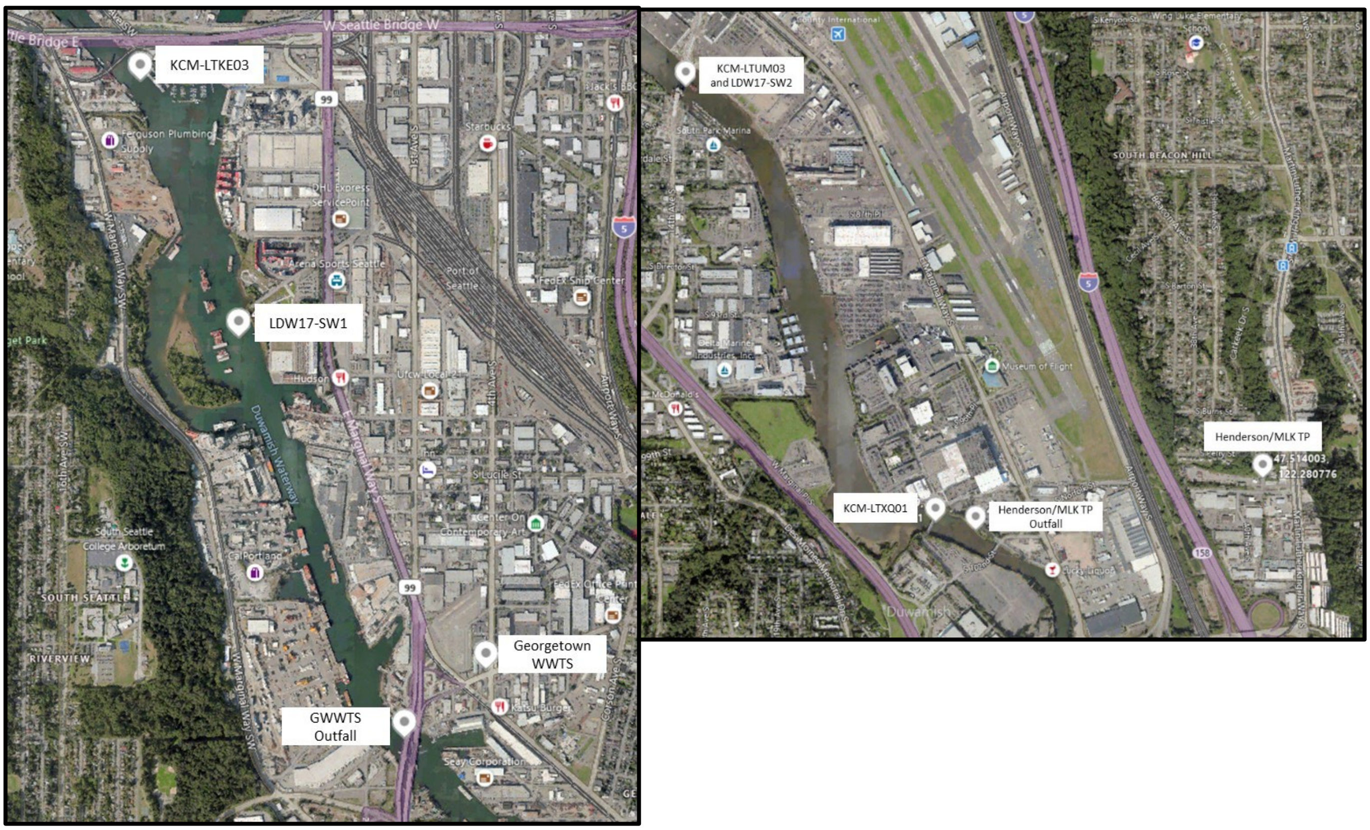


Table 17 – Lower Duwamish Waterway Ambient Background Data

Parameter	Average	Geomean	90th Percentile
Temperature, water (deg C)	11.3	10.6	16.6
pH (Std. Unit)	7.1	7.1	7.2
Salinity (PSU)	18.9	16.3	27.7
Dissolved Oxygen (mg/L)	8.7	8.5	11.2
Hardness as CaCO3 (mg/L)	451.7	166.2	1570.0
Total Suspended Solids (mg/L)	8.692	5.655	13.460
Fecal Coliform (cfu/100mL)	75.139	34.177	179.800
Enterococci (cfu/100mL)	59.963	22.839	150.000
Ammonia as N (mg/L)	0.033	0.027	0.062
Nitrate + Nitrite as N (mg/L)	0.338	0.318	0.491
Total Phosphorus as P (mg/L)	0.063	0.060	0.081
Ortho-Phosphate as P (mg/L)	0.031	0.027	0.058
Arsenic (ug/L)	0.700	0.609	1.291
Cadmium (ug/L)	0.035	0.022	0.079
Chromium (ug/L)	0.229	0.119	0.661
Copper (ug/L)	0.6758	0.6064	1.1680
Lead (ug/L)	0.019	0.018	0.025
Mercury (ug/L)	0.00046	0.00042	0.00077
Nickel (ug/L)	0.563	0.442	1.025
Silver (ug/L)	0.021	0.021	0.022
Zinc (ug/L)	1.930	1.280	4.930
Di(2-ethylhexyl) phthalate (ug/L)	1.500	1.414	1.900
Total PCBs (pg/L)	1433.4	1159.0	2774.0

II.C. Wastewater influent characterization – West Point WWTP

King County reports influent pollutant concentrations in discharge monitoring reports. The following tables summarize influent wastewater quality for each facility for the period between January 2015 and December 2021.

Table 18 – West Point Wastewater Influent Characterization

Parameter	Units	Average	Maximum	Minimum	95th Percentile
BOD_5 Concentration	mg/L	224	740	32	318
BOD_5 Mass	lbs/day	152,352	408,800	62,609	207,441
$CBOD_5$ Concentration	mg/L	188	485	25	277
$CBOD_5$ Mass	lbs/day	126,856	308,891	53,420	173,515
TSS Concentration	mg/L	234	530	60	325
TSS Mass	lbs/day	163,923	617,555	50,722	250,888

II.D. Wastewater effluent characterization – West Point WWTP

King County reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The following tables summarize effluent quality for each facility from January 2015 to December 2021. The priority pollutant data presented contains only detectable compounds and parameters with existing water quality criteria.

Table 19 – West Point Wastewater Effluent Characterization – Conventional Pollutants

Parameter	Units	Average	Maximum	Minimum	95th Percentile
Flow, Monthly Average	MGD	92.3	390.9	53.1	191.8
$CBOD_5$ Concentration	mg/L	10.5	163.0	2.0	21.7
$CBOD_5$ Mass	lbs/day	9,280	164,105	1,084	28,236
TSS Concentration	mg/L	12.8	227.0	2.0	36.75
TSS Mass	lbs/day	11,965	410,028	1,049	48,223
Total Residual Chlorine	µg/L	101.7	630.0	10.0	160.0
pH (Daily Min)	Std Units	6.8	7.5	6.0	6.4
pH (Daily Max)	Std Units	7.0	8.0	6.4	7.3
Fecal Coliform	#/100 mL	6.0	104.0	1.0	14.0
Ammonia	mg/L as N	22.4	37.7	3.6	34.3
Total Kjeldahl Nitrogen	mg/L as N	26.7	45.4	5.5	39.4
Nitrate+Nitrite Nitrogen	mg/L as N	3.1	21.7	0.4	6.5
Total Phosphorous	mg/L as P	2.9	14.9	0.7	4.1
Ortho-Phosphate	mg/L as P	2.4	4.4	0.5	3.7

Table 20 – West Point Wastewater Effluent Characterization – Expanded Testing

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
Hardness	mg/l as CaCO3	8	8	107.20	155.00	144.50
Cyanide, Weak & Dissociable	mg/L	19	8	0.0059	0.0134	0.0127
Total Phenolic Compounds	mg/L	19	1	0.11	0.11	0.11
Oil and Grease	mg/L	19	11	3.63	9.30	8.75
Antimony, Total, ICP-MS	µg/L	22	20	0.46	0.84	0.66
Arsenic, Total, ICP-MS	µg/L	26	26	1.64	2.03	1.94
Barium, Total, ICP-MS	µg/L	22	22	12.07	22.90	20.69
Cadmium, Total, ICP-MS	µg/L	26	12	0.11	0.29	0.22
Chromium, Total, ICP-MS	µg/L	26	26	1.03	3.41	2.30
Copper, Total, ICP-MS	µg/L	26	26	13.89	30.70	28.48
Lead, Total, ICP-MS	µg/L	26	26	1.48	6.69	4.94
Mercury, Total, CVAF	µg/L	26	26	0.01	0.02	0.02
Nickel, Total, ICP-MS	µg/L	26	26	2.97	6.53	4.16
Selenium, Total, ICP-MS	µg/L	26	11	0.76	1.34	1.20
Silver, Total, ICP-MS	µg/L	26	16	0.09	0.18	0.18
Zinc, Total, ICP-MS	µg/L	26	26	45.09	81.00	73.93
Acetone	µg/L	10	6	65.55	177.00	168.50
Benzoic Acid	µg/L	11	9	29.65	103.00	97.20
Benzyl Alcohol	µg/L	11	7	11.08	37.70	33.62
Bis(2-Ethylhexyl)Phthalate	µg/L	11	11	2.58	11.80	9.34
2-Butanone (MEK)	µg/L	10	1	7.40	7.40	7.40

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
Chloroform	µg/L	10	5	1.58	2.10	2.08
Diethyl Phthalate	µg/L	11	9	0.71	1.56	1.51
Dimethyl Phthalate	µg/L	11	2	0.06	0.07	0.06
Di-N-Octyl Phthalate	µg/L	11	2	0.41	0.68	0.65
2-Methylphenol	µg/L	11	2	0.28	0.38	0.37
3-,4-Methylphenol	µg/L	11	10	9.25	34.80	33.99
n-Octadecane	µg/L	10	3	0.67	1.19	1.14
Pentachlorophenol	µg/L	11	1	0.40	0.40	0.40
Phenol	µg/L	11	3	6.00	7.85	7.72
Toluene	µg/L	10	3	1.30	1.60	1.57

Whole Effluent Toxicity Testing - West Point WWTP

King County conducted acute toxicity testing in March 2017 and July 2017 as well as chronic toxicity testing in April 2017 and October 2017. Acute toxicity tests were conducted with Daphnia pulex and fathead minnow. Chronic toxicity tests were conducted with Atlantic mysid shrimp and topsmelt. See Appendix E— Monitoring Data Summary for toxicity test results. Ecology notes that the first rounds of acute and chronic testing in March and April 2017, respectively, occurred during the period when the West Point Treatment Plant was recovering from the February 2017 flooding event. The effluent samples tested had not received full secondary treatment and were not representative of typical effluent quality.

The performance standard for acute toxicity requires median survival in 100% effluent at levels equal to or greater than 80%, and no individual test result showing less than 65% survival in 100% effluent. All toxicity tests performed in 2017 met these standards.

The performance standard for chronic toxicity requires that no chronic toxicity test demonstrates a statistically significant difference in response between the control and a test concentration equal to the acute critical effluent concentration (ACEC). Both the topsmelt and mysid tests conducted in 2017 met acceptability criteria regarding control survival and mean control weight.

II.E. Wastewater effluent characterization – CSO Treatment Plants

Tables 21 through 24 characterize the effluent quality for KC-WTDs CSO treatment plants based on monitoring completed between January 2015 to December 2021. This section does not include data for the Georgetown CSO treatment plant since no monitoring has yet occurred at the facility.

Table 21 – Alki CSO Treatment Plant Effluent Characterization

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
BOD_5	mg/L	56	56	26.45	58.00	52.25
TSS	mg/L	56	56	38.25	96.00	67.00
Settleable Solids	ml/L	56	56	0.11	0.30	0.23
Total Residual Chlorine	µg/L	57	57	52.25	659.00	378.80
pH (Daily Min)	Std Units	57	57	6.28		5.36
pH (Daily Max)	Std Units	57	57	6.79		7.22
Fecal Coliform	#/100 mL	22	22	66.70	732.60	168.00
Ammonia	mg/L-N	3	3	2.04	3.23	3.10
Nitrite + Nitrate Nitrogen	mg/L-N	8	8	1.12	1.67	1.61
Total Kjeldahl Nitrogen	mg/L-N	3	3	4.75	6.39	6.20
Total Phosphorus	mg/L-P	3	3	0.66	0.80	0.79
Hardness	mg/L as CaCO3	14	14	44.14	76.80	67.32
Total Phenolic Compounds	mg/L	5	4	0.10	0.22	0.20
Oil and Grease	mg/L	9	9	7.49	29.00	22.42
Antimony, Total, ICP-MS	µg/L	14	14	0.60	0.78	0.74
Arsenic, Total, ICP-MS	µg/L	14	14	2.00	2.29	2.27
Barium, Total, ICP-MS	µg/L	14	14	14.06	19.00	17.44
Cadmium, Total, ICP-MS	µg/L	13	13	0.07	0.10	0.09
Chromium, Total, ICP-MS	µg/L	14	14	2.25	3.15	3.00
Copper, Total, ICP-MS	µg/L	14	14	12.56	16.80	15.66
Lead, Total, ICP-MS	µg/L	14	14	5.12	7.41	6.97
Mercury, Total, CVAF	µg/L	9	9	0.04	0.08	0.07
Nickel, Total, ICP-MS	µg/L	14	14	4.99	18.80	10.40
Silver, Total, ICP-MS	µg/L	14	13	0.09	0.21	0.19
Zinc, Total, ICP-MS	µg/L	14	14	49.87	74.60	71.84
Acetone	µg/L	2	2	29.10	48.70	46.74
Benzoic Acid	µg/L	2	2	16.44	25.60	24.68
Benzyl Alcohol	µg/L	2	2	1.70	2.25	2.20
Benzyl Butyl Phthalate	µg/L	5	4	0.10	0.14	0.13
Bis(2-Ethylhexyl)Phthalate	µg/L	13	13	0.77	3.03	1.87
Chloroform	µg/L	8	7	2.23	3.87	3.74
Diethyl Phthalate	µg/L	13	13	0.92	1.41	1.30
Dimethyl Phthalate	µg/L	2	1	0.06	0.06	0.06
Di-N-Butyl Phthalate	µg/L	2	1	0.15	0.15	0.15
3-,4-Methylphenol	µg/L	2	2	5.52	6.93	6.79
n-Octadecane	µg/L	2	2	0.53	0.81	0.79
Phenol	µg/L	6	6	1.10	1.68	1.63
Toluene	µg/L	4	3	1.53	1.90	1.85
Styrene	µg/L	2	1	7.12	7.12	7.12

Table 22 – Carkeek CSO Treatment Plant Effluent Characterization

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
BOD_5	mg/L	60	60	31.00	68.00	60.10

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
TSS	mg/L	61	61	24.38	84.00	52.00
Settleable Solids	ml/L	61	61	0.13	1.00	0.40
Total Residual Chlorine	µg/L	62	62	200.29	3,139.00	510.55
pH (Daily Min)	Std Units	62	62	6.57		6.26
pH (Daily Max)	Std Units	62	62	7.14		8.20
Fecal Coliform	#/100 mL	24	24	2,206.67	25,035.00	21,626.93
Ammonia	mg/L-N	4	3	2.13	2.58	2.52
Nitrite + Nitrate Nitrogen	mg/L-N	11	9	2.15	2.80	2.70
Total Kjeldahl Nitrogen	mg/L-N	4	3	5.32	5.91	5.90
Total Phosphorus	mg/L-P	4	3	0.85	0.99	0.97
Hardness	mg/L as CaCO3	12	12	41.11	51.90	49.20
Total Phenolic Compounds	mg/L	10	3	0.08	0.14	0.13
Cyanide, Weak & Dissociable	mg/L	10	2	0.00	0.00	0.00
Oil and Grease	µg/L	10	9	5.90	10.30	9.78
Antimony, Total, ICP-MS	µg/L	12	12	0.55	0.93	0.78
Arsenic, Total, ICP-MS	µg/L	12	12	2.10	2.72	2.62
Barium, Total, ICP-MS	µg/L	12	12	16.62	20.20	19.60
Cadmium, Total, ICP-MS	µg/L	12	12	0.09	0.24	0.17
Chromium, Total, ICP-MS	µg/L	12	12	1.53	2.08	2.07
Copper, Total, ICP-MS	µg/L	12	12	12.94	17.80	17.20
Lead, Total, ICP-MS	µg/L	12	12	3.71	7.59	6.31
Mercury, Total, CVAF	µg/L	10	9	0.02	0.03	0.03
Nickel, Total, ICP-MS	µg/L	12	12	2.37	2.91	2.91
Silver, Total, ICP-MS	µg/L	12	9	0.05	0.09	0.08
Zinc, Total, ICP-MS	µg/L	12	12	61.09	161.00	133.50
Acetone	µg/L	11	2	16.30	16.30	16.30
Benzoic Acid	µg/L	11	2	29.30	29.30	29.30
Benzyl Alcohol	µg/L	11	2	2.38	2.47	2.46
Benzyl Butyl Phthalate	µg/L	10	1	0.10	0.10	0.10
Bis(2-Ethylhexyl)Phthalate	µg/L	11	10	6.07	31.80	23.97
Chloroform	µg/L	10	9	4.34	8.60	8.60
Diethyl Phthalate	µg/L	11	10	0.52	0.79	0.75
Di-N-Butyl Phthalate	µg/L	11	1	0.14	0.14	0.14
3-,4-Methylphenol	µg/L	11	2	9.93	10.20	10.17
n-Octadecane	µg/L	11	2	0.40	0.40	0.40
Phenol	µg/L	9	7	1.25	1.61	1.59
Toluene	µg/L	5	3	1.60	1.70	1.70

Table 23 – Elliott West CSO Treatment Plant Effluent Characterization

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
BOD_5	mg/L	92	92	62.30	235.00	170.80
TSS	mg/L	96	96	112.19	636.00	310.75
Settleable Solids	ml/L	97	97	2.37	30.00	9.20
Total Residual Chlorine	µg/L	95	95	297.69	3,412.00	866.20
pH (Daily Min)	Std Units	99	99	5.98		5.24
pH (Daily Max)	Std Units	99	99	7.22		8.32
Fecal Coliform	#/100 mL	32	32	13,753.59	330,000.00	46,936.39
Ammonia	mg/L-N	3	2	1.98	2.16	2.14
Nitrite + Nitrate Nitrogen	mg/L-N	7	6	0.49	1.03	0.88
Total Kjeldahl Nitrogen	mg/L-N	3	2	5.64	6.83	6.71
Total Phosphorus	mg/L-P	2	1	0.72	0.72	0.72
Hardness	mg/L as CaCO3	12	12	53.88	222.00	149.90
Total Phenolic Compounds	mg/L	7	1	0.17	0.17	0.17
Cyanide, Weak & Dissociable	mg/L	12	1	0.00	0.00	0.00
Oil and Grease	µg/L	11	10	8.29	14.40	14.04
Antimony, Total, ICP-MS	µg/L	13	13	1.42	3.90	3.03
Arsenic, Total, ICP-MS	µg/L	13	13	2.75	6.22	4.58
Arsenic, Dissolved, ICP-MS	µg/L	10	10	2.05	4.41	3.35
Barium, Total, ICP-MS	µg/L	9	9	43.20	120.00	101.04
Barium, Dissolved, ICP-MS	µg/L	13	13	12.06	30.00	24.00
Cadmium, Total, ICP-MS	µg/L	12	12	0.18	0.71	0.44
Chromium, Total, ICP-MS	µg/L	10	10	5.37	15.50	11.46
Copper, Total, ICP-MS	µg/L	60	60	40.80	148	84.05
Lead, Total, ICP-MS	µg/L	10	10	21.05	76.90	54.85
Lead, Dissolved, ICP-MS	µg/L	10	10	0.86	2.22	1.79
Mercury, Total, CVAF	µg/L	9	9	0.06	0.12	0.12
Nickel, Total, ICP-MS	µg/L	11	11	4.84	14.10	10.13
Silver, Total, ICP-MS	µg/L	9	8	0.24	0.85	0.66
Zinc, Total, ICP-MS	µg/L	12	12	104.98	163.00	162.45
Benzyl Butyl Phthalate	µg/L	8	1	0.19	0.19	0.19
Bis(2-Ethylhexyl)Phthalate	µg/L	9	8	4.14	12.80	12.14
Chloroform	µg/L	10	9	9.25	39.70	28.02
Chloromethane	µg/L	9	1	1.10	1.10	1.10
Diethyl Phthalate	µg/L	9	4	0.82	1.54	1.43
Dimethyl Phthalate	µg/L	9	1	0.09	0.09	0.09
Di-N-Butyl Phthalate	µg/L	8	1	0.23	0.23	0.23
Di-N-Octyl Phthalate	µg/L	8	1	0.09	0.09	0.09
Fluoranthene	µg/L	8	1	0.10	0.10	0.10
Phenol	µg/L	8	1	2.60	2.60	2.60
Toluene	µg/L	8	3	4.58	8.77	8.16

Table 24 – Henderson/MLK CSO Treatment Plant Effluent Characterization

Parameter	Units	Samples tested	# Detected	Average	Maximum	95th Percentile
BOD_5	mg/L	14	14	14.54	22.00	20.70
TSS	mg/L	16	16	27.68	98.00	53.75
Settleable Solids	ml/L	16	16	0.14	0.40	0.33
Total Residual Chlorine	µg/L	16	16	138.36	1,100.00	874.25
pH (Daily Min)	Std Units	16	16	6.25		5.60
pH (Daily Max)	Std Units	16	16	6.91		7.95
Fecal Coliform	#/100 mL	9	9	18.31	103.92	73.12
Hardness	mg/L-N	9	9	47.61	64.30	60.18
Cyanide, Weak & Dissociable	mg/L-N	8	3	0.01	0.01	0.01
Total Phenolic Compounds	mg/L-N	8	2	0.13	0.21	0.20
Oil and Grease	mg/L-P	8	8	3.18	4.30	4.20
Antimony, Total, ICP-MS	mg/L as CaCO3	9	9	0.71	0.81	0.81
Arsenic, Total, ICP-MS	mg/L	9	9	1.80	2.08	2.06
Barium, Total, ICP-MS	mg/L	9	9	20.59	51.80	38.70
Cadmium, Total, ICP-MS	µg/L	9	5	0.09	0.14	0.13
Chromium, Total, ICP-MS	µg/L	9	9	2.40	3.34	3.29
Copper, Total, ICP-MS	µg/L	9	9	14.61	24.20	22.32
Lead, Total, ICP-MS	µg/L	9	9	3.76	7.12	6.18
Mercury, Total, CVAF	µg/L	7	7	0.02	0.04	0.03
Nickel, Total, ICP-MS	µg/L	9	9	3.50	4.47	4.45
Silver, Total, ICP-MS	µg/L	9	2	0.04	0.05	0.04
Zinc, Total, ICP-MS	µg/L	9	9	39.76	67.70	62.26
Acetone	µg/L	9	5	8.40	12.10	11.46
Benzoic Acid	µg/L	9	4	13.31	16.10	15.80
Benzyl Alcohol	µg/L	9	6	0.73	1.11	1.06
Bis(2-Ethylhexyl)Phthalate	µg/L	9	8	2.30	13.76	9.33
Chloroform	µg/L	9	7	21.05	56.60	52.10
Diethyl Phthalate	µg/L	8	7	0.27	0.40	0.37
Di-N-Butyl Phthalate	µg/L	9	6	0.26	0.41	0.39
Di-N-Octyl Phthalate	µg/L	9	3	0.16	0.21	0.20
Dimethyl Phthalate	µg/L	9	1	0.11	0.11	0.11
3-,4-Methylphenol	µg/L	9	5	1.68	2.06	2.01
n-Octadecane	µg/L	9	5	0.35	0.46	0.45
Pentachlorophenol	µg/L	9	1	0.39	0.39	0.39
Phenol	µg/L	9	6	3.50	7.09	6.51
Tetrachloroethylene	µg/L	9	1	1.80	1.80	1.80
Toluene	µg/L	9	1	1.40	1.40	1.40

Elliott West Copper and Settleable Solids:

Due to historically elevated effluent concentrations of copper and settleable solids discharged from the Elliott West CSO Treatment Plant, the 2015 permit required KC-WTD to complete studies to assess variables that influence treatment performance and to evaluate strategies for improving removal of these pollutants. KC-WTD submitted reports for both assessments in October 2018.

The 2018 Copper Assessment Report concluded that analytical testing consistently met required quality assurance protocols and that copper plumbing at the facility was unlikely to have caused elevated effluent copper concentrations. The assessment also did not find apparent weather, rainfall, land use, or seasonal relationships with total copper concentrations and it did not find unique and substantive copper sources from industrial dischargers in the basin. However, the assessment found a strong relationship between total copper concentrations and total suspended solids concentrations. It also identified uncertainty about the partitioning between dissolved and particulate copper in the effluent.

The 2018 Settleable Solids Assessment, completed by Carollo Engineers, relied on a 3-dimensional computational fluid dynamics model of the facility to evaluate solids settleability. The analysis indicated that several factors hampered settleable solids removal, including:

- hydraulic conditions in the lower reaches of the Mercer Street Tunnel and Elliott West wet well prevent effective settling of solids greater than 0.6 millimeters (mm), particularly for flows in excess of 40 MGD;
- limited ability to remove settled solids during dewatering of the tunnel and wet well;
- direct connection of combined sewage from the Elliott Bay Interceptor (EBI) Control Structure to the Elliott West wet well, which may comprise up to 40 percent of flow that enters the facility;
- resuspension of solids that have settled in the lower reaches of the Mercer Street Tunnel and wet well between storm events; and,
- the lack of suitable flow measurement locations necessary to facilitate effective influent solids characterization

II.F.Sediment characterization

The following sections summarize the quality of sediments near the outfalls regulated by the proposed permit based on historical testing performed by KC-WTD.

II.F.1. West Point WWTP Outfall

King County has conducted sediment analyses near the West Point WWTP outfall five times in the past sixteen years (1998, 2000, 2006, April 2011, July 2011, September 2017, and April 2018). Results from these sample events can be found in King County's *2017 West Point NPDES Outfall Sediment Sample Event: Final Results*. Many of the stations have consistently shown no indication of chemical or biological effects. Except for one station in 1998, three stations in 2011, and four stations in 2017, all detected concentrations met the SQS chemical numeric standards. Bioassay test results have shown apparent sediment toxicity at a few stations, but the cause of toxicity is unclear based on chemistry results and all results in the most recent round of sampling indicated no potential biological impact. Benthic surveys in 1998 showed benthic abundance and diversity were reduced at the two stations that also had bioassay toxicity (WP230P, WP430N), but this was not evident in

2000, 2006 or 2017. Sediment monitoring will continue in the vicinity of the outfall with more focus on investigating the area which has shown some evidence of sediment impacts.

Table 25 provides a summary of sediment testing around the West Point WWTP outfall completed between 1998 and 2018. The sediment sampling stations for the 2017/18 sampling report are shown in Figure 12. Samples were collected in 2017 at all locations shown in the figure while 2018 sampling was only undertaken at locations that indicated an exceedance of the numeric chemical criteria in the marine sediment quality standards (SQS) in 2017 (WP230P, WP280W, WP410W, and WP420NW).

Table 25 – West Point WWTP Sediment Test Results

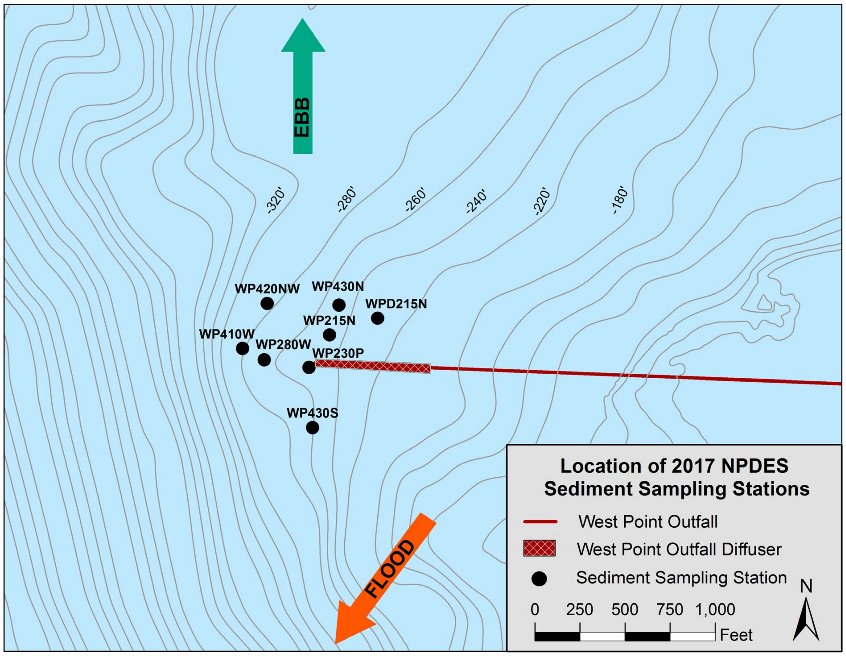
Year	Chemistry # of stations	Bioassays # of stations	Benthic Surveys[1]	SQS Hits	Stations
2018	4	4	0	None	N/A
2017	8	0	24	Chemistry	WP230P, WP280W, WP410W, and WP420NW: benzoic acid and benzyl alcohol (WP230P only)
2011-July	1	8 –Larval echinoderm only	0	Bioassays	WP430S (no chemistry hits to support toxicity and TIE conducted by KC-WTD indicates toxicity was likely due to sample turbidity and not chemically induced)
2011-April	8	8	0	Chemistry & Bioassays	WP230P: Total PCB WP420NW: Total PCB WP215N: dimethyl phthalate
2006	19	10	10	Bioassays	WP280W, WP230P, WP215N
2000	12	2	6	Bioassays	WP230P, WP430N
1998	12	2	5	Chemistry & Bioassays	WP230P, WP430N

[1] Unable to determine compliance with Sediment Management Standards for the benthic surveys due to lack of reference station.

Sediment Chemistry

Historical results have shown that all detected concentrations generally meet the SQS chemical numeric standards or the 1988 Lowest Apparent Effects Threshold (LAET). The record shows that one station (WP230P) in 1998 exceeded the SQS concentrations for two polycyclic aromatic hydrocarbon (PAH) compounds. Two stations (WP230P and WP420NW) exceeded the SQS concentrations for PCBs and one station (WP215N) exceeded the SQS concentration for dimethyl phthalate in April 2011. Due to low organic carbon content of the sediment samples, chemical concentrations were compared to the 1988 LAET dry weight thresholds that are the basis for the organic carbon-normalized criteria in the Sediment Management Standards.

Figure 12 – Sediment sampling locations for West Pt WWTP outfall



The 2017 sediment sampling continued to show chemistry results with concentrations generally below SQS criteria in all eight samples, with two exceptions. Four stations (WP230P, WP280W, WP410W, and WP420NW) showed concentrations of benzoic acid above the SQS and benzyl alcohol (which degrades to benzoic acid) exceeded the SQS at one of those stations (WP230P). The sediment analysis report submitted by KC-WTD identified that abnormally high benzoic acid sediment concentrations appeared to be widespread in the Central Basin of Puget Sound based on sediment monitoring results collected in 2017 by King County's Marine Sediments Monitoring Program. The second round of sediment chemistry testing completed in 2018 indicated that concentrations of all chemicals, including benzoic acid and benzyl alcohol, were well below their respective chemical criteria at the four stations that initially had exceedances.

Sediment Bioassays

Historical Bioassay test results have indicated potential toxicity at several stations. The following stations have failed one or more bioassay test: WP280W, WP230P, WP215N, WP430S and WP430N. Some of these stations coincide with elevated concentrations of PAH compounds. The sediments at Station WP280W failed all three bioassay tests in 2006, but no elevated chemicals were detected. The sediments at station WP230P failed bioassay tests in 1998, 2000, and 2006, but passed in 2011. In April 2011, Station WP430S showed a bioassay hit, but again toxicity was not supported with elevated chemical concentrations and a toxics identification evaluation conducted by King County showed that the toxicity was likely a result of physical characteristics (i.e., sample turbidity) and not chemically induced.

While past monitoring results have indicated occasional exceedances or bioassay hits, the 2018 round of bioassay testing did not indicate any potential biological impact to sediments surrounding the outfall and suggests that these potential impacts are often not repeated and don’t indicate chronic problems.

Benthic Taxonomy

In 1998, benthic surveys showed benthic abundance and diversity were reduced at two stations (WP230P, WP430N) compared to the other sites near the outfall. These two stations also had bioassay toxicity. In 2006, no differences were evident between the stations. Ecology cannot compare benthic data to the SQS criteria because no reference station data was collected. Benthic surveys conducted in 2011 and 2017 showed a robust and diverse benthic community. Abundance in 2017 was moderate, but richness and diversity indices were high compared to regional data. There was no over-abundance of pollution tolerant species, although some were noted, and some pollution-sensitive species were present including a large recruitment of actiniid sea anemones at several stations. Regional comparisons for 2011 were not possible due to a lack of an appropriate reference station and the fact that sampling did not occur during the spring instead of the fall.

II.F.2. Alki CSO Treatment Plant

King County most recently sampled sediments near the Alki CSO treatment plant in October 2001. The study evaluated sediments at six stations; five of the stations formed a transect perpendicular to the end of the outfall and the sixth station was located approximately 1,500 feet from the outfall. All detected chemical concentrations were less than their respective SQS criteria or LAET values. Data from this sampling event can be found in EIM under User Study ID ALKI01. No additional sediment monitoring is planned at this outfall because there were no SMS exceedances in the last round of sampling and source conditions have not changed.

II.F.3. Carkeek CSO Treatment Plant

King County most recently sampled sediments near the Carkeek CSO treatment plant in October 2000. The study evaluated sediments at six stations; five of the stations formed a transect perpendicular to the end of the outfall and the sixth station was located approximately 1,500 feet from the outfall in the direction of the prevailing current. All detected chemical concentrations were less than their respective SQS criteria or LAET values. Data from this sampling event can be found in EIM under User Study ID CARKEK00. No additional sediment monitoring is planned at this outfall because there were no SMS exceedances in the last round of sampling and source conditions have not changed.

II.F.4. Elliott West CSO Treatment Plant

King County has sampled sediments near the Elliott West CSO treatment plant outfall (#027b) and the untreated Denny Way Regulator CSO outfall (#027a) multiple times since 2001 as part of the Denny Way/Lake Union CSO Control Project long-term sediment monitoring program. The County conducted 11 sampling events at 16 locations between 2001- and 2015. Early sampling events indicated that several chemicals exceeded either SQS and/or Clean-up Screening Level (CSL) concentrations at one or more locations. Chemicals of concern include total PCBs, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzyl butyl phthalate, bis(2-ethylhexyl) phthalate, chrysene, dibenzo(a,h)anthracene, fluroanthene, indeno(1,2,3-c,d)pyrene, and mercury.

Following completion of the Denny Way CSO control project in 2005 (Denny RS Overflow and Elliott West Outfall), Ecology and King County entered into an Agreed Order (AO Number DE 5068) under the Model Toxics Control Act (MTCA) that required remediation of nearshore areas around the old outfall. The remediation was completed in early 2008, followed by a six-year post-remediation monitoring program. Monitoring data through 2015 in the area remediated continued to show no SQS exceedances. Samples taken outside of remediation area in 2015 showed concentrations of mercury, some PAHs, phthalates, and PCBs above SQS and CSL levels.

Additional information about the clean-up activities can be found at Ecology's cleanup site web page: https://apps.ecology.wa.gov/cleanupsearch/site/2582 or at King County's Denny Way Sediment Remediation Project web site: https://kingcounty.gov/services/environment/wastewater/sediment-management/plan-implementaton/DennyWay.aspx

II.F.5. Georgetown CSO Treatment Plant

As construction of the Georgetown CSO Treatment Plant has only recently been completed, there has been no direct sediment sampling associated with the outfall. Sediments in the area surrounding the outfall have been sampled several times within the last 10 years as part of the Lower Duwamish Superfund site investigation and clean up as well as by King County in support of the outfall construction. The area in the vicinity of the Georgetown CSO Treatment Plant outfall includes several active heavy and light industrial sites. Sampling results presented in the EPA's *Lower Duwamish Superfund Site Record of Decision* (November 2014) and the Lower Duwamish Waterway Group's (LDWG) *Lower Duwamish Waterway Surface Sediment Data Report* (February 8, 2019) both demonstrate that sediments in the area are impacted with greater than 150 µg/kg of Total PCB Aroclors as well as elevated levels of dioxin/furan, cPAHs, and arsenic. Furthermore, sampling results from the LDWG in 2019 showed the present of several phthalates including Bis(2-ethylhexyl)phthalate at 802 µg/kg near the outfall.

II.F.6. Henderson/MLK CSO Treatment Plant

The following summarizes the characteristics of sediment quality near the Norfolk outfall. As discussed in section II.A.9, the Norfolk outfall also discharges stormwater from multiple jurisdictions in addition to untreated CSOs from the Norfolk Street Regulator Station and treated CSOs from the Henderson/MLK CSO Treatment Plant. In addition, multiple other public and private outfalls discharge stormwater into the Duwamish River near the Norfolk outfall. This summary only provides information about the current sediment quality and does not imply any connection to a specific source or sources of pollutants.

Sediment sampling off the Norfolk outfall was conducted over three rounds from 1994 through 1995 as part of the Elliott Bay Duwamish Restoration Program (EBDRP). Both surface and subsurface sampling were extensively conducted in several hundred feet of the outfall to determine the sediment remediation boundaries. SMS exceedances in this location included mercury, total PCBs, 1, 4 dichlorobenzene, and bis(2-ethylhexyl)phthalate. Sediment sampling in the area and contaminant characterization were further conducted as part of the Lower Duwamish Superfund site. These investigations identified contaminants of concern that include PCBs, arsenic, PAHs, and dioxins/furans. Any further remedial action needed in this area will be done under the Superfund site cleanup process in accordance with the 2014 EPA record of decision.

II.F.7. Untreated CSO Outfalls

Sediments near untreated CSO outfalls managed by KC-WTD “reflect the legacy of the development of Seattle as a major urban and industrial area” (2018 Comprehensive Sediment Quality Summary Report). As such, several outfalls discharge to areas subject to sediment cleanup activities to remediate pollutants from multiple potential sources. In 1999, KC-WTD developed a Sediment Management Plan to evaluate remediation activities for seven cleanup sites near outfall locations. The plan also identified sediment management strategies for King County’s other CSO outfalls. In 2018, KC-WTD updated this plan to update the status of sediment characterization based on recent sampling and deposition modeling near certain outfalls. This update was submitted in conjunction with the 2018 Comprehensive Sediment Quality Summary Report required by the pervious permit.

Since several untreated CSO outfalls discharge into Superfund cleanup sites, King County’s Sediment Management Program coordinates with other agencies on source control and cleanup of larger areas. Cleanups done under CERCLA and MTCA may have short-term monitoring, but rely on other authorities, such as NPDES permits under the Clean Water Act to address long-term monitoring. This NPDES permit has a role in assuring discharges comply with the Sediment Management Standards, but it is necessary to coordinate these efforts with cleanup investigations and actions under state and federal authorities.

The 2018 Comprehensive Sediment Quality Summary Report and the 2018 Sediment Management Plan (SMP) Update provided information on current sediment conditions near the untreated CSO outfalls. Both reports described the sediment characteristics and management strategy for the 24 outfalls listed in Table 26.

Table 26 – CSO Outfall sediment testing history

Outfall No.	Outfall Name	Year Last Sampled	Sample Type	SQS[1]/CSL Exceedance?
003	Ballard Siphon Regulator	2015	Chemistry	Yes - arsenic, cadmium, copper, mercury, nickel, silver, total PCBs, total PAHs, bis(2-ethylhexyl)phthalate, and di-n-octyl phthalate
004	11th Av. NW (East Ballard Overflow)	1989	Chemistry	Yes[2] – bis(2-ethylhexyl)phthalate, PCBs, 1,1-Dichloro-2,2-bis(p-chlorophenyl) ethylene (DDE), and mercury
006	Magnolia South Overflow	2013	Chemistry	None
007	Canal Street Overflow	Not Sampled	N/A	N/A
008	3rd Avenue West Overflow	2011	Chemistry	Yes - Mercury, Silver, Nickel, BEHP, Total PAH, Total PCB Aroclors, Di-n-butyl phthalate
009	Dexter Avenue Regulator	2001	Chemistry	Yes - arsenic, nickel, and BEHP; CSL exceedances included metals (cadmium, chromium, copper, lead, mercury, and silver), tributyltin (TBT), total PCBs, total PAHs and other organics
011	E. Pine St. PS Overflow	2000	Chemistry	Yes – nickel, BEPH, and sulfide
012	Belvoir PS Overflow	2013	Chemistry	Yes[3] – bis(2-ethylhexyl)phthalate and DDE
013	Martin Luther King Way Trunkline Overflow	2000	Chemistry	Yes - nickel, mercury, TBT, total PCBs, PAHs, dibenzofuran, dieldrin, sulfide, and BEHP
014	Montlake Overflow	2011	Chemistry	None
015	University Regulator	2011	Chemistry	Yes - total PCBs, mercury, silver, nickel, lead, and phenol
018	Matthews Park PS Overflow	Not Sampled		
029	Kingdome (Connecticut St Regulator)	1996	Chemistry/ Bioassay	Yes[4] – PAHs, phthalates, total PCBs, and copper
033	Rainier Avenue PS Overflow	2000	Chemistry	Yes – nickel, silver, TBT, total PCBs, BEHP, and sulfide
045	Henderson St. PS Overflow	2000	Chemistry	Yes - nickel, mercury, TBT, total PCBs, PAHs, dibenzofuran, dieldrin, sulfide, and BEHP
048a	North Beach PS Overflow	2013	Chemistry	None
049	30th Ave. N.E. PS Overflow	2013	Chemistry	Yes[3] – bis(2-ethylhexyl)phthalate and DDE
052	53rd St SW PS Overflow	2011	Chemistry	None
054	63rd St SW PS Overflow	1997	Chemistry	None
055	S.W. Alaska Street Overflow	1997	Chemistry	None
056	Murray St PS Overflow	2013	Chemistry	Yes – phthalates and PAHs
057	Barton St PS Overflow	2016	Chemistry	Yes - butylbenzyl phthalate, anthracene, and chrysene

[1]Sediment Cleanup Objective (SCO) values used to evaluate exceedances for freshwater sediments.
[2]Results based on one sample collected in 1989
[3]Sample collected from one location near both outfalls 012 and 049 for use in sediment deposition modeling calibration
[4]Kingdome samples taken prior to dredging by the Port of Seattle in 2005.

The 2018 SMP used sediment modeling to assess the potential for deposition around the outfalls listed in Table 26 to result in SMS exceedances. Most outfalls were analyzed with an Environmental Fluid Dynamics Code (EFDC) model for detailed predictions of particle deposition. The effort also used a simple model to provide order-of-magnitude predictions in areas where detailed geophysical features and boundary condition information was not collected. The modeling predicted that deposition near outfalls located in the Lake Washington Ship Canal, Lake Union, and Portage Bay (Numbers 004, 008, 009, 014 and 015) could potentially exceed SMS criteria. In addition, the modeling predicted potential SMS exceedances near the Kingdome Regulator outfall (#029) in Elliott Bay.

The SMP did not reevaluate strategies for the 14 outfalls listed in Table 27. These outfalls are located in existing cleanup areas and KC-WTD has coordinated remediation work according to the cleanup plans for the identified cleanup sites.

Table 27 - CSO outfalls not evaluated in 2018 SMP Update

Outfall No.	Outfall Name	Cleanup Project Area
027a	Denny Way Regulator	Denny Way Sediment Remediation Project
028	King Street Regulator	King Street CSO
030	Lander Street Regulator	Harbor Island/East Waterway
031	Hanford #1 Regulator	Lower Duwamish Waterway
032	Hanford #2 Regulator	Harbor Island/East Waterway
034	Duwamish PS Overflow	Lower Duwamish Waterway
035	W. Duwamish Overflow	Lower Duwamish Waterway
036	Chelan Avenue Regulator	Harbor Island/West Waterway
037	Harbor Avenue Regulator	Harbor Island/West Waterway
038	Terminal 115 Overflow	Lower Duwamish Waterway
039	Michigan S. Regulator	Lower Duwamish Waterway
040	8th Avenue Regulator	Lower Duwamish Waterway
041	Brandon Street Regulator	Lower Duwamish Waterway
042	Michigan W. Regulator	Lower Duwamish Waterway
043	East Marginal Way PS	Lower Duwamish Waterway
044a	Norfolk Street Regulator	Lower Duwamish Waterway

The 2018 SMP noted that initial dredging and capping of sediments occurred in 2004 near the Duwamish Pump Station Overflow outfall (#034), however additional cleanup is needed as part of the overall LDW cleanup action. All other outfalls in this cleanup area are following the same process. Current cleanup actions for the Lower Duwamish Waterway are focused primarily on pollution source control to finding sources of contamination, then stopping or reducing them before they reach the LDW. Controlling sources of contamination to the LDW is necessary to ensure pollutants are sufficiently controlled before in-waterway cleanup begins. The previous permit required KC-WTD to implement pollution control best management practices (BMPs) to aid in this source control effort.

Cleanup activities have occurred near outfalls listed in Table 27. In 2008, KC-WTD completed initial cleanup near the Denny Way Regulator (outfalls 027a). In addition, KC-WTD proposed a multi-agency action in coordination with Seattle Department of Transportation and Washington State Department of Transportation for cleanup in the area of Coleman Dock, which includes sediments near the King Street Regulator Outfall (#028). This cleanup action is in the planning phase.

Sediment removal by the Port of Seattle in 2009 as part of a navigation improvement project in the East Waterway removed several known contaminants near the Lander Street Regulator outfall (#030). Further cleanup near the Lander outfall and the Hanford #2 Regulator outfall (#032) will take place as part of the Harbor Island – East Waterway Operable Unit Superfund Cleanup Project. Although the outfalls for the Chelan Avenue and Harbor Avenue Regulators (#036 and 037) are located in the area covered by the Harbor Island – West Waterway Operable Unit Superfund Site, the Record of Decision issued by EPA in 2003 identified that no cleanup actions were needed in this area. Therefore, additional cleanup is not needed at this time. While no cleanup action is currently planned, sediment sampling by KC-WTD in 2011 and 2013 identified contamination above SCO levels near the Chelan outfall. Five of eight samples exceeded the SCO for total PCBs, phthalates, and PAHs, and one of eight samples exceeded the CSL for bis(2-ethylhexyl)phthalate.

II.G. Summary of compliance with previous permit issued

King County has not consistently complied with the effluent limits and permit conditions throughout the duration of the permit issued on December 14, 2014. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs), annual CSO reports, and inspections.

In addition to the summary of effluent violations shown below, King County also had several instances of unauthorized bypasses, unauthorized CSO overflows, late DMR reports, and missed sampling events.

A full list of all violations can be found in Appendix E.

II.G.1. West Point Treatment Plant

The West Point WWTP failed to comply with the limits and conditions set forth in the permit mostly as a result of the plant failure on February 9, 2017, that caused serious damage to West Point's ability to treat wastewater. The plant did not return to normal operations until 89 days later on May 9, 2017.

Additionally, from September 4, 2018 through September 27, 2018 an apparent issue with one of the BOD bottle dishwashers and the use of Cidehol 70 for area cleaning in the BOD analysis area caused artificially high BOD test results. Consequently, KC-WTD staff did not report the results for that period.

II.G.2. Alki CSO Treatment Plant

Despite changes and improvements to the Alki CSO Treatment Plant, the plant experienced periodic exceedances of limits for chlorine (5 violations) and pH (6 violations) as well as one violation of fecal coliform limits. This plant also failed to meet its annual TSS removal efficiency limit in 2015, 2016, 2017, and 2021. King County plans to continue improving the Alki plant by:

- Evaluating, testing, and adjusting of the new hypochlorite feed system as well as;
- Evaluating the TSS removal performance by switching the operation of the sedimentary tanks to all six tanks filling simultaneously; and,
- Continuing evaluations of strategies to improve TSS removal at the plant.

II.G.3. Carkeek CSO Treatment Plant

During the permit term, KC-WTD reported 15 effluent violations at the Carkeek CSO treatment plant, primarily for limits on residual chlorine, pH, and fecal coliform. The facility also violated annual TSS removal efficiency limits in 2016, 2017, and 2020. In late 2019, KC-WTD initiated a new capital project to improve the reliability of the dechlorination system at the plant.

II.G.4. Elliott West CSO Treatment Plant

The Elliott West plant routinely failed to comply with effluent limits with more than 100 individual limit violations during the permit term. Reported violations included all daily, monthly, and annual limits, however most involved violations of residual chlorine and fecal coliform limits. As of December 2022, Ecology and EPA have jointly assessed $184,000 in stipulated penalties under King County's CSO consent decree for 55 individual limit violations at the Elliott West CSO Treatment Plant that occurred between 2015 and 2021. Due to the history of poor performance, KC-WTD submitted a draft alternatives analysis report to outline planning efforts to replace the Elliott West facility with an advanced wet weather treatment system.

II.G.5. Georgetown CSO Treatment Plant

There have been no reported violations from operations/discharges at GWWTP.

II.G.6. Henderson/MLK CSO Treatment Plant

The Henderson/MLK CSO Treatment Plant met most permit effluent limits between 2015 and 2022. KC-WTD reported eight permit limit violations during this period, most for exceeding the plant's limit on residual chlorine. Other limit violations included fecal coliform (December 2015), pH (February 2017), annual TSS removal (2017) and annual settleable solids (2020).

II.H. 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 Federal Water Quality Criteria Applicable to Washington (40 CFR 131.45)
- 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/or do not have a reasonable potential to cause a water quality violation.

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

III.A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. The following sections describe the relevant design criteria for each treatment plant regulated by this permit.

West Point WWTP
The design criteria for the West Point WWTP listed in Table 28 are taken from the 1991 Plans titled *West Point Treatment Plant Secondary Treatment Facilities, Liquids Stream,* prepared by CH_2M Hill, KCM, and others.

Table 28 – Design Criteria for West Point WWTP

Parameter	Design Quantity
Monthly average flow (maximum month)	215 MGD

Parameter	Design Quantity
Secondary treatment flow capacity (daily maximum)	300 MGD
Instantaneous maximum flow	440 MGD
Monthly maximum BOD_5 influent loading	201,000 lbs/day
Monthly maximum TSS influent loading	218,000 lbs/day

Alki CSO Treatment Plant

Ecology obtained the design criteria for the Alki facility, listed in Table 29, from the *Facilities Plan for Alki Transfer/CSO Project* prepared by HDR Engineering, Inc. and dated October 1992.

Table 29 – Design Criteria for Alki CSO Treatment Plant

Parameter	Design
Wet weather treatment design flow	65 MGD
Maximum hydraulic capacity	90 MGD
TSS influent loading (average annual)	9,580 lbs/day

Carkeek CSO Treatment Plant

Ecology obtained the design criteria for the Carkeek Storage and CSO Treatment Plant, listed in Table 30, from the *Facility Plan for the Carkeek Transfer/CSO Facilities Project* prepared by Brown and Caldwell Consulting Engineers and dated December 1988.

Table 30 – Design Criteria for Carkeek CSO Treatment Plant

Parameter	Design Quantity
Wet weather treatment design flow	20 MGD
Annual number of discharge events	10
TSS influent loading	5,100 lbs/day

EWCSO CSO Treatment Plant

Ecology obtained the design criteria for the EWCSO Satellite CSO Treatment Plant, listed in Table 31, from the *Denny Way/Lake Union CSO Control Facilities Plan,* dated July 1988.

Table 31 – Design Criteria for Elliott West CSO Treatment Plant

Parameter	Design
Tunnel storage volume	7.2 MG
Wet weather treatment design flow	80 MGD
Maximum hydraulic capacity	250 MGD

Georgetown CSO Treatment Plant

Ecology obtained the design criteria for the Georgetown facility, listed in Table 32, from the *Georgetown Wet Weather Treatment Station Facility Plan* prepared by HDR Engineering, Inc. and CH2M dated June 2016.

Table 32 – Design Criteria for Georgetown CSO Treatment Plant

Parameter	Design
Wet weather treatment flow	70 MGD
Annual treatment volume	69 MG
Annual average TSS Removal efficiency	85%
TSS influent loading	70,000 lbs/day
Annual number of treatment events	20

Henderson/MLK CSO Treatment Plant

Ecology obtained the design criteria for the Henderson/MLK CSO treatment plant, listed in Table 33, from the *Henderson/ML King CSO Control Facilities Plan* (approved March 5, 2002).

Table 33 – Design Criteria for Henderson/MLK CSO Treatment Plant

Parameter	Design
Tunnel storage volume	4 MG
Annual treatment volume (maximum)	27 MG
Maximum hydraulic capacity	148 MGD

III.B. Technology-based effluent limits

Federal and state regulations define some 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). Chapter 173-220-130 WAC requires that "effluent limitations shall not be less stringent than those based upon the treatment facility design efficiency contained in approved engineering plans and reports." The proposed permit includes technology-based limits based on the approved treatment facility design.

West Point WWTP

Table 34 below identifies technology-based limits for pH, fecal coliform, BOD_5, and TSS, as listed in chapter 173-221 WAC. Sections III.F through III.H of this fact sheet describes the potential for water quality-based limits to protect aquatic life and human health.

Table 34 – Technology-based Limits for WPWWTP

Parameter	Average Monthly Limit	Average Weekly Limit
$CBOD_5$	25 mg/L	40 mg/L

In addition, the $CBOD_5$ effluent concentration must not exceed 15% of the average influent concentration from May-October and 20% of the average influent concentration from November-April.

Parameter	Average Monthly Limit	Average Weekly Limit
TSS	30 mg/L	45 mg/L

In addition, the TSS effluent concentration must not exceed 15% of the average influent concentration from May-October and 20% of the average influent concentration from November-April.

Parameter	Average Monthly Limit	Daily Maximum Limit
Total Residual Chlorine	139 µg/L	364 µg/L

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

Parameter	Minimum[1]	Maximum[1]
pH	6.0 standard units	9.0 standard units

[1] Daily minimum/maximum for pH shall be calculated as the lowest/highest five-minute rolling average during a calendar day while monitoring with a continuous/instantaneous measuring device.

Ecology derived the general 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. However, the existing permit included chlorine limits of 139 μg/L (monthly average) and 364 μg/L (daily maximum) to protect for aquatic toxicity. Since the facility demonstrated an ability to comply with these limits, the proposed permit retains the same limits to prevent backsliding.

Technology-based mass limits for $CBOD_5$ and TSS are based on WAC 173-220-130(3)(b) and WAC 173-221-030(11)(b). Ecology calculated the monthly and weekly average mass limits for $CBOD_5$ and Total Suspended Solids as follows:

Mass Limit = CL x DF x CF

Where :

CL = Technology-based concentration limits listed in Table 34

DF = Maximum Monthly Average Design flow (MGD)

CF = Conversion factor of 8.34

Table 35 – Technology-based Mass Limits for WPWWTP

Parameter	Concentration Limit (mg/L)	Mass Limit (lbs/day)
$CBOD_5$ Monthly Average	25	44,800
$CBOD_5$ Weekly Average	40	71,700
TSS Monthly Average	30	53,800
TSS Weekly Average	45	80,700

WAC 173-221-050(3) states that, "for domestic wastewater facilities which receive flows from combined sewer, Ecology shall decide on a case-by-case basis whether any attainable percent removal can be defined during wet weather." The West Point WWTP receives a more dilute influent during wet weather due to a collection system that combines both sanitary sewage and storm water. A dilute influent can make the 85% removal criteria for $CBOD_5$ and TSS difficult to achieve.

Ecology calculated the CBOD5 and TSS effluent concentrations the West Point WWTP would need to achieve to comply with an 85% removal requirement during wet weather months. These calculations show that the plant would need to achieve a CBOD5 effluent concentration 20% lower than the technology-based limit of 25 mg/L to meet 85% removal during the months of November through April. The plant would also need to achieve effluent TSS concentrations limits 11% lower than the 30 mg/L technology-based limit. The previous permit included requirements for 80% removal of CBOD5 and TSS during wet weather months. Based on an evaluation of plant performance between 2015 and 2021, the plant can continue to achieve this standard, and no change is warranted.

The federal CSO control policy (59 FR 18688) requires as one of the Nine Minimum Controls that King County maximizes flows to the plant during the wet season in order to minimize CSO discharges. Ecology recognizes that increased flows and more dilute flows to the treatment plant over time may impact the achievable removal efficiency during wet weather conditions. In accordance with the EPA CSO guidance document, Ecology will re-evaluate wet season percent removal requirements each permit cycle based on recent plant performance data.

CSO Treatment Plants

The federal CSO control policy requires entities with Combined Sewer Overflows to implement "Nine Minimum Controls" as technology-based performance standards for all CSO discharges. Section V.H of this fact sheet discusses Nine Minimum Controls in more detail in relation to managing untreated CSOs. Beyond the requirements to implement the Nine Minimum Controls, federal regulations require communities with combined sewer systems to provide at least primary clarification, solids and floatable material disposal, and disinfection for treatment of combined sewage in excess of the amount they can reduce or eliminate through storage or other conventional flow reduction efforts.

Washington state regulations similarly allow the use of "at-site treatment" as a strategy to achieve the "greatest reasonable reduction" of untreated CSO discharges. WAC 173-245-020(1) defines "at-site treatment" as the treatment and discharge of combined sewage at the site of an untreated CSO discharge. At site CSO treatment requires at least "primary treatment", which WAC 173-245-020(16) defines as "any process that removes at least 50% of the total suspended solids from the waste stream, and discharges less than 0.3 ml/L/hr of settleable solids." According to WAC 173-245-040(2)(b)(iv), at-site treatment may also require disinfection in areas near harvestable shellfish or primary contact recreation areas.

Table 36 summarizes the technology-based limits applicable for the five CSO treatment plants regulated by the proposed permit. Given that these facilities operate intermittently during wet weather, Ecology assesses compliance with the TSS and settleable solids limits on an annual average basis. Ecology's *Criteria for Sewage Works Design*, Section C3-3.3.8, identifies a fecal coliform concentration of 400/100 mL as an appropriate end-of-pipe performance expectation for at-site CSO treatment facilities. Ecology has historically included a pH limit for treated CSO discharges based on best professional judgement.

Table 36 – Technology -based limits for CSO Treatment Plants

Parameter	Limit
TSS	50% removal, annual average
Settleable Solids	0.3 mL/L/hr, annual average
Fecal Coliform Bacteria	400 /100 mL
pH	Within the range between 6.0 and 9.0 standard units

Ecology does not set a technology-based limit for residual chlorine discharged from CSO treatment plants due to the intermittent and highly variable operating nature of these facilities. However, each facility must comply with water quality-based limits appropriate for their receiving water and available dilution.

Total Suspended Solids: Previous permits allowed KC-WTD to assess compliance with the TSS removal efficiency requirement through an annual mass balance approach that used the combined removal efficiencies of both the CSO treatment plant and the West Point WWTP. This approach provided a credit for solids stored at the CSO treatment facility and subsequently removed through treatment at the West Point WWTP. Ecology reevaluated this allowance and determined that the approach does not comply with the state's requirement related to CSO treatment. As discussed above, state regulations allow the use of "at-site treatment" of excess combined sewage prior to discharge. The regulation further defines the specific level of treatment required for that "at-site treatment". Neither definition provides a basis to allow a credit for solids removed through treatment at another location. Based on requirements outlined in WAC 173-245, Ecology determined that using the treatment efficiency of the West Point WWTP in calculations to assess compliance of the CSO treatment plants is inappropriate as it does not accurately evaluate the efficiency of the "at-site treatment" facility.

To ensure consistency with the standards identified in WAC 173-245, the proposed permit specifies that KC-WTD must calculate TSS removal at the CSO treatment plants based only on the concentration of solids removed during treatment events. The calculation will compare the annual average concentration of TSS monitored in the influent during a treatment event to the annual average TSS concentration discharged from the facility. The permit also excludes any "storage only" events from the calculation. "Storage only" refers to any event where combined sewage flows into the treatment facility but does not discharge through the facility's outfall. Ecology considered allowing calculations that use the total mass of solids removed by the CSO treatment plant on an annual basis. However, this method was rejected since state and federal regulations generally refer to concentration when defining precent reduction of pollutants (ie, percent removal of BOD_5 and TSS for secondary treatment).

Reviewing discharge records from 2015-2021 revealed that the previous approach that relied on solids removal at the West Point WWTP consistently under-reported the actual solids removal efficiencies achieved at the Carkeek, Alki, and Henderson/MLK CSO treatment plants. Appendix E presents comparisons of the removal efficiencies calculated based on the previous approach and calculations based on solids removed only at the CSO treatment plant. The calculations show that the Carkeek and Henderson/MLK facilities consistently achieved better than 50% TSS removal each year and the Alki facility achieved better than 50% removal during four of seven years. The comparison also showed that the Elliott West facility failed to comply with the 50% removal standard in all but one year (2019).

III.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).

III.C.1. Numeric criteria for the protection of aquatic life and recreation

Numeric 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 numeric 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.

III.C.2. Numeric criteria for the protection of human health

Numeric criteria for the protection of human health are promulgated in Chapter 173-201A WAC and 40 CFR 131.45. These criteria are designed to protect human health 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.

III.C.3. Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2016) 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, 2016) and of all marine waters (WAC 173-201A-210, 2016) in the state of Washington.

III.C.4. Antidegradation

Description — The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2016) 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.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- 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.

III.C.5. 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 numeric 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 numeric 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 and four tenths (2.4) liters/day for drinking water (increased from two liters/day in the 2016 Water Quality Standards update).
- A one-in-one-million cancer risk for carcinogenic chemicals.

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

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 King County meets the requirements of AKART.

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

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

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

West Point WWTP

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from King County's effluent dilution modeling submitted as Attachment 9 with their 2019 application for permit renewal.

Table 37 – Model Critical Conditions: West Point Treatment Plant Discharge

Critical Condition	Value
Water depth at MLLW	230 feet (70 meters)
Number of diffuser ports	200
Diffuser port diameter	4.5" - 5.75"
Density profile with a difference of 0.89 sigma-t units between 75 meters and the surface (July condition)	

Critical Condition	Value
10th percentile current speeds between 75 meters and the surface	8.6-9.5 cm/sec
90th percentile current speeds between 75 meters and the surface	42.8-49.3 cm/sec
50th percentile current speeds between 75 meters and the surface	26.4-25.2 cm/s
Maximum daily effluent flow (acute condition)	372 MGD
50th percentile current speeds for chronic and human health mixing zones	0.252-0.264 m/sec
Maximum of average monthly effluent flow for chronic and human health non-carcinogen	126 MGD
Annual average flow for human health carcinogen (design average annual flow)	142 MGD

Alki CSO Treatment Plant

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from King County's effluent dilution modeling submitted as Attachment 9 with their 2019 application for permit renewal.

Table 38 – Model Critical Conditions: Alki CSO Treatment Plant Discharge

Critical Condition	Value
Water depth at MLLW	143 feet (44 meters)
Number of diffuser ports	8
Diffuser port diameter	12"
Density profile with a difference of 1.3 sigma-t units between 45 meters and the surface (February condition)	
10th percentile current speeds at 22 meters	5.5 cm/sec
90th percentile current speeds	43 cm/sec
50th percentile current speeds	16 cm/sec
Instantaneous flow/Maximum one-hour flow (acute condition)	68 MGD
Maximum equivalent 24-hour flow (chronic condition)	50 MGD
Maximum equivalent four-day flow (chronic condition)	21 MGD

Carkeek CSO Treatment Plant

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from King County's effluent dilution modeling submitted as Attachment 9 with their 2019 application for permit renewal.

Table 39 – Model Critical Conditions: Carkeek CSO Treatment Plant Discharge

Critical Condition	Value
Water depth at MLLW	195 feet (59.5 meters)
Number of diffuser ports	13
Diffuser port diameter	5.5 - 10"
Density profile with a difference of 1.24 sigma-t units between 65 meters and the surface (September condition)	
10th percentile current speeds (91-meter depth)	2 cm/sec
90th percentile current speeds (91-meter depth)	15 cm/sec
50th percentile current speeds (91-meter depth)	5 cm/sec

Critical Condition	Value
Instantaneous flow (acute condition)	22.2 MGD
Maximum one-hour flow (acute condition)	19.3 MGD
Maximum equivalent 24-hour flow (chronic condition)	12.8 MGD
Maximum equivalent four-day flow (chronic condition)	3.1 MGD

Elliott West CSO Treatment Plant

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from King County's effluent dilution modeling submitted as Attachment 9 with their 2019 application for permit renewal.

Table 40 – Model Critical Conditions: Elliott West CSO Treatment Plant Discharge

Critical Condition	Value
Water depth at MLLW	60 feet (18.3 meters)
Number of diffuser ports	1
Diffuser port diameter	90"
Density profile with a difference of 0.87 sigma-t units between 25 meters and the surface (October condition)	
10^{th} percentile current speeds (near surface)	2.5 cm/sec
90^{th} percentile current speeds (near surface)	10 cm/sec
50^{th} percentile current speeds (near surface)	5 cm/sec
Instantaneous flow (acute condition)	258 MGD
Maximum one-hour flow (acute condition)	244 MGD
Maximum equivalent 24-hour flow (chronic condition)	59.1 MGD
Maximum equivalent four-day flow (chronic condition)	20.5 MGD

Georgetown CSO Treatment Plant

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from *King County's Georgetown Wet Weather Treatment Station Facility Plan* published in June 2016.

Table 41 – Model Critical Conditions: Georgetown CSO Treatment Plant Discharge

Critical Condition	Value
Water depth at MLLW (port depth varies over length of diffuser)	13-17.8 feet (4.0-5.4 meters)
Number of diffuser ports	8
Diffuser port diameter	20"
Ambient salinity between 6 meters and the surface [1]	28.56-5.18 psu
Density profile with a difference of 18.4 sigma-t units between 6 meters and the surface	
10^{th} percentile current speeds	4 cm/sec
90^{th} percentile current speeds	29 cm/sec
50^{th} percentile current speeds	15 cm/sec
Instantaneous flow/ Maximum one-hour flow (acute condition)	70 MGD
Maximum equivalent 24-hour flow (chronic condition)	48.9 MGD

Critical Condition	Value
Maximum equivalent four-day flow (chronic condition)	13.5 MGD

[1] The LDW is considered a brackish water body with a bottom saltwater wedge overridden by fresh water. The water column generally transitions to salt water at about 3 meters depth at MLLW.

Henderson/MLK CSO Treatment Plant

Ecology obtained ambient data at critical conditions in the vicinity of the outfall from King County's effluent dilution modeling submitted as Attachment 9 with their 2019 application for permit renewal.

Table 42 – Model Critical Conditions: Henderson/MLK CSO Treatment Plant Discharge

Critical Condition	Value
Number of diffuser ports	1
Port diameter	84"
Density – assumed freshwater	999.9255 kg/m^3
10^{th} percentile current speeds (acute condition)	7.8 cm/sec
90^{th} percentile current speeds (acute condition)	39 cm/s
50^{th} percentile current speeds (chronic condition)	21 cm/s
Instantaneous flow (acute condition)	70 MGD
Maximum one-hour flow (acute condition)	38 MGD
Maximum equivalent 24-hour flow (chronic condition)	6.0 MGD
Maximum equivalent four-day flow (chronic condition)	1.5 MGD

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 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 for 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.**

For each outfall, Ecology determined the acute criteria will be met at 10% of the distance or volume fraction 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.

10. Not Discussed – applicable to mixing zones for stormwater discharges.

11. Combined sewer overflows.

Washington’s surface water quality standards allow Ecology to authorize a mixing zone for untreated CSO discharges (WAC 173-201A-400(11)). This allowance provides a once per year exemption to the numeric size criteria discussed in parts 7 and 8 above as well as an exemption to the overlap restriction discussed in part 9 above. However, the standards do not allow this mixing zone if doing so would create a condition that has a reasonable potential to cause a loss of sensitive our important habitat, substantially interfere with existing or characteristic uses, result in damage to the ecosystem, or adversely affect public health (see part 4 above). The standards also limit this mixing zone allowance to only those CSO outfalls that comply with the requirements for “controlled” outfalls defined in 173-245.

Section V.H of this fact sheet discusses the status of King County’s untreated CSO outfalls. That section also describes the post-construction monitoring KC-WTD must perform to validate discharges from controlled outfalls comply with applicable water quality standards. The approved 2012 Post Construction Monitoring Plan for King County CSO Controls discusses the mixing zone eligibility for untreated CSO outfalls and describes the proposed monitoring KC-WTD will perform to validate compliance.

III.D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. The standards define criteria based on whether the surface water body is designated as a “marine” or “freshwater” environment. All of Puget Sound and its embayments are designated as marine environment while the Lower Duwamish River is designated as a brackish environment. When a water body is recognized as “brackish”, Ecology applies aquatic life categories designated for freshwater environments but may use numeric criteria appropriate for marine water environments when the average salinity exceeds one part per thousand.

For marine environments, 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.

In addition to the above aquatic life uses, the water quality standards include criteria to protect the following uses: Shellfish harvesting, Primary contact recreation, and miscellaneous uses (wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics).

Aquatic Life Uses in freshwater environments are designated based on the presence of, or the intent to provide protection for the key uses by specific fish species, such as salmonids, char, or other indigenous fish. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The freshwater standards also must protect for the following uses: Primary contact recreation, Water supply (domestic, agricultural, industrial, and stock watering), and Miscellaneous uses (wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics).

The tables included below summarize the criteria applicable for the designated uses of the receiving waters for each treatment facility regulated by the proposed permit.

West Point, Alki, and Carkeek Treatment Plants:

The West Point, Alki, and the Carkeek facilities discharge to regions of Puget Sound designated as “Extraordinary Marine waters”. Table 43 identifies the associated criteria for this category.

Table 43 – Extraordinary Quality

Criteria	Limit
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.

In addition, Ecology must use the following bacteria standards:

- To protect primary contact recreation: enterococci organism levels within an averaging period must not exceed a geometric mean of 30 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample values exist) obtained within the averaging period exceeding 110 CFU or MPN per 100 mL.
- 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.

Elliott West CSO Treatment Plant:

The Elliott West facility discharges to a region designated as “Excellent Marine waters”. Table 44 identifies the associated criteria for this category.

Table 44 – Excellent Quality

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

In addition, Ecology must use the following bacteria standards:

- To protect primary contact recreation: enterococci organism levels within an averaging period must not exceed a geometric mean of 30 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample values exist) obtained within the averaging period exceeding 110 CFU or MPN per 100 mL.

- 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.

Georgetown and Henderson/MLK CSO Treatment Plants:

The Georgetown and Henderson/MLK CSO treatment plants discharge to the Duwamish River. Table 602 of the water quality standards categorizes this section of the Duwamish River for the freshwater aquatic life use of salmonid rearing and migration only. However, data from King County's 2012 Receiving Water Study and other sources indicate that the section of the Duwamish in the vicinity of both outfalls meets the definition of a "brackish" environment with an average salinity between one and ten parts per thousand. According to WAC 173-201A-260(3)(e), Ecology must apply criteria associated with the marine aquatic life use for "Good Quality" waters to protect for the salmonid rearing and migration only use. Table 45 identifies the associated criteria for this category.

Table 45 – Good Quality

Criteria	Limit
Temperature Criteria – Highest 1D MAX	19°C (66.2°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	5.0 mg/L
Turbidity Criteria	• 10 NTU over background when the background is 50 NTU or less; or • A 20 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

Ecology must also apply bacteria standards appropriate to protect the designated uses of primary contact recreation and shellfish harvesting. For brackish waters, the standard for primary contact recreation depends on the salinity of the receiving water. Marine bacteria standards for enterococci apply when ninety-five percent of the salinity values are greater than ten parts per thousand (based on vertically averaged daily maximum salinity values); freshwater bacteria standards for *Escherichia coli* (*E. coli*) apply when salinity is less than ten parts per thousand. Previous permits applied freshwater standards for bacteria since the periods with the CSO treatment plants operate coincide with storm events that will create higher amounts of freshwater runoff through the Duwamish River system. However, as shown in Table 17, vertically averaged salinity levels exceed ten parts per thousand ninety-five percent of the time. Because of this, Ecology will use the marine standards for primary contact recreation and shellfish protection, as described below.

- To protect primary contact recreation: enterococci organism levels within an averaging period must not exceed a geometric mean of 30 CFU or MPN per 100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample values exist) obtained within the averaging period exceeding 110 CFU or MPN per 100 mL.

- 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.

III.E. Water quality impairments

The 2014 Water Quality Assessment identified 136 impaired area 303(d) listings for dissolved oxygen in the Salish Sea and 331 Category 2 listings indicating waters of concern. Ecology's extensive ongoing scientific investigations supporting the Puget Sound Nutrient Reduction Project demonstrate that the cumulative impact of point and nonpoint sources of nutrients, specifically nitrogen, contribute to areas of dissolved oxygen depletion in Puget Sound and the Salish Sea. Ecology is developing the Puget Sound Nutrient Reduction Plan (NRP) to address dissolved oxygen impairment listings in Puget Sound in a comprehensive manner. See the Puget Sound Nutrient Reduction Project webpage (https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Helping-Puget-Sound/Reducing-Puget-Sound-nutrients/Puget-Sound-Nutrient-Reduction-Project) for more information about this effort.

Ecology's 2018 303(d) list identifies regions of Elliott Bay and Central and South Puget Sound as impaired (Category 5) for fecal coliform and enterococci bacteria in the water column as well as PCBs and mercury in fish tissue. However, the list also shows the water segments in the immediate vicinities of the West Point, Alki, and Carkeek outfalls with Category 1 (meets water quality standards) for bacteria. and does not include listings in any categories for PCB and mercury. Finally, the list identifies water in the immediate vicinity of the Elliott West CSO Treatment Plant outfall as Category 2 (water of concern) for PCB and mercury in fish tissue and Category 1 for bacteria in the water column.

Ecology's 2018 303(d) list includes multiple listings in the lower Duwamish River. These listings are based on extensive monitoring of the water column, fish tissue, and sediments in this stretch of the river. Category 5 listings include pH, temperature and bacteria based on water samples collected from multiple locations. The listings also include Category 5 impairments based on fish tissue and sediment concentrations of a wide range of contaminants due to decades of industrial activity and run off from industrial areas. These contaminants include PCBs (polychlorinated biphenyls), PAHs (polycyclic aromatic hydrocarbons), chlorinated dioxins & furans, arsenic and other metals, pesticides and phthalates.

In 2001, EPA added the five-mile stretch of the Duwamish River between the southern tip of Harbor Island and the 102nd Street bridge, known as the Lower Duwamish Waterway (LDW), to the Superfund National Priorities List; Ecology added the LDW to the Washington Hazardous Sites list in 2002. In 2014, the LDW Record of Decision (ROD) was finalized, setting a path forward toward active river cleanup. EPA oversees the cleanup of the contaminated sediments, including the investigations, design, construction, and post-construction monitoring work associated with the cleanup. Ecology leads efforts to control sources of pollution from the drainage area surrounding the LDW, which is known as LDW Source Control. More information on the Lower Duwamish Waterway Superfund site can be found on EPA's Lower Duwamish

Waterway website (https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=1002020). Sampling data and reports related to planning and construction of the remedial actions can be found on the Lower Duwamish Waterway Group's (LDWG's) webpage (http://www.ldwg.org). Information about LDW Source Control is available at Ecology's webpage (http://www.ecy.wa.gov/programs/tcp/sites_brochure/lower_duwamish/lower_duwamish_hp.html).

III.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.

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

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

III.G.1. Puget Sound discharges:

The water quality standards classify all of Puget Sound and Elliott Bay as an "estuary" for mixing zone purposes. Chronic mixing zones in estuary waters, 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.

For acute mixing zones in estuary waters, WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the chronic zone.

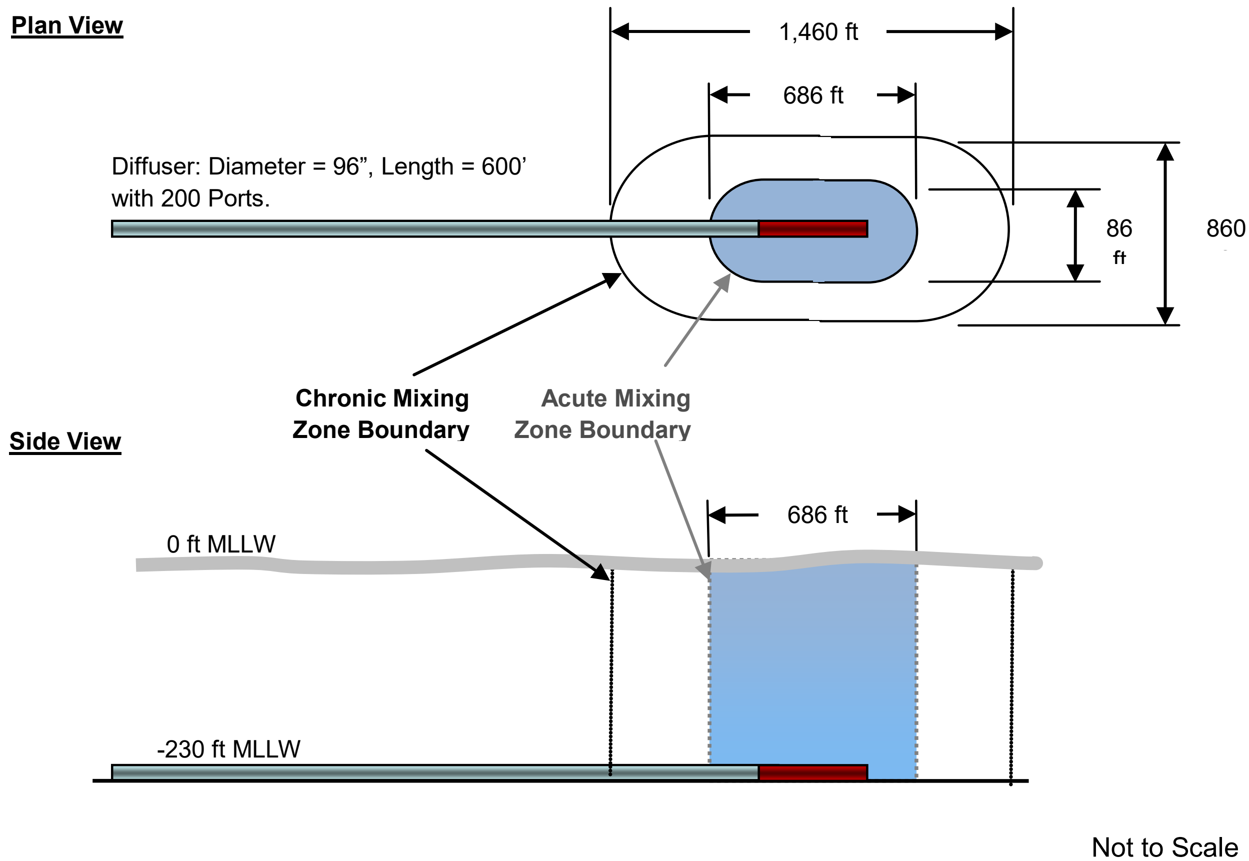
The following sections describe the physical dimensions of the mixing zones authorized for each treatment plant that discharges to Puget Sound.

West Point WWTP:

The diffuser at outfall 001 is 600 feet long with 200 ports spaced equally on alternating sides with diameters ranging between 4.5 and 5.75-inches. The mean lower low water (MLLW) diffuser depth is 230 feet. Ecology obtained this information from King County's *2019 Effluent Dilution Modeling – West Point Treatment Plant Marine Outfall* memo.

The horizontal distance of the chronic mixing zone is 430 feet from any discharge port. The acute mixing zone extends 43 feet in any direction from any discharge port.

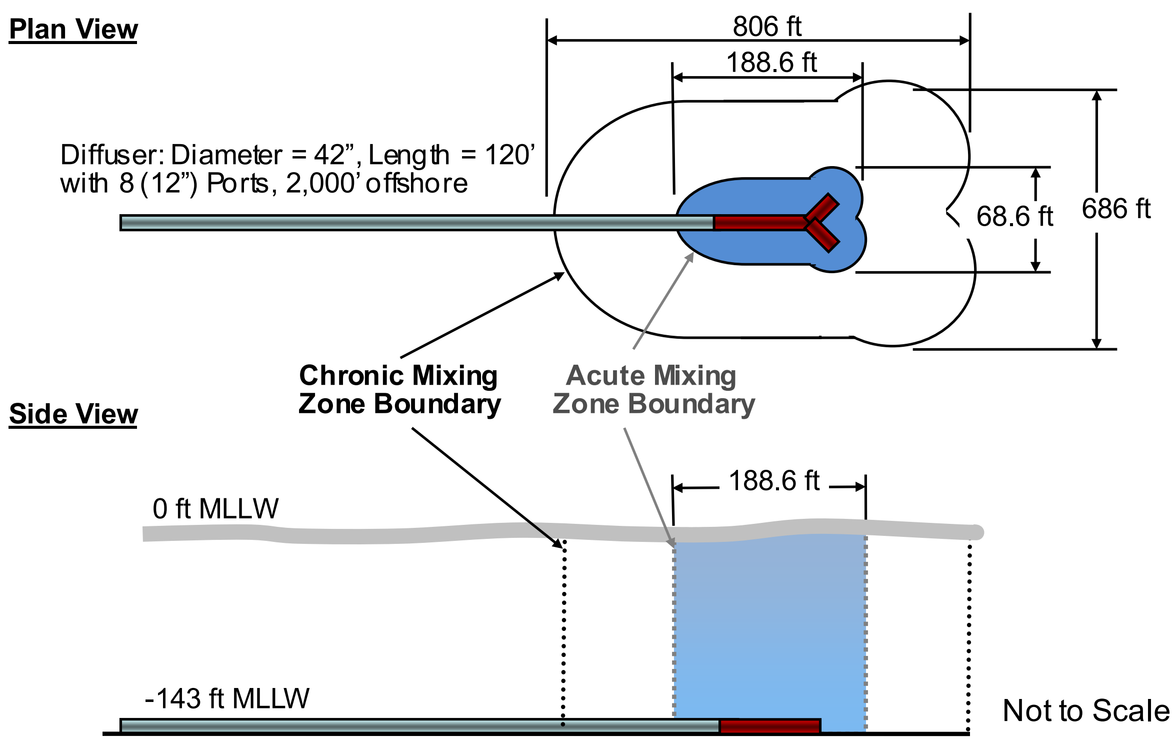
Figure 13 – West Point's WWTP's Mixing Zone



Alki CSO Treatment Plant:

The Alki outfall ends in a multi-port diffuser at a depth of 43.6m (143 ft) MLLW. The diffuser is 120 feet long with eight 12-inch diameter diffuser ports. The first six ports are directed to alternating sides of the outfall. The two end ports formed a ‘Y’ at the end of the diffuser. Ecology obtained this information from King County’s *2019 Effluent Dilution Modeling – Alki CSO Treatment Facility Marine Outfall* memo. The horizontal distance of the chronic mixing zone is 343 feet. The acute mixing zone extends 34 feet in any direction from any discharge port.

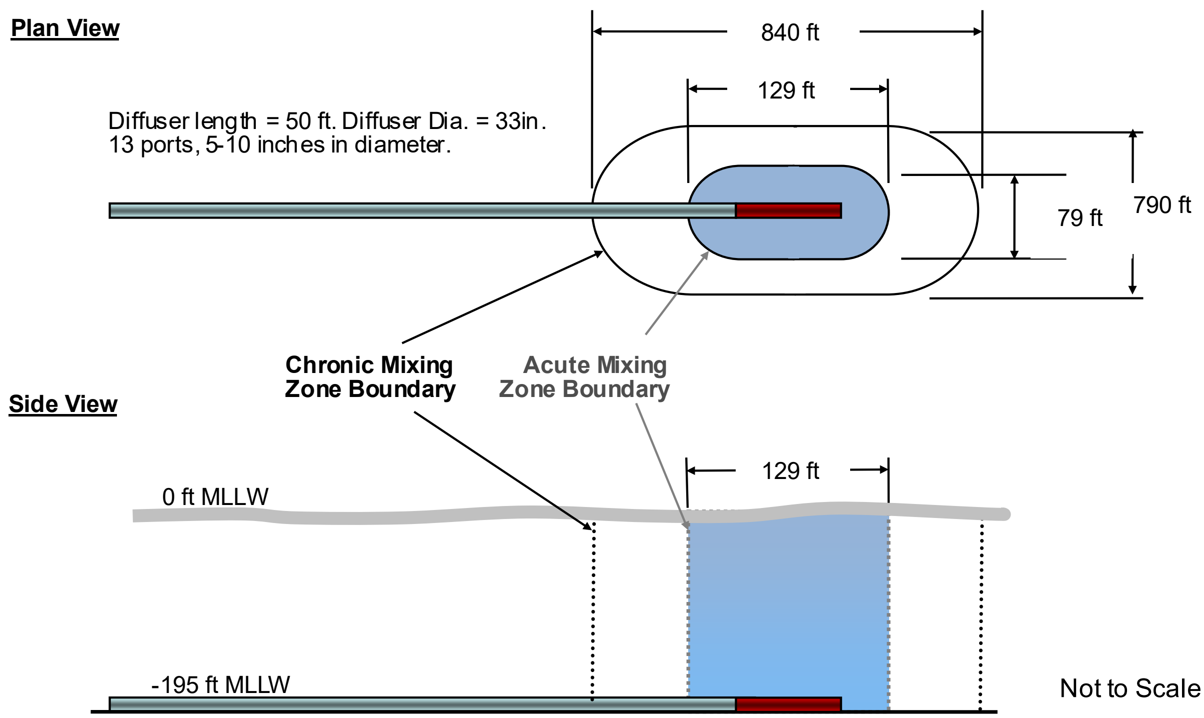
Figure 14 – Alki CSO Treatment Plant Mixing Zone



Carkeek CSO Treatment Plant:

The Carkeek outfall ends in a multi-port diffuser at a depth of 59.5m (195 ft) MLLW. The diffuser is 50 feet long with 13 diffuser ports varying between 5.5-inches and 10.0-inches in diameter. The ports are equally spaced on alternating sides. A port diameter of 6.57 inches corresponds to the average port area. Ecology obtained this information from King County's *2019 Effluent Dilution Modeling – Carkeek CSO Treatment Facility Marine Outfall* memo. The horizontal distance of the chronic mixing zone is 395 feet from any discharge port. The acute mixing zone extends 39.5 feet in any direction from any discharge port.

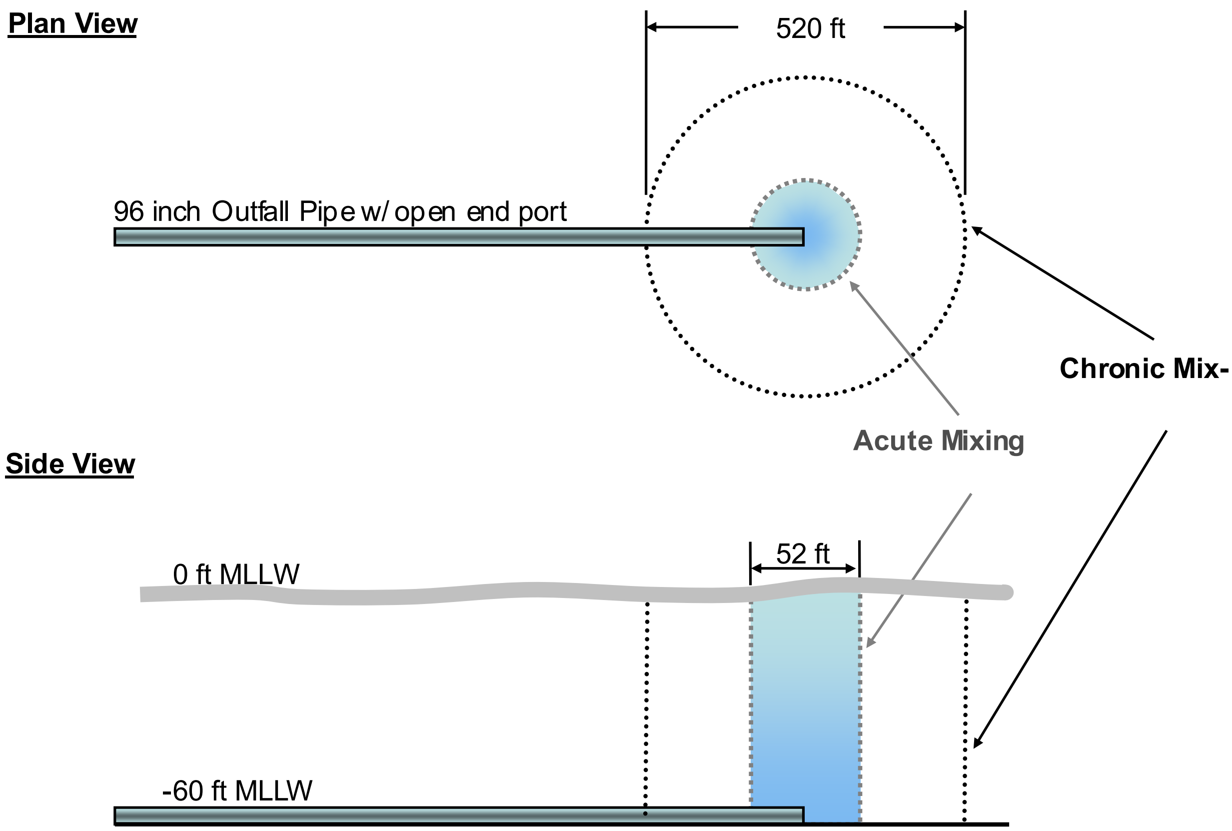
Figure 15 – Carkeek CSO Treatment Plant Mixing Zone



Elliott West CSO Treatment Plant:

The Elliott West outfall ends with a single 90-inch diameter port at a depth of 60 ft MLLW, approximately 490 ft offshore. Several years ago, King County removed a duckbill valve from the end of the port to reduce back pressure caused by the valve. Ecology obtained this information from King County's *2019 Effluent Dilution Modeling – Elliott West CSO Treatment Facility Marine Outfall* memo. The horizontal distance of the chronic mixing zone is 260 feet from any discharge port. The acute mixing zone extends 26 feet in any direction from any discharge port.

Figure 16 – Elliott West CSO Treatment Plant Mixing Zone



III.G.2. Duwamish River discharges:

While the brackish waters of the Lower Duwamish River generally meet the definition of an estuarine environment, the water quality standards apply mixing zone size restrictions for rivers and streams to estuary receiving waters that exhibit flow characteristics resembling rivers. Ecology considers whether the tidal influence results in flow reversal at the point of discharge when determining whether to apply the river or estuary mixing zone restrictions. The Georgetown CSO Treatment Plant discharges through a submerged outfall into a section of the river significantly influenced by tidal variations in depth and flow. Given the tidal influence, Ecology considers the estuary size restrictions discussed above appropriate for the Georgetown discharge.

In contrast, the Henderson/MLK CSO Treatment Plant discharges through a shallow, side-bank outfall into a portion of the river with less tidal influence. The nature of this discharge is such that effluent most likely remains near the water surface, which is dominated by freshwater from the Green River. As such, Ecology considers those discharge characteristics to more resemble a river system.

Size restrictions for chronic mixing zones in rivers and streams are outlined in WAC 173-201A-400(7)(a). This section specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body. The mixing zone extends from the bottom to the top of the water column.

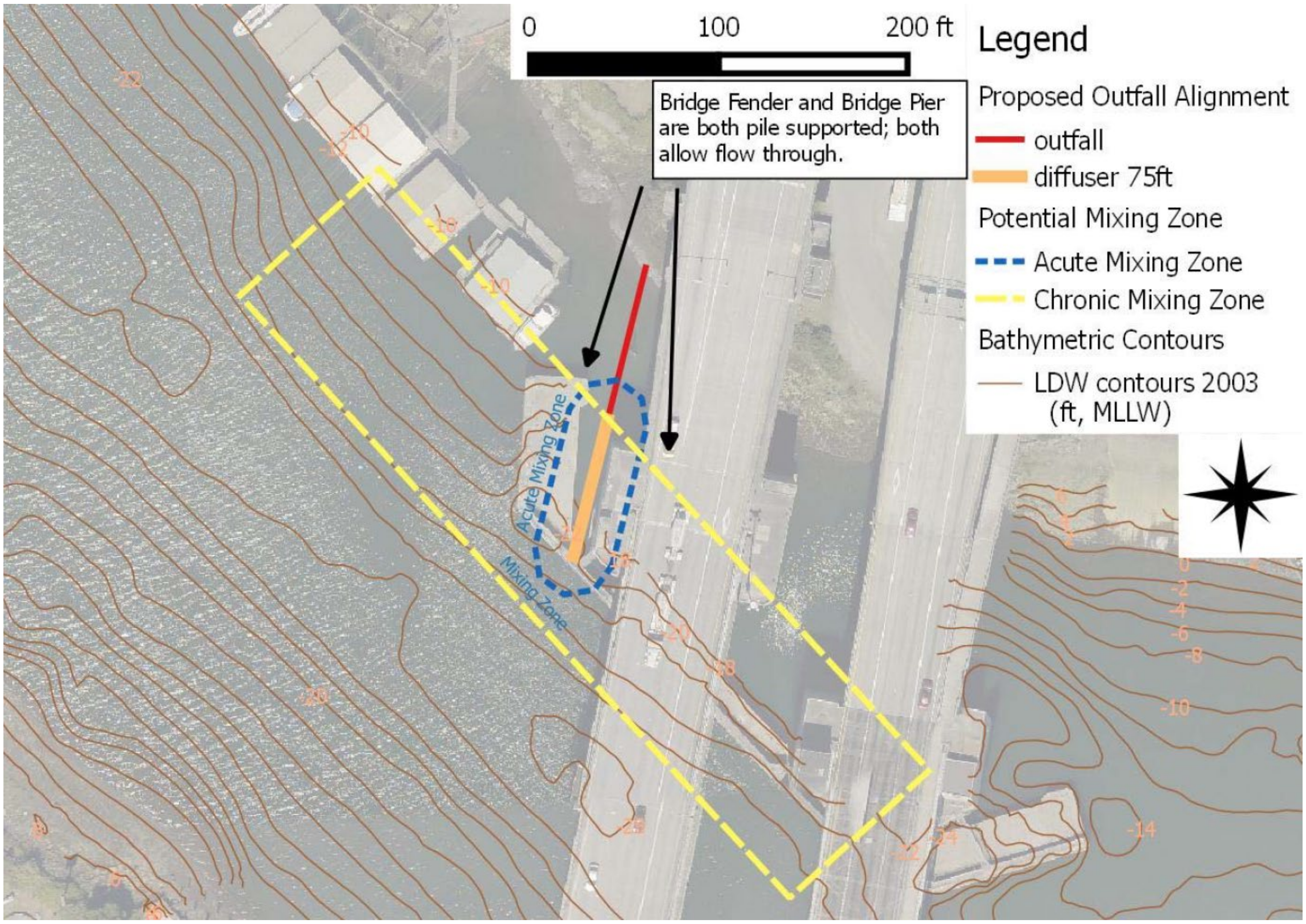
For acute mixing zones in freshwaters, WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body. The mixing zone extends from the bottom to the top of the water column.

Georgetown CSO Treatment Plant:

The Georgetown outfall consists of a 54-inch diameter pipe equipped with an eight-port diffuser. Three ports are clustered at the end of the diffuser with each separated by a 30-degree angle relative to each other. The remaining five ports are spaced along the length of the diffuser on 11-foot spacing with their discharge oriented downriver. All ports measure 20-inches in diameter and are equipped with duckbill valves. The diffuser ports are at a depth of 19 ft MLLW and the outfall extends from the north bank of the Duwamish River. Ecology obtained this information from King County's *Georgetown Wet Weather Treatment Station Outfall Design* plans and specifications completed in September 2017.

The chronic mixing zone extends 214 ft (upstream and downstream) from any discharge port and 100 ft perpendicular to the river channel. The acute mixing zone extends 21.4 feet in any direction from any discharge port.

Figure 17 – Georgetown CSO Treatment Plant Mixing Zone

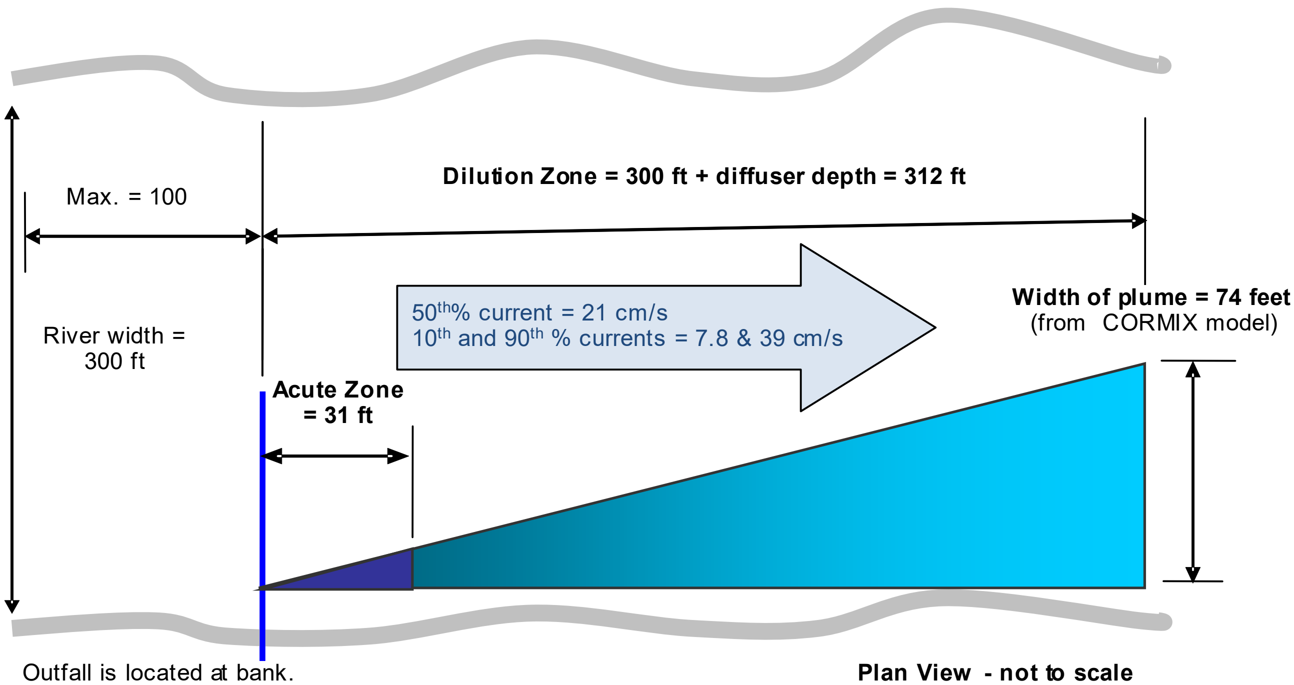


Henderson /MLK CSO Treatment Plant:

The Henderson/MLK effluent discharges through an 84-inch, single-port pipe, located at the Norfolk outfall. The Norfolk outfall is located on the north bank of the Duwamish River approximately at river km 10.5. The 84-inch diameter outfall approaches the riverbank at a 90-degree angle to the river flow and is flush with the bank. The port is at a depth of 12 ft below the surface. There is a flap gate on the end of the pipe that is assumed to be completely open during discharge events.

For the Henderson/MLK CSO treatment plant outfall, the chronic mixing zone is 312 feet long (downstream) and 74 feet wide. The acute mixing zone is 31.2 feet long. Both mixing zones extend from the river bottom to the top of the water surface. The dilution factors are based on dilution at the downstream distance or where the plume width reaches 25% of the river width, whichever is more conservative.

Figure 18 – Henderson/MLK CSO Treatment Plant Mixing Zones



III.G.3. Dilution factors

King County modeled the dilution factors that occur within these zones at the critical conditions using Visual Plumes (UM3 and RSB model components) for all outfalls except Henderson/MLK, which used the CORMIX model. Modeling results were presented in the 2019 Supplemental Dilution Modeling memos submitted as an attachment to the West Point WWTP permit renewal application. The memos updated dilution based on current information and established dilution factors for the West Point WWTP specific to pollutants of concern for human health. Table 46 lists the dilution factors from these reports for the West Point WWTP.

Table 46 – Dilution Factors (DF) for West Point WWTP

Criteria	Acute	Chronic
Aquatic Life	29	229
Human Health, Non-Carcinogen		229
Human Health, Carcinogen		316

Ecology's guidance for mixing zone analyses establishes methods for determining dilution factors for intermittent discharges based on time-averaged adjustments to anticipated maximum flow rates. The appropriate flow averaging period varies depending on the critical exposure time for a particular pollutant. For aquatic life criteria, acute dilution factors are typically assessed using the maximum one-hour average flow, however the toxicity of some pollutants (pesticides and silver) are evaluated based on instantaneous flow. Chronic dilution factors are typically assessed using the maximum 4-day average flow, except for pesticides and PCBs that use 24-hour flow rates. Table 47 list applicable dilution for the CSO treatment plants for each of the four critical averaging periods. The reports for the CSO treatment plants do not include human health-based dilution factors due to the intermittent nature of those discharges.

Table 47 –Dilution Factors for CSO Treatment Plants

Outfall	Instantaneous Acute Dilution Factor	1-hour Acute Dilution Factor	24-hour Chronic Dilution Factor	4-Day Chronic Dilution Factor
Alki[1]	17	17	82	190
Carkeek	35	41	102	420
Elliott West	2.5	2.6	39	113
Georgetown[2]	10	10	20.5	74.1
Henderson/MLK[1]	2.5	2.5	44	180

[1] The modeling assumed the same instantaneous and maximum 1-hour flow rates for the Alki and Henderson/MLK facilities.

[2] Modeling for the Georgetown facility used the facility's design flow for acute instantaneous and 1-hour dilution since there is no current operating history for the facility.

Ecology determined the impacts of pH, bacteria (fecal coliform and enterococci), chlorine, ammonia, metals, other toxics, and temperature as described below, using the dilution factors in the above tables. 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.

III.G.4. Determination of water quality-based limits

Nutrients — Ecology's Puget Sound Nutrient Reduction Project evaluated the cumulative impact of anthropogenic sources of nutrients using the Salish Sea Model (Ahmed et al, 2019). That model's simulations predict that nutrients discharged from wastewater treatment plants have a reasonable potential to contribute to existing low dissolved oxygen levels, below state water quality criteria, in the Salish Sea (which includes Puget Sound). On December 1, 2021, Ecology issued the Puget Sound Nutrient General Permit (PSNGP) to regulate the discharge of Total Inorganic Nitrogen from 58 domestic wastewater treatment plants that discharge to marine and estuarine waters in Washington's waters of the Salish Sea (https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Nutrient-Permit). King County's West Point Treatment Plant is covered by the PSNGP, which includes requirements for the control and monitoring of nutrients. This individual permit does not contain limits or other conditions related to the regulation of nutrients.

Dissolved Oxygen — BOD_5 and Ammonia Effects — Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone. The 5-day Biochemical Oxygen Demand (BOD_5) of an effluent sample indicates the amount of biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of ammonia-based nitrogen in the wastewater also provides an indication of oxygen demand potential in the receiving water.

With technology-based limits, the continuous discharge from the West Point WWTP and intermittent discharges from the CSO treatment plants result in a small amount of biochemical oxygen demand (BOD_5) relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits, in combination with the Puget Sound Nutrient General Permit discussed above, will ensure that dissolved oxygen criteria are met in the receiving water.

pH — Ecology predicts no violation of the water quality standards for pH for discharges from the treatment facilities regulated by this proposed permit. For facilities discharging to marine waters (West Point, Carkeek, Alki, and Elliott West), 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.

For discharges from the Henderson/MLK and GWWTS facilities to the brackish waters of the Lower Duwamish Waterway, Ecology modeled the impact of the effluent pH using the calculations from EPA, 1988 (see Appendix D), and the chronic dilution factors shown in Table 47. The calculations predict the pH change at the edge of the chronic mixing zones for each facility to range between zero change and 0.03 standard units, with the resulting pH staying at approximately 7.1 standard units. Therefore, the proposed permit does not include water quality-based limits for pH.

Bacteria (fecal coliform) — Ecology evaluated whether discharges from the West Point WWTP or the CSO treatment plants have a reasonable potential to violate applicable water quality standards for bacteria based on simple mixing within the allowable chronic mixing zone. Modeling for the West Point WWTP assumed a chronic dilution of 229, as shown in Table 46, and the technology-based weekly geometric mean limit of 400 fecal coliform organisms per 100 ml and ambient receiving water concentrations listed in Table 11. Since the West Point WWTP discharges continuously, the model used the long-term geometric mean standard of 14 fecal coliform organisms per 100 ml to assess compliance with the standard to protect for shellfish harvesting. Under critical conditions, modeling predicts that discharges from the West Point WWTP will increase fecal coliform bacteria concentrations by 1.7 organisms per 100 ml to an estimated concentration of 2.9 organisms per 100 ml. This indicates no violation of the shellfish harvesting criterion for fecal coliform. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

Ecology also evaluated the reasonable potential for discharges from the CSO treatment plants to violate applicable water quality standards for fecal coliform bacteria based on simple mixing. The analysis used the 24-hour chronic dilution factors listed in Table 47 and the technology-based Monthly geometric mean limit of 400 fecal coliform organisms per 100 ml and ambient concentrations from Section II.B of this fact sheet. Since the intermittent discharge nature of the CSO treatment plants will generally result in short-term changes in ambient water quality, Ecology used the maximum or single-sample standard of 43 fecal coliform organisms per 100 ml for this analysis. Under critical conditions, modeling predicts that discharges from the CSO treatment plants discharging to Puget Sound and Elliott Bay will not exceed the criterion. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria for the Carkeek, Alki, and Elliott West CSO treatment plants.

Modeling of the discharges from the Henderson/MLK and Georgetown facilities using ambient fecal coliform data from all monitoring stations in the lower 5-mile stretch of the river showed no reasonable potential for the Henderson/MLK facility to violate the shellfish harvesting criterion for fecal coliform, but suggested that discharges from the Georgetown discharge may violate the fecal coliform standard. However, Ecology recognizes that the ambient data used in the analysis was skewed by historically high results from King County's long-term monitoring station KC-LTXQ01, located approximately 3 miles upriver from the Georgetown outfall near South 98th Street (Boeing Pedestrian Bridge). Monitoring at the South Park Bridge, approximately 1.3 miles upriver from the Georgetown outfall, indicate that fecal coliform concentrations near the outfall are generally lower. The data also shows lower concentrations during wet weather months when the facility would discharge. An analysis of anticipated discharges from the Georgetown facility using only ambient data from the South Park Bridge (Station KC-LTUM-03) and excluding dry weather months (June-September) indicates no reasonable potential to violate the shellfish harvesting criterion for fecal coliform. Therefore, the proposed permit will use the technology-based limit for fecal coliform bacteria at for the Georgetown and Henderson/MLK CSO treatment plants.

Bacteria (enterococci) — The marine water quality recreational use criterion has changed from fecal coliform to enterococci. While Ecology obtained ambient data for enterococci bacteria in all receiving waters, past effluent monitoring did not require testing for that bacteria species. In addition, the technology-based limits for fecal coliform in WAC 173-221 for secondary-treated effluent remain in effect. The technology-based limits for CSO treatment plants also continue to use fecal coliform bacteria. Without effluent data for enterococci or technology-based limits based on that bacteria, Ecology cannot determine conclusively whether the discharge will violate the recreational use criterion for enterococci.

Ecology estimated the potential impact of discharges for KC-WTD's treatment facilities based on typical bacteria removal in facilities providing conventional wastewater treatment and disinfection. Conventional wastewater treatment processes can generally achieve at least a 4-log (99.99%) reduction in bacteria after disinfection. Assuming a worst-case enterococci concentration of 1,000 organisms per 100 ml in treated effluent from each treatment facility, simple mixing predicts that the discharges from each facility will not result in exceedances of the recreational bacteria standard at the edge of each chronic mixing zone.

Given that the characteristics of the receiving water and the discharge have not changed substantially since the analysis conducted in the previous permit cycle, and the transition is a change in bacterial indicator not more or less stringent than the previous criterion, the proposed permit will maintain the technology-based effluent limit for fecal coliform. In addition, the permittee will be required to monitor for both fecal coliform and enterococci. Ecology will use this data to assess the reasonable potential to exceed the applicable water quality criterion in the next iteration of this permit.

Turbidity — Ecology evaluated the impact of turbidity based on the range of total suspended solids in the effluent from each treatment facility and turbidity of the receiving waters. Ecology expects no violations of the turbidity criteria outside the designated mixing zones provided each facility meets its respective technology-based total suspended solids permit limits.

Temperature – The state's water quality standards include separate criteria for marine water and freshwater environments. For brackish environments like the Lower Duwamish Waterway, marine water quality standards apply at locations where salinity is routinely above 1.0 PSU. Therefore, the discharges from all facilities regulated by this permit must comply with appropriate marine temperature standards. The 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 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 applicable criteria.

- 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.

- Guidelines to prevent acute mortality or barriers to migration of salmonids. These site-level considerations do not override the temperature criteria listed above.
  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: Temperatures at the edge of a chronic mixing zone must not exceed either a 1DMax of 23°C or a 7DADMax of 22°C. When adjacent downstream temperatures are 3°C or more cooler, the 1DMax at the edge of the chronic mixing zone must not exceed 22°C.
  3. Lethality to incubating fish: The temperature must not exceed 17.5°C at locations where eggs are incubating.

West Point Treatment Plant

Ecology calculated the reasonable potential for discharges from the West Point Treatment Plant to exceed the applicable annual 1-Day maximum temperature and incremental warming criteria at the edge of the respective chronic mixing zones during critical conditions. As shown in Appendix D, Ecology predicts that the discharge will increase temperature in the vicinity of the outfall by 0.05° C to a temperature of 12.85° C. Since ambient temperature in the north-central region of Puget Sound is within 0.2 °C of the water quality criteria of 13.0 °C, the maximum allowable incremental warming for the discharge is limited to 0.2 °C. The predicted incremental temperature increase shown above is well within the allowable incremental change. Therefore, 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 West Point Treatment Plant 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 West Point treatment Plant 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.

Carkeek CSO Treatment Plant

Ecology calculated the reasonable potential for discharges from the Carkeek CSO Treatment Plant to exceed the applicable annual 1-Day maximum temperature and incremental warming criteria at the edge of the respective chronic mixing zones during critical conditions. As shown in Appendix D, Ecology predicts that the discharge will increase temperature in the vicinity of the outfall by 0.07° C to a temperature of 12.87° C. Since ambient temperature in the north-central region of Puget Sound is within 0.2 °C of the water quality criteria of 13.0 °C, the maximum allowable incremental warming for the discharge is limited to 0.2 °C. The predicted incremental temperature increase shown above is well within the allowable incremental change. Therefore, 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 West Point Treatment Plant 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 Carkeek CSO Treatment Plant intermittently discharges treated combined sewage during wet weather events. As such, Ecology does not expect effluent temperatures to approach 33°C at any time. 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.

Alki CSO Treatment Plant

Ecology calculated the reasonable potential for discharges from the Alki CSO Treatment Plant to exceed the applicable 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 0.09° C to a temperature of 12.89° C. Since ambient temperature in the Middle-central region of Puget Sound is within 0.2 °C of the water quality criteria of 13.0 °C, the maximum allowable incremental warming for the discharge is limited to 0.2 °C. The predicted incremental temperature increase shown above is well within the allowable incremental change. Therefore, 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 West Point Treatment Plant 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 Alki CSO Treatment Plant intermittently discharges treated combined sewage during wet weather events. As such, Ecology does not expect effluent temperatures to approach 33°C at any time. 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.

Elliott West CSO Treatment Plant

Ecology calculated the reasonable potential for discharges from the Elliott West CSO Treatment Plant to exceed the applicable 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 0.19° C to a temperature of 13.09° C. Since ambient temperature in the Elliott Bay is significantly lower than the water quality criteria of 16.0 °C, the maximum allowable incremental warming equation limits allowable incremental warming to 1.10 °C. The predicted incremental temperature increase shown above is well within the allowable incremental change. Therefore, 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 Elliott West CSO Treatment Plant 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 Elliott West CSO Treatment Plant intermittently discharges treated combined sewage during wet weather events. As such, Ecology does not expect effluent temperatures to approach 33°C at any time. 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.

Henderson/MLK CSO Treatment Plant

Ecology calculated the reasonable potential for discharges from the Henderson/MLK CSO Treatment Plant to exceed the applicable annual 1-Day maximum temperature and incremental warming criteria at the edge of the respective chronic mixing zones during critical conditions. As shown in Appendix D, Ecology predicts that the discharge will increase temperature in the vicinity of the outfall by 0.09° C to a temperature of 16.69° C. Since ambient temperature in the Lower Duwamish Waterway is significantly lower than the water quality criteria of 19.0 °C, the maximum allowable incremental warming equation limits allowable incremental warming to 0.82 °C. The predicted incremental temperature increase shown above is well within the allowable incremental change. Therefore, 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 West Point Treatment Plant 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 Henderson/MLK CSO Treatment Plant intermittently discharges treated combined sewage during wet weather events. As such, Ecology does not expect effluent temperatures to approach 33°C at any time. 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.

Georgetown CSO Treatment Plant

Ecology cannot directly assess the reasonable potential for discharges from the GWWTS to exceed applicable water quality criteria for temperature due to a lack of operational history. However, based on effluent temperatures observed at King County’s other CSO treatment plants, Ecology considers the risk low for this discharge to exceed the temperature standards. Based on the anticipated effluent temperature and chronic dilution of 20.5:1, Ecology anticipates discharges from the GWWTS to increase temperature in the vicinity of the outfall by 0.19° C to a temperature of 16.79° C. The proposed permit includes characterization monitoring to collect necessary temperature data for future evaluations.

Ecology also considered the acute effects the discharge may have in the receiving water. The GWWTS intermittently discharges treated combined sewage during wet weather events. As such, Ecology does not expect effluent temperatures to approach 33°C at any time. 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.

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

The following sections identify the toxic pollutants detected as present in the discharges from each of KC-WTD's treatment plants. Ecology conducted a reasonable potential analysis (See Appendix D) on these parameters to determine whether it would require effluent limits in this permit. The reasonable potential analysis takes into account the reported concentrations of pollutants in the effluent from each treatment plant as well as ambient concentrations, when known, and the amount of dilution available for each outfall.

West Point Treatment Plant

As shown in Table 20, priority pollutant monitoring of effluent from the West Point Treatment Plant identified the presence of the following pollutants that are toxic to aquatic life: ammonia, chlorine, cyanide, pentachlorophenol, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc. Effluent monitoring for chromium did not differentiate between the trivalent or hexavalent species, however, the state's water quality standards only have numeric criteria related to marine aquatic life toxicity for the hexavalent fraction. Therefore, Ecology used the conservative assumption that all chromium detected in the effluent is hexavalent.

As shown in Table 11, valid ambient background data were available for ammonia, arsenic, cadmium, chromium (assumed hexavalent), copper, lead, mercury, nickel, silver, and zinc. Ecology used the 90^{th} percentile of the ambient data for each parameter to evaluate reasonable potential for this discharge to cause a violation of water quality standards. Valid ambient background data were not available for the other parameters detected in the effluent. Ecology used zero for the background concentration for these parameters.

Ecology determined that the concentrations of the pollutants listed above pose no reasonable potential to exceed the aquatic life 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. Therefore, the proposed permit does not include water quality-based limits for the listed parameters.

Carkeek CSO Treatment Plant

As shown in Table 22, priority pollutant monitoring of effluent from the Carkeek CSO Treatment Plant identified the presence of the following pollutants that are toxic to aquatic life: ammonia, chlorine, cyanide, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. Effluent monitoring for chromium did not differentiate between the trivalent or hexavalent species, however, the state's water quality standards only have numeric criteria related to marine aquatic life toxicity for the hexavalent fraction. Therefore, Ecology used the conservative assumption that all chromium detected in the effluent is hexavalent.

As shown in Table 11, valid ambient background data were available for ammonia, arsenic, cadmium, chromium (assumed hexavalent), copper, lead, mercury, nickel, silver, and zinc. Ecology used the 90th percentile of the ambient data for each parameter to evaluate reasonable potential for this discharge to cause a violation of water quality standards. Valid ambient background data were not available for the other parameters detected in the effluent. Ecology used zero for the background concentration for these parameters.

Ecology determined that the concentrations of the pollutants listed above pose no reasonable potential to exceed the aquatic life water quality criteria at the critical condition. Therefore, the proposed permit does not include water quality-based limits for the listed parameters.

Previous permits included a water-quality based limit for chlorine of 490 µg/L based on the dilution factor in the 2004 permit. Although current dilution may allow for a higher limit, the anti-backsliding provision under the federal regulations [CFR 122.44(l)] requires that the more stringent limit established in previous permits be applied since it has been shown to be technologically achievable. The proposed permit retains this water quality-based limit for chlorine discharged from the Carkeek CSO Treatment Plant.

Alki CSO Treatment Plant

As shown in Table 21, priority pollutant monitoring of effluent from the Alki CSO Treatment Plant identified the presence of the following pollutants that are toxic to aquatic life: ammonia, chlorine, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. Effluent monitoring for chromium did not differentiate between the trivalent or hexavalent species, however, the state's water quality standards only have numeric criteria related to marine aquatic life toxicity for the hexavalent fraction. Therefore, Ecology used the conservative assumption that all chromium detected in the effluent is hexavalent.

As shown in Table 13, valid ambient background data were available for ammonia, arsenic, cadmium, chromium (assumed hexavalent), copper, lead, mercury, nickel, silver, and zinc. Ecology used the 90th percentile of the ambient data for each parameter to evaluate reasonable potential for this discharge to cause a violation of water quality standards. Valid ambient background data were not available for the other parameters detected in the effluent. Ecology used zero for the background concentration for these parameters.

Ecology determined that the concentrations of each pollutant listed above except chlorine pose no reasonable potential to exceed the aquatic life water quality criteria at the critical condition. The proposed permit does not include water quality-based limits for the parameters without a reasonable potential determination.

Ecology determined that chlorine continues to have a reasonable potential to cause a violation of the water quality standards. The previous permit contained a water quality-based maximum daily limit of 234 μg/L for chlorine based on a previous reasonable potential determination. Ecology reevaluated the effluent limits using methods from EPA, 1991 and current dilution factors. Based on this new assessment, the proposed permit will include a maximum daily limit of 221 μg/L for chlorine.

Elliott West CSO Treatment Plant

As shown in Table 23, priority pollutant monitoring of effluent from the Elliott West CSO Treatment Plant identified the presence of the following pollutants that are toxic to aquatic life: ammonia, chlorine, cyanide, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. Effluent monitoring for chromium did not differentiate between the trivalent or hexavalent species, however, the state's water quality standards only have numeric criteria related to marine aquatic life toxicity for the hexavalent fraction. Therefore, Ecology used the conservative assumption that all chromium detected in the effluent is hexavalent.

As shown in Table 15, valid ambient background data were available for ammonia, arsenic, cadmium, chromium (assumed hexavalent), copper, lead, mercury, nickel, silver, and zinc. Ecology used the 90^{th} percentile of the ambient data for each parameter to evaluate reasonable potential for this discharge to cause a violation of water quality standards. In addition, King County's 2013 Receiving Water Characterization Study established a site-specific copper translator of 0.79 for Elliott Bay. Ecology used this site-specific value in the reasonable potential analysis. Valid ambient background data were not available for the other parameters detected in the effluent. Ecology used zero for the background concentration for these parameters.

Ecology determined that the concentrations of each pollutant listed above except chlorine, copper, and zinc pose no reasonable potential to exceed the aquatic life water quality criteria at the critical condition. The proposed permit does not include water quality-based limits for the parameters without a reasonable potential determination.

Ecology determined that chlorine, copper, and zinc each have a reasonable potential to cause a violation of the water quality standards. Federal regulations require the establishment of limits appropriate for the nature of the discharge (40 CFR 122.45(e)). Due to the intermittent nature of discharges from the Elliott West CSO treatment plant, Ecology considers limits based on monthly or weekly averaging periods inappropriate for this discharge. Therefore, the proposed permit relies on daily maximum water quality-based limits.

The previous permit contained a water quality-based maximum daily limit of 109 μg/L for chlorine based on a previous reasonable potential determination. Ecology reevaluated the effluent limits using methods from EPA, 1991 and current dilution factors. Based on this new assessment, the proposed permit will include a maximum daily limit of 33.8 μg/L for chlorine.

Ecology derived effluent limits for copper and zinc using methods from EPA, 1991 as shown in Appendix D. Based on this method, the proposed permit must include a daily maximum limit of 15.0 μg/L for copper and 246 μg/L for zinc. Monitoring of the Elliott West effluent during the previous permit term indicates that the discharge can comply with the proposed zinc limit but cannot comply with the proposed copper limit. Therefore, the proposed permit includes the water quality-based limit above for zinc and a performance-based limit for copper as discussed below.

The Elliott West Copper Assessment Report submitted by KC-WTD in October 2018 did not identify opportunities for reducing copper concentrations through source control and concluded that improved TSS removal at the facility would result in reductions in effluent copper concentrations. The report also recommended additional evaluation of copper partitioning between dissolved and particulate phases. Since improved solids treatment requires significant construction at the facility, the proposed permit contains a compliance schedule for completing the design work necessary for those improvements.

Given the need for facility improvements to meet the final water quality-based limit, the proposed permit contains an interim limit for copper as required by chapter 173-201A WAC. Ecology calculated the limit based on existing demonstrated performance. The proposed interim limit 84.1 μg/L, which represents the 95th percentile of effluent copper data reported by KC-WTD between March 2014 and November 2021.P While EPA's Technical Support Document allows the use of other statistical methods to calculate performance-based limits, these methods would result in limits that are significantly higher than the concentrations demonstrated achievable at the 95th percentile level.

Henderson/MLK CSO Treatment Plant

As shown in Table 24, priority pollutant monitoring of effluent from the Henderson/MLK CSO Treatment Plant identified the presence of the following pollutants that are toxic to aquatic life: ammonia, chlorine, cyanide, pentachlorophenol, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. Effluent monitoring for chromium did not differentiate between the trivalent or hexavalent species, however, the state's water quality standards only have numeric criteria related to marine aquatic life toxicity for the hexavalent fraction. Therefore, Ecology used the conservative assumption that all chromium detected in the effluent is hexavalent.

As shown in Table 17, valid ambient background data were available for ammonia, arsenic, cadmium, chromium (assumed hexavalent), copper, lead, mercury, nickel, silver, and zinc. Ecology used the 90th percentile of the ambient data for each parameter to evaluate reasonable potential for this discharge to cause a violation of water quality standards. Valid ambient background data were not available for the other parameters detected in the effluent. Ecology used zero for the background concentration for these parameters.

Ecology determined that the concentrations of each pollutant listed above except chlorine and copper pose no reasonable potential to exceed the aquatic life water quality criteria at the critical condition. The proposed permit does not include water quality-based limits for the parameters without a reasonable potential determination.

Ecology determined that chlorine and copper each have a reasonable potential to cause a violation of the water quality standards. The previous permit contained a water quality-based maximum daily limit of 39 μg/L for chlorine based on a previous reasonable potential determination. Ecology reevaluated the effluent limits using methods from EPA, 1991 and current dilution factors. Based on this new assessment, the proposed permit will include a maximum daily limit of 32.5 μg/L for chlorine.

Ecology derived effluent limits for copper using methods from EPA, 1991 as shown in Appendix D. Based on this method, the proposed permit should include a daily maximum limit of 12.3 μg/L for copper. However, the reasonable potential and limit calculations assume a steady state condition consistent with continuous or relatively frequent, controlled discharges and a marine water environment. Discharge records for the Henderson/MLK CSO treatment plant demonstrate that the facility discharges infrequently (between one and three times per year) and each discharge lasts for an average of less than 14 hours. In addition, the Henderson/MLK outfall is located near the upstream boundary that Ecology recognizes as the line between brackish and freshwater conditions. Ambient monitoring shows salinity levels near the outfall between two and ten parts per thousand during winter months when the facility is most likely to discharge. Evaluating this discharge using freshwater criteria rather than marine criteria suggests that existing concentrations may not result in toxicity to freshwater aquatic life. Given the low frequency and duration of discharge along with the outfall's proximity to areas recognized as "freshwater", Ecology considers a performance-based limit of 22.3 μg/L appropriate. This concentration represents the 95th percentile of monitored data collected between 2014 and 2019. This concentration is adequate to protect aquatic life based on freshwater criteria. The proposed permit also requires KC-WTD to assess options for reducing copper discharges from the Henderson/MLK facility.

Georgetown CSO Treatment Plant

An operating history for the Georgetown CSO Treatment Plant does not yet exist since the facility only recently went online. Therefore, Ecology cannot perform a reasonable potential analysis at this time. Modeling completed by King County during the initial facility planning identified the minimum dilution needed to ensure discharges comply with applicable water quality criteria. This analysis assumed effluent quality based on known concentrations of pollutants in the combined sewage that will enter the facility for treatment and assumed treatment efficiencies. Ecology approved the facility design based on the presumption of no reasonable potential. The proposed permit will require follow up monitoring to validate the assumptions. If the characterization monitoring results in a reasonable potential determination, Ecology may modify the proposed permit to include water quality-based limits or may place those limits in the next permit version.

III.H. Human health

Washington's water quality standards include numeric human health-based criteria for priority pollutants that Ecology must consider when writing NPDES permits. Ecology determined the effluent from West Point WWTP, Alki CSO TP, Carkeek CSO TP, Elliott West CSO TP, Georgetown CSO TP, and the Henderson/MLK CSO TP may contain chemicals of concern for human health, based on effluent monitoring conducted during the previous permit term.

West Point Treatment Plant

Ecology evaluated potential for discharges from the West Point Treatment Plant 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. This evaluation assessed the reasonable potential for the following detected pollutants to exceed the applicable numeric human health criteria: antimony, bis(2-ethylhexyl) phthalate, chloroform, cyanide, diethyl phthalate, 2,4 dimethyl phenol, dimethyl phthalate, mercury, nickel, pentachloro phenol, phenol, selenium, toluene, and zinc. Ecology's analysis used valid ambient concentrations that were available for mercury, nickel, and zinc. Valid ambient data was not available for other parameters and, therefore, Ecology assumed used zero in the analysis. The evaluation showed that the discharge has no reasonable potential to cause a violation of human health-based water quality standards for the pollutants listed above and effluent limits are not needed.

CSO Treatment Plants

Ecology determined the effluent from the CSO treatment plants may contain chemicals of concern for human health, based on the available sampling data. Satellite CSO treatment plant discharges are highly intermittent and highly variable in discharge volumes, durations, and pollutant concentrations, both between storms and during a single storm event. Therefore, statistical derivations of reasonable potential and numeric effluent limits for human health criteria are infeasible. Ecology expects these intermittent discharges to have no reasonable potential to cause a violation of water quality criteria for human health, and effluent limits are not needed.

Chapter 173-201A-510(6) WAC recognizes that the influent to combined sewer overflow treatment plants is "highly variable in frequency, volume, duration, and pollutant concentration". Due to this variability, this provision states that Ecology will primarily use narrative limits, such as application of best management practices in waste discharge permits, to achieve compliance with human health criteria. In accordance with this provision, the proposed permit includes requirements for King County to characterize effluent from each CSO treatment plant. In addition, Special Condition S11.B of the permit (Nine Minimum Controls) requires King County to develop source control BMPs it will implement to minimize the presence of toxic pollutants in untreated CSO discharges as well as in the treated combined sewage discharged from the CSO treatment facilities.

III.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://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Sediment-cleanups)

As discussed in Section II.F of this fact sheet, previous sediment testing identified intermittent exceedances of the numeric sediment quality standards for sediment chemistry along with occasional failed bioassay tests. While Ecology has not identified a need for effluent limits to protect sediments near the West Point WWTP outfall, the historical results support continued monitoring. Therefore, the proposed permit retains the requirement for KC-WTD to conduct chemistry and bioassay testing of sediments around the West Point WWTP outfall. This monitoring must, at a minimum, include chemistry and bioassay testing at stations that have previously shown exceedances of chemistry standards or failed bioassay tests.

The proposed permit also includes requirements for KC-WTD to monitor sediments near controlled CSO outfalls based on commitments in the approved 2012 *Post Construction Monitoring Plan for King County CSO Controls* and as supplemented by the 2018 *King County Sediment Management Plant Update*. The 2018 update recommended additional sediment monitoring at the Barton outfall (#057) as well as the Lake Washington location for the Henderson Pump Station (#045) and MLK Jr. Way (#013) outfalls. In addition to ambient sediment monitoring near controlled CSO outfalls, the proposed permit includes expanded source control monitoring and in-line sediment chemistry monitoring in areas of the combined collection system in the Duwamish basin. This monitoring is intended to support efforts to minimize the discharge of pollutants to areas with active contaminated sediment cleanup sites.

III.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://apps.ecology.wa.gov/publications/documents/9580.pdf), which is referenced in the permit. King County's Environmental Lab holds a current State accreditation for WET testing.

As discussed in Section II.D of this fact sheet, WET testing of effluent from the West Point WWTP conducted during the previous permit term 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. King County 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. King County 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. King County may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

III.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 KC-WTD treatment plants do not discharge wastewater to the ground. Therefore, no permit limits are required to protect groundwater.

III.L. Comparison of effluent limits with the previous permit

Tables 48 through 53 compare the limits for the six treatment plants regulated by the proposed permit. Note that while the numeric limit for annual average TSS percent removal did not change, the proposed permit changes the allowable method for calculating the annual percent removal for evaluating compliance with the limit (see Section III.B, page 59).

Table 48 – West Point WWTP (Outfall 001) Limit Comparison

Parameter	Basis of Limit	Existing permit limit	Proposed permit limit
$CBOD_5$ – Average Monthly	Technology	25 mg/L; 44,800 lbs/day May–Oct: 85% $CBOD_5$ removal Nov–April: 80% $CBOD_5$ removal	25 mg/L; 44,800 lbs/day May–Oct: 85% $CBOD_5$ removal Nov–April: 80% $CBOD_5$ removal
$CBOD_5$ – Average Weekly	Technology	40 mg/L 71,700 lbs/day	40 mg/L 71,700 lbs/day
TSS – Average Monthly	Technology	30 mg/L; 53,800 lbs/day May–Oct: 85% TSS removal Nov–April: 80% TSS removal	30 mg/L; 53,800lbs/day May–Oct: 85% TSS removal Nov–April: 80% TSS removal
TSS – Average Weekly	Technology	45 mg/L 80,700 lbs/day	45 mg/L 80,700 lbs/day
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	200/100 mL	200/100 mL
Fecal Coliform Bacteria – Weekly Geometric Mean	Technology	400/100 mL	400/100 mL
pH – Daily Minimum	Technology	6.0 standard units	6.0 standard units
pH – Daily Maximum	Technology	9.0 standard units	9.0 standard units
Total Residual Chlorine – Average Monthly	Water Quality	139 µg/L	139 µg/L
Total Residual Chlorine – Daily Maximum	Water Quality	364 µg/L	364 µg/L

Table 49 – Elliott West CSO treatment plant (Outfall 027b) Limit Comparison

Limit	Basis of Limit	Existing permit limit	Proposed permit limit
Settleable Solids	Technology	0.3 mL/L/hr	0.3 mL/L/hr
Total Suspended Solids – Average Monthly	Technology	Report Only – No Limit	Not Used
Total Suspended Solids – Annual Average [1]	Technology	≥50% removal of influent TSS	≥50% removal of influent TSS
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	400/100 mL	400/100 mL
pH – Daily Minimum	Technology	6.0 Standard Units	6.0 Standard Units
pH – Daily Maximum	Technology	9.0 Standard Units	9.0 Standard Units
Total Residual Chlorine – Daily Maximum	Water Quality	109 µg/L	33.8 µg/L
Zinc – Daily Maximum	Water Quality	No Limit	246 µg/L
Copper – Daily Maximum (interim limit)	Water Quality	No Limit	84.1 µg/L
Copper – Daily Maximum (final limit)	Water Quality	No Limit	15.0 µg/L

Table 50 – Henderson/MLK CSO treatment plant (Outfall 044) Limit Comparison

Limit	Basis of Limit	Existing permit limit	Proposed permit limit

Settleable Solids	Technology	0.3 mL/L/hr	0.3 mL/L/hr
Total Suspended Solids – Average Monthly	Technology	Report Only – No Limit	No Used
Total Suspended Solids – Annual Average	Technology	≥50% removal of influent TSS	≥50% removal of influent TSS
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	400/100 mL	400/100 mL
pH – Daily Minimum	Technology	6.0 Standard Units	6.0 Standard Units
pH – Daily Maximum	Technology	9.0 Standard Units	9.0 Standard Units
Total Residual Chlorine – Daily Maximum	Water Quality	39 µg/L	32.5 µg/L
Copper – Daily Maximum	Water Quality	No Limit	22.3 µg/L

Table 51 – Carkeek CSO treatment plant (Outfall 046) Limit Comparison

Limit	Basis of Limit	Existing permit limit	Proposed permit limit
Settleable Solids	Technology	0.3 mL/L/hr	0.3 mL/L/hr
Total Suspended Solids – Average Monthly	Technology	Report Only – No Limit	No Used
Total Suspended Solids – Annual Average	Technology	≥50% removal of influent TSS	≥50% removal of influent TSS
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	400/100 mL	400/100 mL
pH – Daily Minimum	Technology	6.0 Standard Units	6.0 Standard Units
pH – Daily Maximum	Technology	9.0 Standard Units	9.0 Standard Units
Total Residual Chlorine – Daily Maximum	Water Quality	490 µg/L	490 µg/L

Table 52 – Alki CSO treatment plant (Outfall 051) Limit Comparison

Limit	Basis of Limit	Existing permit limit	Proposed permit limit
Settleable Solids	Technology	0.3 mL/L/hr	0.3 mL/L/hr
Total Suspended Solids – Average Monthly	Technology	Report Only – No Limit	No Used
Total Suspended Solids – Annual Average [1]	Technology	≥50% removal of influent TSS	≥50% removal of influent TSS
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	400/100 mL	400/100 mL
pH – Daily Minimum	Technology	6.0 Standard Units	6.0 Standard Units
pH – Daily Maximum	Technology	9.0 Standard Units	9.0 Standard Units
Total Residual Chlorine – Daily Maximum	Water Quality	234 µg/L	221 µg/L

Table 53 – Georgetown CSO treatment plant (Outfall 058) Limit Comparison

Limit	Basis of Limit	Existing permit limit	Proposed permit limit
Settleable Solids	Technology	Not in Permit	0.3 mL/L/hr

Total Suspended Solids – Annual Average	Technology	Not in Permit	≥50% removal of influent TSS
Fecal Coliform Bacteria – Monthly Geometric Mean	Technology	Not in Permit	400/100 mL
pH – Daily Minimum	Technology	Not in Permit	6.0 Standard Units
pH – Daily Maximum	Technology	Not in Permit	9.0 Standard Units

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.

IV.A. Wastewater monitoring

The monitoring schedules are 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 frequencies are consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-109) for municipal activated sludge facilities with design flows greater than 5 MGD and for CSO discharges.

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

Ecology updated the water contact recreation bacteria criteria, effective January 1, 2021 and eliminated all recreational uses except for primary contact criteria in both fresh and marine waters. Primary contact criteria changed to *E.coli* for freshwater and to enterococci for marine water. Because the wastewater treatment plants regulated by the proposed permit have effluent limits based on the protection of primary contact recreation, this permit requires monitoring of both fecal coliform and enterococci during this permit cycle. Ecology will reevaluate the bacteria limit based on the new indicator during the next permit cycle.

As a pretreatment publicly owned treatment works (POTW), KC-WTD is required to sample influent, final effluent, and biosolids for toxic pollutants in order to characterize the industrial input. Sampling is also done to determine if pollutants interfere with the treatment process or pass-through the plant to the sludge or the receiving water. King County will use the monitoring data to develop local limits which commercial and industrial users must meet.

IV.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 the West Point Treatment Plant for most compliance monitoring. Ecology accredited the West Point laboratory (Accreditation #W681) for general chemistry and microbiology parameters in non-potable water along with general chemistry in solids and chemical materials. Priority pollutant and whole effluent 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.

West Point:

https://apps.ecology.wa.gov/laboratorysearch/SearchLabName.aspx?CompanyID=681

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

V. Other Permit Conditions

V.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). Consistent with EPA's e-reporting rule (80 FR 64102, Oct. 22, 2015, as amended at 85 FR 69199, Nov. 2, 2020) the proposed permit requires KC-WTD to submit all monitoring data and most written reports electronically using Ecology's Water Quality Permitting Portal.

V.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 report must also provide an overview of I/I monitoring and improvement measures planned or implemented for the service area contributing flows to the West Point Treatment Plant.

V.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.

V.D. Pretreatment

V.D.1. Duty to enforce discharge prohibitions

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

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes “pass-through” or “interference”. This general prohibition is from 40 CFR §403.5(a). Appendix C of this fact sheet defines these terms.
- The second section reinforces a number of specific state and federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:

a. Are prohibited due to dangerous waste rules.

b. Are explosive or flammable.

c. Have too high or low of a pH (too corrosive, acidic or basic).

d. May cause a blockage such as grease, sand, rocks, or viscous materials.

e. Are hot enough to cause a problem.

f. Are of sufficient strength or volume to interfere with treatment.

g. Contain too much petroleum-based oils, mineral oil, or cutting fluid.

h. Create noxious or toxic gases at any point.

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

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:

a. Cooling water in significant volumes.

b. Stormwater and other direct inflow sources.

c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Ecology delegated authority to King County for permitting, monitoring, and enforcement over industrial users discharging to their treatment system to provide more direct and effective control of pollutants. Ecology oversees the delegated Industrial Pretreatment Program to assure compliance with federal pretreatment regulations (40 CFR Part 403) and categorical standards and state regulations (chapter 90.48 RCW and chapter 173-216 WAC).

During the previous permit term, King County enacted several non-substantial program modifications including changes to the Enforcement Response Plan and Local Limits. Non-substantial modifications do not require Ecology approval, however Ecology issued approval letters for both modifications on 9/2/2020 and 8/24/2020, respectively.

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

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

V.D.2. Additional controls for PFAS

Per- and polyfluoroalkyl substances (PFAS) are a class of persistent chemicals known as widespread pollutants that have been found in food, water, people, and the environment. Ecology began work in 2016 in collaboration with the Department of Health to develop a Chemical Action Plan (CAP) to prevent potential exposure to people and the environment from PFAS. Ecology issued an interim CAP in 2018 and a final version in 2021.

In 2022, the state legislature amended the Pollution Prevention for Healthy People and Puget Sound Act (Chapter 70A.350 RCW) to establish a timeline for Ecology to regulate PFAS in consumer products as a class of priority toxic chemicals. In September 2022, Ecology published a revised PFAS Chemical Action Plan that include a recommendation to "Understand and manage PFAS in waste", which included recommendations related to wastewater treatment. In a separate action, the US-EPA issued guidance in December 2022 that recommended strategies permitting authorities should use to control discharges of PFAS at their sources. Consistent with the 2022 revised CAP recommendations, the proposed permit includes the following requirements that are based on EPA's permitting recommendations:

- Monitor for PFAS in the influent to the West Point WWTP.
- Identify and locate all possible industrial users with discharges that are expected or suspected to contain PFAS.
- Identify Best Management Practices the Industrial Waste Program can require of industrial users for the reduction or elimination of PFAS in their discharges.

V.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 Public Health – Seattle and King County.

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.

V.F. Spill plan

Each treatment facility regulated by this proposed permit 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].

King County developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires KC-WTD to review the plan annually and send revised plans to Ecology when significant changes are made.

V.G. Wet weather operations

Permit Condition S10 authorizes CSO-related bypasses of the secondary treatment portion of the West Point WWTP when the instantaneous flows to the WWTP exceed 300 MGD as a result of precipitation. The wastewater that bypasses secondary treatment must receive solids and floatables removal, primary clarification, and disinfection. The final combined discharge must at all times meet the effluent limits listed in S1.

EPA's 1994 CSO Control Policy allows for "CSO-related bypass" under certain conditions. EPA's *CSO Guidance for Permit Writers* (EPA-832-B-95-08) states that a "CSO-related bypass" at the wastewater treatment plant can only occur if there is no feasible alternative and the no feasible alternatives analysis is part of the administrative record. The no feasible alternative requirement can be met if "the record shows that the secondary treatment system is properly operated and maintained, that the system has been designed to meet secondary limits for flows greater than the peak dry weather flow, plus an appropriate quantity of wet weather flow, and that it is either technically or financially infeasible to provide secondary treatment at the existing facilities for greater amounts of wet weather flow."

As recommended by EPA's guidance, the West Point WWTP "meets secondary limits for flows greater than the peak dry weather flow plus an appropriate wet weather flow" (i.e., the facility provides secondary treatment to flows up to 300 MGD, which is greater than the maximum month wet weather flow of 215 MGD and meets secondary limits under all CSO conditions). When Metro designed the facility, it was deemed infeasible to provide secondary treatment to peak wet weather flows from the combined system due to concerns that peak flows would wash out the secondary process.

King County submitted to Ecology a no feasibility alternatives analysis in 2009 (King County, 2009) per the CSO Control Policy requirements. As part of this permit development process Ecology reviewed this document again and concluded it still applies since there have been no major capacity changes at the facility. The document provides adequate justification to continue to authorize the CSO-related bypass for this permit cycle. Additionally, the collection system storage projects planned and in progress will likely result in fewer bypass events allowing the West Point facility to provide secondary treatment to more CSO flows than previously assessed in the 2009 analysis.

V.H. Combined sewer overflows

Combined sewer systems (CSS) are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same piping system. Most of the time, CSS transport all wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, however, the wastewater volume in a CSS can exceed the capacity of the conveyance system or treatment plant. For this reason, CSSs are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. State and federal regulations authorize these discharges under limited circumstances. Chapter 173-245 WAC and EPA's CSO control policy (59 FR 18688) identify the conditions for authorization and the required measures for controlling overflows from combined sewer systems.

Federal regulations require all combined sewer overflows (CSO) to comply with both technology-based and water quality-based requirements of the Clean Water Act. Similarly, state regulations require the use of all known, available, and reasonable methods of prevention and control to achieve and maintain the "greatest reasonable reduction" in CSO discharges. State regulations also state that CSO discharges may not:

- Cause violations of applicable water quality standards,
- Restrict the characteristic uses of the receiving water,
- Cause accumulation of deposits that exceed sediment criteria or standards or have an adverse biological effect.

As discussed below, technology-based requirements include implementing a CSO reduction plan designed to minimize the frequency of discharges and meet a performance standard of no more than one untreated CSO discharge per year, on average, for each CSO outfall. In addition, the proposed permit requires implementation of Nine Minimum Controls as technology-based requirements to minimize the impact of pollutants in that one discharge. Finally, the proposed permit requires the development and implementation of a Post-construction Monitoring Plan to verify that discharges from CSO outfalls comply with applicable water quality standards.

CSO Reduction Plan/Long-Term Control Plan and CSO Reduction Plan Amendments

The state legislature amended chapter 90.48 RCW in 1985 to establish a requirement for Ecology to work with local governments to develop “reasonable plans and compliance schedules for the greatest reasonable reduction of combined sewer overflows…at the earliest possible date” (RCW 90.48.480). Ecology codified the requirement as chapter 173-245 WAC in 1987. This regulation established a maximum allowable discharge frequency for untreated CSOs. The regulation also included minimum treatment standards for “at site” CSO treatment facilities that apply if the municipalities with CSOs chose to use this control strategy. Section III of this fact sheet discusses the technology and water quality-based limits for the five CSO treatment facilities used by KC-WTD.

Ecology required municipalities to develop CSO reduction plans for approval by January 1, 1988. As required by chapter 173-245 WAC, these plans documented how the municipality planned to reduce the discharge frequency of each CSO outfall to a performance standards of no more than one untreated discharge per year, on average. These plans are substantially equivalent to the long-term control plan (LTCP) defined by EPA’s CSO control policy (59 FR 18688).

Metro received approval for multiple plans to control CSOs between 1972 and 1986. Ecology approved Metro’s first CSO reduction plan developed in response to Chapter 173-245 WAC in 1988. King County submitted its most recent updated CSO control plan in 2012, which Ecology approved in November 2012. This plan became the technical basis for projects required by the federal CSO consent decree that King County entered into with Ecology, EPA, and the US Department of Justice in July 2013. While King County submitted an updated CSO control plan in 2018, it did not proposed changes to the 2012 approved plan.

King County has not completed all CSO control projects and does not fully comply with the performance standard for all outfalls. Since the 2013 CSO consent decree identifies the compliance schedule King County must follow, the proposed permit does not include a compliance schedule. In addition, since the consent decree does not allow substantive changes to the projects in the CSO control plan without modification of the consent decree, the proposed permit limits the scope of the next control plan update to assessing the effectiveness of completed projects and identifying activities King County will complete in the next five years.

Compliance with performance standard

Ecology defines the technology-based performance standard for controlled CSOs as achieving a discharge frequency of no more than one discharge per year, on average, for each outfall. Once achieved, Chapter 173-245-015 WAC requires municipalities to maintain compliance with this standard. The proposed permit defines the means of assessing compliance with the standard and identifies adaptive management procedures KC-WTD must take if a previously controlled outfall fails to maintain compliance.

Averaging period and compliance: The proposed permit specifies assessing compliance with the performance standard each year based on a 20-year averaging period. This assessment uses the actual number of discharges monitored during each year following completion of CSO projects along with the number of discharges estimated by a calibrated hydraulic model for the years prior to completing the control project. The proposed permit requires KC-WTD to report the calculated 20-year moving average in an annual report to document compliance with the performance standard.

Adaptive Management: The proposed permit uses an adaptive management process to address potential noncompliance with the CSO performance standard. This process starts with comparing the results of annual calculations of the 20-year moving average number of discharges with the performance standard of no more than one discharge per year. Ecology considers any previously controlled outfall that fails to meet the performance standard for two consecutive years as a potential violation of the standard. If this occurs, the adaptive management process requires KC-WTD to take corrective actions. Acceptable actions may range from verifying monitoring accuracy to developing and constructing new structural control projects. The proposed permit requires the development of a corrective action plan specific to each outfall that requires correction to explain the actions KC-WTD will or has taken to restore compliance. This plan must include the anticipate the scope and schedule for corrective work. The proposed permit also relies on the CSO annual report as the means of documenting the effectiveness of the selected corrective actions.

Nine Minimum Controls

Municipalities with combined sewer overflow outfalls must also implement nine minimum controls as a second set of technology-based standards for CSO discharges. The nine minimum controls are largely programmatic policies and practices designed to minimize the impacts untreated CSOs have on human health and the environment.

The nine minimum controls include:

1. Use proper operations and maintenance practices within the combined collection system to reduce the magnitude, frequency and duration of CSOs.
2. Implement procedures that maximize storage capacity of the combined collection system.
3. Minimize pollution from non-domestic wastewater sources through close management of a pretreatment program.
4. Maximize treatable flow to the wastewater treatment plant during wet weather.
5. Prevent CSO discharges during dry weather and properly report any dry weather CSO discharges immediately to Ecology.
6. Implement procedures to control solid and floatable materials in CSOs.
7. Implement and maintain a pollution prevention program designed to keep pollutants from entering the combined sewer system. Data collected in CSO basins discharging to the LDW should inform King County’s LDW Source Control Implementation Plan (SCIP) and its associated actions.
8. Establish a process to notify the public when and where CSOs occur.

9. Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls, including event-based monitoring of all CSO flow quantity, frequency and duration.

Post-Construction Monitoring Program

Under EPA's CSO control policy's (59 FR 18688) presumption approach, CSO controls are presumed to attain water quality standard (WQS) if certain performance criteria are met. It is not possible with current knowledge and technology to calculate numeric water quality-based effluent limits for untreated CSOs. However, Washington's regulations allow Ecology to authorize a mixing zone for outfalls that comply with the technology-based requirements described above as a means for evaluating compliance with numeric water quality criteria. While Ecology presumes that a program that meets the technology-based requirements in state and federal regulations provides an adequate level of control to meet the water quality-based requirements of the Clean Water Act, KC-WTD must perform post-construction monitoring to verify compliance.

Consistent with the federal CSO control policy, the proposed permit requires KC-WTD to implement a post-construction monitoring program that includes characterization, monitoring, and modeling of the system necessary to verify compliance with applicable water quality standards. The program must include consideration of sensitive areas. It applies to any CSO outfall that complies with the performance standard for controlled outfalls.

Ecology approved King County's CSO post-construction monitoring plan in September 2012. Since 2012, Ecology revised the state's water quality standards to include new bacteria indicators to protect for the designated use of primary contact recreation. In addition, Ecology's 2016 revision of the state's human health criteria included specific implementation tools relevant for assessing whether CSO treatment plants comply with the new standards. The current plan does not adequately document how monitoring will demonstrate compliance with these changed standards. The approved plan does not provide sufficient analysis to justify that a mixing zone for untreated CSO discharges "would not have a reasonable potential to cause a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health", as required by WAC 173-201A-400(4). The 2012 plan and subsequent data reports only state that "it is assumed that the exemption to the mixing zone requirements applies". To address the above concerns, the proposed permit requires KC-WTD to reevaluate and update the post-construction monitoring plan. The revision must also verify that the timing of proposed ambient monitoring at swimming beaches and intertidal beach areas accessible to the public adequately characterizes the impacts of untreated CSO discharges.

CSO Monitoring and reporting

Along with the post-construction monitoring program discussed above, the proposed permit requires, at a minimum, KC-WTD to monitor the volume, duration and precipitation associated with each CSO discharge event at each identified outfall. Monitoring at each CSO treatment plant must analyze the effluent for all pollutants with effluent limits along with other specified pollutants as needed to fully characterize the discharge. The proposed permit also requires reporting the results of this monitoring electronically through the WQWebDMR system, consistent with requirements of EPA's e-reporting rules.

KC-WTD must also submit annual reports according to the requirements of WAC 173-245-090(1). This report must contain the following information:

- A summary of the past year's frequency and volume of untreated combined sewage discharge from each CSO outfall along with an assessment of whether the discharge volume or frequency has increased over baseline annual conditions.
- A discussion of the previous year's CSO reduction accomplishments
- A list of the projects planned for the next year (if any)
- A comparison of each outfall's average discharge frequency with the CSO performance standard.
- A discussion of any corrective actions required by an adaptive management strategy for controlled CSOs
- A discussion of compliance with the Nine Minimum Controls
- A summary of results from post-construction monitoring completed during the reporting year.
- Identification of any outfall with a compliance status that changed during the reporting period.
- A summary of the performance of each CSO treatment plant, Including an assessment of compliance with annual effluent limits.
- A summary of wet weather bypasses (flow blending) at the West Point WWTP

V.I. Compliance schedule

The Elliott West CSO Treatment Plant has consistently struggled to meet its effluent limits (see Section II.F). Additionally, two reports required by the previous permit completed in October 2018 (*Elliott West Wet Weather Treatment Station – Copper Reduction Assessment* and *Elliott West Wet Weather Treatment Station – Settleable Solids Removal Assessment*) concluded that significant facility alterations were needed to improve treatment. Based on these factors, KC-WTD initiated planning to replace the Elliott West facility in 2019. In December 2021, KC-WTD submitted a preliminary alternatives analysis that examined the feasibility for a replacement treatment facility. The proposed permit requires completion of an engineering report and design documents during the permit term.

V.J. 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

VI.A. Permit modifications

Ecology may modify this permit to impose numeric 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.

VI.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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Appendix A — Public Involvement Information

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

Ecology will place a Public Notice of Draft on April 5, 2023 in the Seattle Times to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet. Ecology will also schedule two virtual public hearings for May 9, 2023, at 6:00 pm and on May 16, 2023, at 2:00 pm to allow interested parties to provide verbal comments on the draft permit.

The notice:

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

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting*, which is available on our website at https://apps.ecology.wa.gov/publications/documents/0307023.pdf.

You may obtain further information from Ecology by telephone, 206-594-0000, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
P.O. Box 330316,
Shoreline, WA 98133-9716

The primary authors of this permit and fact sheet are Shawn McKone, PE, and Sean Wilson, 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 RCW 90.48.520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

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

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

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

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

Average monthly (intermittent) discharge limit – The average of the measured values obtained over a calendar 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 (BMP) – 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 WAC 173-240-130.

Enterococci – A subgroup of fecal streptococci that includes *S. faecalis, S. faecium, S. gallinarum,* and *S. avium.* The enterococci are differentiated from other streptococci by their ability to grow in 6.5% sodium chloride, at pH 9.6, and at 10°C and 45°C.

E. coli – A bacterium in the family Enterobacteriaceae named Escherichia coli and is a common inhabitant of the intestinal tract of warm-blooded animals, and its presence in water samples is an indication of fecal pollution and the possible presence of enteric pathogens.

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 501, 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 or contribute to 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 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

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

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

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

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

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

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

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

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

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

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

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

Appendix D — 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://ecology.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 tables summarize the simple mixing analysis for fecal coliform and enterococci bacteria at the edge of each chronic mixing zone based on anticipated worst-case discharges.

West Point WWTP

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	229.0
Receiving Water Fecal Coliform, #/100 ml	1.2
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criterion, #/100 ml	*14*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**2.9**
Difference between mixed and ambient, #/100 ml	1.7

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

Calculation of Enterococci at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	229.0
Receiving Water Enterococci, #/100 ml	1.7
Effluent Enterococci - worst case, #/100 ml	1000
Surface Water Criterion, #/100 ml	*30*
OUTPUT	
Enterococci at Mixing Zone Boundary, #/100 ml	**6**
Difference between mixed and ambient, #/100 ml	4

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

Carkeek

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	102.0
Receiving Water Fecal Coliform, #/100 ml	1.2
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criterion, #/100 ml	*43*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**5**
Difference between mixed and ambient, #/100 ml	4

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

Calculation of Enterococci at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	102.0
Receiving Water Enterococci, #/100 ml	1.7
Effluent Enterococci - worst case, #/100 ml	1000
Surface Water Criterion, #/100 ml	*110*
OUTPUT	
Enterococci at Mixing Zone Boundary, #/100 ml	**11**
Difference between mixed and ambient, #/100 ml	10

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

Alki

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	82.0
Receiving Water Fecal Coliform, #/100 ml	1.0
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criterion, #/100 ml	*43*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**6**
Difference between mixed and ambient, #/100 ml	5

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

Calculation of Enterococci at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	82.0
Receiving Water Enterococci, #/100 ml	1.5
Effluent Enterococci - worst case, #/100 ml	1000
Surface Water Criterion, #/100 ml	*110*
OUTPUT	
Enterococci at Mixing Zone Boundary, #/100 ml	**14**
Difference between mixed and ambient, #/100 ml	12

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

Elliott West

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	39.0
Receiving Water Fecal Coliform, #/100 ml	3.4
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criterion, #/100 ml	*43*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**14**
Difference between mixed and ambient, #/100 ml	10

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

Calculation of Enterococci at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	39.0
Receiving Water Enterococci, #/100 ml	3.8
Effluent Enterococci - worst case, #/100 ml	1000
Surface Water Criterion, #/100 ml	*110*
OUTPUT	
Enterococci at Mixing Zone Boundary, #/100 ml	**29**
Difference between mixed and ambient, #/100 ml	26

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

Henderson/MLK

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	44.0
Receiving Water Fecal Coliform, #/100 ml	34.2
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criterion, #/100 ml	*43*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**42**
Difference between mixed and ambient, #/100 ml	8

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

Calculation of Enterococci at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	44.0
Receiving Water Enterococci, #/100 ml	22.8
Effluent Enterococci - worst case, #/100 ml	1000
Surface Water Criterion, #/100 ml	*110*
OUTPUT	
Enterococci at Mixing Zone Boundary, #/100 ml	**45**
Difference between mixed and ambient, #/100 ml	22

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

Georgetown

Calculation of Fecal Coliform at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	20.5
Receiving Water Fecal Coliform, #/100 ml	21.4
Effluent Fecal Coliform - worst case, #/100 ml	400
Surface Water Criterion, #/100 ml	*43*
OUTPUT	
Fecal Coliform at Mixing Zone Boundary, #/100 ml	**40**
Difference between mixed and ambient, #/100 ml	18

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

Calculation of Enterococci at Chronic Mixing Zone

INPUT	
Chronic Dilution Factor	20.5
Receiving Water Enterococci, #/100 ml	22.8
Effluent Enterococci - worst case, #/100 ml	1000
Surface Water Criterion, #/100 ml	*110*
OUTPUT	
Enterococci at Mixing Zone Boundary, #/100 ml	**70**
Difference between mixed and ambient, #/100 ml	48

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

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 used the available receiving water information for ambient station shown in Tables 10, 12, 14, and 16 and Ecology spreadsheet tools. The following tables calculate the ammonia criteria for each receiving water area.

North-Central Puget Sound

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):	12.8
2. Receiving Water pH, (90th percentile):	7.7
3. Receiving Water Salinity, g/kg (10th percentile):	30.5
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):	0.627
2. pKa8 at 25 deg C (Whitfield model "B"):	9.318
3. Percent of Total Ammonia Present as Unionized:	1.0%
4. Total Ammonia Criteria (mg/L as NH_3):	
Acute:	23.98
Chronic:	3.60
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	**19.72**
Chronic:	**2.96**

Mid-Central Puget Sound

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):	12.8
2. Receiving Water pH, (90th percentile):	7.6
3. Receiving Water Salinity, g/kg (10th percentile):	30.5
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):	0.627
2. pKa8 at 25 deg C (Whitfield model "B"):	9.318
3. Percent of Total Ammonia Present as Unionized:	0.8%
4. Total Ammonia Criteria (mg/L as NH_3):	
Acute:	30.13
Chronic:	4.53
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	**24.78**
Chronic:	**3.72**

Elliott Bay

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):	12.9
2. Receiving Water pH, (90th percentile):	7.6
3. Receiving Water Salinity, g/kg (10th percentile):	30.4
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):	0.625
2. pKa8 at 25 deg C (Whitfield model "B"):	9.317
3. Percent of Total Ammonia Present as Unionized:	0.8%
4. Total Ammonia Criteria (mg/L as NH_3):	
Acute:	29.89
Chronic:	4.49
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	**24.59**
Chronic:	**3.69**

Lower Duwamish Waterway

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):	16.6
2. Receiving Water pH, (90th percentile):	7.1
3. Receiving Water Salinity, g/kg (10th percentile):	27.7
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):	0.568
2. pKa8 at 25 deg C (Whitfield model "B"):	9.311
3. Percent of Total Ammonia Present as Unionized:	0.3%
4. Total Ammonia Criteria (mg/L as NH_3):	
Acute:	70.32
Chronic:	10.56
RESULTS	
Total Ammonia Criteria (mg/L as N)	
Acute:	**57.84**
Chronic:	**8.69**

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.

$$WLA_a = (\text{acute criteria} \times DF_a) - [(\text{background conc.} \times (DF_a - 1)]$$

$$WLA_c = (\text{chronic criteria} \times DF_c) - [(\text{background conc.} \times (DF_c - 1)]$$

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

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

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

$z = 2.326$ (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

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

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

n = number of samples/month

z = 1.645 (95th % 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	King Co. West Point
Water Body Type	Marine

Dilution Factors:

	Acute	Chronic
Aquatic Life	29.0	229.0
Human Health Carcinogenic		316.0
Human Health Non-Carcinogenic		229.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ANTIMONY (INORGANIC) 744036 1M	ARSENIC (dissolved) 7440382 2M	BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	CADMIUM - 7440439 4M Hardness dependent	CHLORINE (Total Residual) 7782505	CHLOROFORM 67663 11V	CHROMIUM(HEX) 18540299 - Dissolved	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	DIETHYLPHTHALATE 84662 24B
Effluent Data	# of Samples (n)		309	22	26	11	26	2526	10	26	26	19	11
	Coeff of Variation (Cv)		0.37	0.29	0.1	1.33	0.58	0.38	0.27	0.69	0.53	0.68	0.7
	Effluent Concentration, ug/L (Max. or 95th Percentile)		34,320		1.94		0.22	160	2.1	2.3	28.48	0.0127	
	Calculated 50th percentile Effluent Conc. (when n>10)			0.46		0.995						0.0045	0.505
Receiving Water Data	90th Percentile Conc., ug/L		57		1.387		0.071	0		0.132	0.378	0	
	Geo Mean, ug/L			0		0	0		0			0	0
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	19,724	-	69	-	42	13	-	1100	4.8	9.1	-
		Chronic	2,963	-	36	-	9.3	7.5	-	50	3.1	2.8	-
	WQ Criteria for Protection of Human Health, ug/L		-	180	-	0.25	-	-	1200	-	-	270	5000
	Metal Criteria Translator, decimal	Acute	-	-	1	-	0.994	-	-	-	0.83	-	-
		Chronic	-	-	-	-	0.994	-	-	-	0.83	-	-
	Carcinogen?		N	N	Y	Y	N	N	Y	N	N	N	N

Aquatic Life Reasonable Potential

			AMMONIA	ANTIMONY	ARSENIC	BIS(2-ETHYLHEXYL) PHTHALATE	CADMIUM	CHLORINE	CHLOROFORM	CHROMIUM(HEX)	COPPER	CYANIDE	DIETHYLPHTHALATE
Effluent percentile value			0.950		0.950		0.950	0.950		0.950	0.950	0.950	
s	$s^2=\ln(CV^2+1)$		0.358		0.100		0.538	0.367		0.624	0.498	0.617	
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.990		0.891		0.891	0.999		0.891	0.891	0.854	
Multiplier			1.00		1.00		1.00	1.00		1.00	1.00	1.44	
Max concentration (ug/L) at edge of...		Acute	1,238		1.406		0.076	5.517		0.207	1.180	0.001	
		Chronic	206		1.389		0.072	0.699		0.141	0.480	0.000	
Reasonable Potential? Limit Required?			**NO**		**NO**		**NO**	**NO**		**NO**	**NO**	**NO**	

Human Health Reasonable Potential

		AMMONIA	ANTIMONY	ARSENIC	BIS(2-ETHYLHEXYL) PHTHALATE	CADMIUM	CHLORINE	CHLOROFORM	CHROMIUM(HEX)	COPPER	CYANIDE	DIETHYLPHTHALATE
s	$s^2=\ln(CV^2+1)$		0.2842		1.0092			0.2653			0.6165	0.6315
Pn	Pn=(1-confidence level)1/n		0.873		0.762			0.741			0.854	0.762
Multiplier			0.7234		0.4877			0.8423			0.522	0.6381
Dilution Factor			229		316			316			229	229
Max Conc. at edge of Chronic Zone, ug/L			0.002		0.0031			5.6E-03			2E-05	0.0022
Reasonable Potential? Limit Required?			**NO**		**NO**			**NO**			**NO**	**NO**

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Reasonable Potential Calculation - Page 2

Facility	King Co. West Point
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	29.0	229.0
Human Health Carcinogenic		316.0
Human Health Non-Carcinogenic		229.0

Pollutant, CAS No. & NPDES Application Ref. No.			2,4 DIMETHYLPHENOL 105679	DIMETHYLPHTHALATE 131113 25B	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	PENTACHLOROPHENOL 87865 9A (pH dependent in freshwater)	PHENOL 108952 10A	SELENIUM 7782492 10M	SILVER - 7740224 11M dependent on hardness.	TOLUENE 108883 25V	ZINC- 7440666 13M hardness dependent
Effluent Data	# of Samples (n)		9	11	26	26	26	1	11	26	26	10	26
	Coeff of Variation (Cv)		0.6	0.03	1.11	0.76	0.33	0.6	0.3	0.34	0.54	0.19	0.34
	Effluent Concentration, ug/L (Max. or 95th Percentile)		0.775		4.94	0.02	4.16	0.4		1.2	0.18	1.6	73.93
	Calculated 50th percentile Effluent Conc. (when n>10)			0.063		0.004	2.705		6.56	0.62			41.75
Receiving Water Data	90th Percentile Conc., ug/L				0.01	0.0003	0.423	0		0	0.0268		0.6
	Geo Mean, ug/L		0	0	0	0.0003	0.408	0	0	0		0	0.407
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	-	-	210	1.8	74	13	-	290	1.9	-	90
		Chronic	-	-	8.1	0.025	8.2	7.9	-	71	-	-	81
	WQ Criteria for Protection of Human Health, ug/L		97	130000	-	0.15	190	0.1	200000	480	-	410	2900
	Metal Criteria Translator, decimal	Acute	-	-	0.951	0.85	0.99	-	-	-	0.85	-	0.946
		Chronic	-	-	0.951	-	0.99	-	-	-	-	-	0.946
	Carcinogen?		N	N	N	N	N	Y	N	N	N	N	N

Aquatic Life Reasonable Potential

			2,4 DIMETHYLPHENOL	DIMETHYLPHTHALATE	LEAD	MERCURY	NICKEL	PENTACHLOROPHENOL	PHENOL	SELENIUM	SILVER	TOLUENE	ZINC
Effluent percentile value					0.950	0.950	0.950	0.950		0.950	0.950		0.950
s	$s^2=\ln(CV^2+1)$				0.896	0.675	0.322	0.555		0.331	0.506		0.331
Pn	$Pn=(1\text{-confidence level})^{1/n}$				0.891	0.891	0.891	0.050		0.891	0.891		0.891
Multiplier					1.00	1.00	1.00	6.20		1.00	1.00		1.00
Max concentration (ug/L) at edge of...		Acute			0.172	0.001	0.550	0.085		0.041	0.031		2.991
		Chronic			0.030	0.000	0.439	0.011		0.005	0.027		0.903
Reasonable Potential? Limit Required?					**NO**	**NO**	**NO**	**NO**		**NO**	**NO**		**NO**

Human Health Reasonable Potential

		2,4 DIMETHYLPHENOL	DIMETHYLPHTHALATE	LEAD	MERCURY	NICKEL	PENTACHLOROPHENOL	PHENOL	SELENIUM	SILVER	TOLUENE	ZINC
s	$s^2=\ln(CV^2+1)$	0.5545	0.03		0.6752	0.3215	0.5545	0.2936	0.3307		0.1883	0.3307
Pn	Pn=(1-confidence level)1/n	0.717	0.762		0.891	0.891	0.050	0.762	0.891		0.741	0.891
Multiplier		0.7276	0.9789		0.435	0.6728	2.4895	0.8115	0.6652		0.8853	0.6652
Dilution Factor		229	229		229	229	316	229	229		229	229
Max Conc. at edge of Chronic Zone, ug/L		0.0025	0.0003		0.0003	0.418	3.2E-03	2.9E-02	0.0027		0.0062	0.5875
Reasonable Potential? Limit Required?		**NO**	**NO**		**NO**	**NO**	**NO**	**NO**	**NO**		**NO**	**NO**

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Reasonable Potential Calculation

Facility	Carkeek CSO
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	41.0	420.0
Human Health Carcinogenic		420.0
Human Health Non-Carcinogenic		420.0

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	CADMIUM - 7440439 4M Hardness dependent	CHLORINE (Total Residual) 7782505	CHROMIUM(HEX) 18540299 - Dissolved	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	ZINC- 7440666 13M hardness dependent
Effluent Data	# of Samples (n)		4	12	12	62	12	12	10	12	10	12	12
	Coeff of Variation (Cv)		0.6	0.6	0.6	2.485	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		2,580	2.72	0.24	510.55	2.08	17.8	0.0033	7.59	0.033	2.91	161
	Calculated 50th percentile Effluent Conc. (when n>10)								0.0033		0.0198	2.3706	61.094
Receiving Water Data	90th Percentile Conc., ug/L		57	1.387	0.071	0	0.132	0.378	0	0.01	0.0003	0.423	0.6
	Geo Mean, ug/L								0		0.0003	0.408	0.404
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	19,724	69	42	13	1100	4.8	1	210	1.8	74	90
		Chronic	2,963	36	9.3	7.5	50	3.1	1	8.1	0.025	8.2	81
	WQ Criteria for Protection of Human Health, ug/L		-	-	-	-	-	-	270	-	0.15	190	2900
	Metal Criteria Translator, decimal	Acute	-	1	0.994	-	-	0.83	-	0.951	0.85	0.99	0.946
		Chronic	-	-	0.994	-	-	0.83	-	0.951	-	0.99	0.946
	Carcinogen?		N	Y	N	N	N	N	N	N	N	N	N

Aquatic Life Reasonable Potential

Effluent percentile value		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
s	$s^2=\ln(CV^2+1)$	0.555	0.555	0.555	1.404	0.555	0.555	0.555	0.555	0.555	0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$	0.473	0.779	0.779	0.953	0.779	0.779	0.741	0.779	0.741	0.779	0.779
Multiplier		2.59	1.63	1.63	1.00	1.63	1.63	1.74	1.63	1.74	1.63	1.63
Max concentration (ug/L) at edge of...	Acute	218	1.461	0.079	12.452	0.211	0.954	0.000	0.296	0.001	0.527	6.623
	Chronic	73	1.394	0.072	1.216	0.140	0.434	0.000	0.038	0.000	0.433	1.188
Reasonable Potential? Limit Required?		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

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Reasonable Potential Calculation - Page 2

Facility	Carkeek CSO
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	35.0	420.0
Human Health Carcinogenic		420.0
Human Health Non-Carcinogenic		420.0

			SILVER - 7740224 11M dependent on hardness.
Pollutant, CAS No. & NPDES Application Ref. No.			
Effluent Data	# of Samples (n)		12
	Coeff of Variation (Cv)		0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		0.086
	Calculated 50th percentile Effluent Conc. (when n>10)		
Receiving Water Data	90th Percentile Conc., ug/L		0.0268
	Geo Mean, ug/L		
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	1.9
		Chronic	-
	WQ Criteria for Protection of Human Health, ug/L		-
	Metal Criteria Translator, decimal	Acute	0.85
		Chronic	-
	Carcinogen?		N

Aquatic Life Reasonable Potential

Effluent percentile value			0.950
s	$s^2=\ln(CV^2+1)$		0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.779
Multiplier			1.63
Max concentration (ug/L) at edge of...		Acute	0.025
		Chronic	0.027
Reasonable Potential? Limit Required?			**NO**

Comments/Notes:

References: WAC 173-201A,
Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Reasonable Potential Calculation

Dilution Factors:	Acute	Chronic
Aquatic Life	17.0	190.0
Human Health Carcinogenic		190.0
Human Health Non-Carcinogenic		190.0

Facility	Alki CSO
Water Body Type	Marine

Pollutant, CAS No. & NPDES Application Ref. No.			AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	CADMIUM - 7440439 4M Hardness dependent	CHLORINE (Total Residual) 7782505	CHROMIUM(HEX) 18540299 - Dissolved	COPPER - 744058 6M Hardness dependent	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	SILVER - 7740224 11M dependent on hardness.	ZINC- 7440666 13M hardness dependent
Effluent Data	# of Samples (n)		3	14	13	57	14	14	14	9	14	14	14
	Coeff of Variation (Cv)		0.6	0.6	0.6	2.55	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		3,230	2.29	0.096	378.8	3.15	16.8	7.14	0.0763	18.8	0.212	74.6
	Calculated 50th percentile Effluent Conc. (when n>10)										4.9921		49.871
Receiving Water Data	90th Percentile Conc., ug/L		44	1.4225	0.073	0	0.139	0.318	0.0076	0.0002	0.4249	0.024	0.5635
	Geo Mean, ug/L									0.0002	0.4109		0.4366
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	24,782	69	42	13	1100	4.8	210	1.8	74	1.9	90
		Chronic	3,723	36	9.3	7.5	50	3.1	8.1	0.025	8.2	-	81
	WQ Criteria for Protection of Human Health, ug/L		-	-	-	-	-	-	-	0.15	190	-	2900
	Metal Criteria Translator, decimal	Acute	-	1	0.994	-	-	0.83	0.951	0.85	0.99	0.85	0.946
		Chronic	-	-	0.994	-	-	0.83	0.951	-	0.99	-	0.946
	Carcinogen?		N	Y	N	N	N	N	N	N	N	N	N

Aquatic Life Reasonable Potential

Effluent percentile value		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
s	$s^2=\ln(CV^2+1)$	0.555	0.555	0.555	1.420	0.555	0.555	0.555	0.555	0.555	0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$	0.368	0.807	0.794	0.949	0.807	0.807	0.807	0.717	0.807	0.807	0.807
Multiplier		3.00	1.54	1.58	1.00	1.54	1.54	1.54	1.81	1.54	1.54	1.54
Max concentration (ug/L) at edge of...	Acute	611	1.546	0.078	22.282	0.416	1.561	0.622	0.007	2.084	0.039	6.916
	Chronic	95	1.434	0.073	1.994	0.164	0.429	0.063	0.001	0.573	0.026	1.132
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month					1							
LTA Coeff. Var. (CV), decimal					2.55							
Permit Limit Coeff. Var. (CV), decimal					2.55							
Waste Load Allocations, ug/L	Acute				221							
	Chronic				1425							
Long Term Averages, ug/L	Acute				22.283							
	Chronic				234.93							
Limiting LTA, ug/L					22.283							
Metal Translator or 1?					1.00							
Average Monthly Limit (AML), ug/L					[illegible]							
Maximum Daily Limit (MDL), ug/L					**221.0**							

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Reasonable Potential Calculation

Facility	Elliott West CSO
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	2.6	113.0
Human Health Carcinogenic		113.0
Human Health Non-Carcinogenic		113.0

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	CADMIUM - 7440439 4M Hardness dependent	CHLORINE (Total Residual) 7782505	CHROMIUM(HEX) 18540299 - Dissolved	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	ZINC- 7440666 13M hardness dependent
Effluent Data	# of Samples (n)	3	10	12	98	10	60	12	10	9	11	12
	Coeff of Variation (Cv)	0.6	0.6	0.6	1.68	0.6	0.56	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	2,160	4.41	0.707	838.6	15.5	84.05	0.0038	2.22	0.123	14.1	163
	Calculated 50th percentile Effluent Conc. (when n>10)							0.0038			4.8364	104.98
Receiving Water Data	90th Percentile Conc., ug/L	53	1.369	0.072	0	0.127	0.405	0	0.0254	0.0003	0.4216	0.769
	Geo Mean, ug/L							0		0.0002	0.4099	0.595
Water Quality Criteria	Aquatic Life Criteria, ug/L Acute	24,585	69	42	13	1100	4.8	1	210	1.8	74	90
	Aquatic Life Criteria, ug/L Chronic	3,693	36	9.3	7.5	50	3.1	1	8.1	0.025	8.2	81
	WQ Criteria for Protection of Human Health, ug/L	-	-	-	-	-	-	270	-	0.15	190	2900
	Metal Criteria Translator, decimal Acute	-	-	0.994	-	-	0.79	-	0.951	0.85	0.79	0.946
	Metal Criteria Translator, decimal Chronic	-	-	0.994	-	-	0.79	-	0.951	-	0.79	0.946
	Carcinogen?	N	Y	N	N	N	N	N	N	N	N	N

Aquatic Life Reasonable Potential

		AMMONIA	ARSENIC	CADMIUM	CHLORINE	CHROMIUM(HEX)	COPPER	CYANIDE	LEAD	MERCURY	NICKEL	ZINC
Effluent percentile value		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
s	$s^2=\ln(CV^2+1)$	0.555	0.555	0.555	1.158	0.555	0.522	0.555	0.555	0.555	0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$	0.368	0.741	0.779	0.970	0.741	0.951	0.779	0.741	0.717	0.762	0.779
Multiplier		3.00	1.74	1.63	1.00	1.74	1.00	1.63	1.74	1.81	1.68	1.63
Max concentration (ug/L) at edge of...	Acute	2,525	3.792	0.484	######	10.446	25.788	0.002	1.428	0.073	7.448	96.858
	Chronic	110	1.425	0.081	7.421	0.364	0.989	0.000	0.058	0.002	0.583	2.980
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**YES**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**	**YES**

Aquatic Life Limit Calculation

		AMMONIA	ARSENIC	CADMIUM	CHLORINE	CHROMIUM(HEX)	COPPER	CYANIDE	LEAD	MERCURY	NICKEL	ZINC
# of Compliance Samples Expected per month					1		1					1
LTA Coeff. Var. (CV), decimal					1.68		0.56					0.6
Permit Limit Coeff. Var. (CV), decimal					1.68		0.56					0.6
Waste Load Allocations, ug/L	Acute				33.8		11.832					232.77
	Chronic				847.5		304.94					9066.9
Long Term Averages, ug/L	Acute				4.4704		4.0244					74.738
	Chronic				202.28		167.14					4782.2
Limiting LTA, ug/L					4.4704		4.0244					74.738
Metal Translator or 1?					1.00		0.79					0.95
Average Monthly Limit (AML), ug/L					15.4		10.5					168.1
Maximum Daily Limit (MDL), ug/L					**33.8**		**15.0**					**246.1**

Comments/Notes: Site-specific metal translator of 0.79 used for copper (source: King County 2013 Receiving Water Characterization Study)

References: WAC 173-201A,
Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

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Reasonable Potential Calculation - Page 2

Facility	Elliott West CSO
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	2.5	113.0
Human Health Carcinogenic		113.0
Human Health Non-Carcinogenic		113.0

Pollutant, CAS No. & NPDES Application Ref. No.			SILVER - 7740224 11M dependent on hardness.
Effluent Data	# of Samples (n)		9
	Coeff of Variation (Cv)		0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		0.846
	Calculated 50th percentile Effluent Conc. (when n>10)		
Receiving Water Data	90th Percentile Conc., ug/L		0.0271
	Geo Mean, ug/L		
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	1.9
		Chronic	-
	WQ Criteria for Protection of Human Health, ug/L		-
	Metal Criteria Translator, decimal	Acute	0.85
		Chronic	-
	Carcinogen?		N

Aquatic Life Reasonable Potential

Effluent percentile value			0.950
s	$s^2=\ln(CV^2+1)$		0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.717
Multiplier			1.81
Max concentration (ug/L) at edge of...		Acute	0.517
		Chronic	0.040
Reasonable Potential? Limit Required?			**NO**

Comments/Notes:

References: WAC 173-201A,
Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

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Reasonable Potential Calculation

Facility	Henderson/MLK CSO
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	2.5	180.0
Human Health Carcinogenic		180.0
Human Health Non-Carcinogenic		180.0

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	ARSENIC (dissolved) 7440382 2M	CADMIUM - 7440439 4M Hardness dependent	CHLORINE (Total Residual) 7782505	CHROMIUM(HEX) 18540299 - Dissolved	COPPER - 744058 6M Hardness dependent	CYANIDE 57125 14M	LEAD - 7439921 7M Dependent on hardness	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness	PENTACHLOROPHENOL 87865 9A (pH dependent in freshwater)
Effluent Data	# of Samples (n)	3	9	9	16	9	9	8	9	7	9	9
	Coeff of Variation (Cv)	0.6	0.6	0.6	2.33	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	2,500	2.08	0.135	1100	3.34	24.2	0.0108	7.12	0.0353	0.394	0.394
	Calculated 50th percentile Effluent Conc. (when n>10)											
Receiving Water Data	90th Percentile Conc., ug/L	62	1.291	0.079	0	0.661	1.168	0	0.025	0.0008	1.025	0
	Geo Mean, ug/L							0		0.0004	0.442	0
Water Quality Criteria	Aquatic Life Criteria, ug/L Acute	57,838	69	42	13	1100	4.8	1	210	1.8	74	13
	Aquatic Life Criteria, ug/L Chronic	8,688	36	9.3	7.5	50	3.1	1	8.1	0.025	8.2	7.9
	WQ Criteria for Protection of Human Health, ug/L	-	-	-	-	-	-	270	-	0.15	190	0.1
	Metal Criteria Translator, decimal Acute	-	1	0.994	-	-	0.83	-	0.951	0.85	0.99	-
	Metal Criteria Translator, decimal Chronic	-	-	0.994	-	-	0.83	-	0.951	-	0.99	-
	Carcinogen?	N	Y	N	N	N	N	N	N	N	N	Y

Aquatic Life Reasonable Potential

Effluent percentile value		0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
s	$s^2=\ln(CV^2+1)$	0.555	0.555	0.555	1.364	0.555	0.555	0.555	0.555	0.555	0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$	0.368	0.717	0.717	0.829	0.717	0.717	0.688	0.717	0.652	0.717	0.717
Multiplier		3.00	1.81	1.81	2.58	1.81	1.81	1.90	1.81	2.01	1.81	1.81
Max concentration (ug/L) at edge of…	Acute	3,037	2.282	0.145	1133.411	2.816	15.253	0.008	4.921	0.025	0.898	0.285
	Chronic	103	1.305	0.080	15.742	0.691	1.364	0.000	0.093	0.001	1.023	0.004
Reasonable Potential? Limit Required?		**NO**	**NO**	**NO**	**YES**	**NO**	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month					1		1					
LTA Coeff. Var. (CV), decimal					2.33		0.6					
Permit Limit Coeff. Var. (CV), decimal					2.33		0.6					
Waste Load Allocations, ug/L	Acute				32.5		10.248					
	Chronic				1350		348.93					
Long Term Averages, ug/L	Acute				3.45118		3.2905					
	Chronic				240.499		184.04					
Limiting LTA, ug/L					3.45118		3.2905					
Metal Translator or 1?					1.00		0.83					
Average Monthly Limit (AML), ug/L					12.8		8.5					
Maximum Daily Limit (MDL), ug/L					**32.5**		**12.3**					

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Reasonable Potential Calculation - Page 2

Facility	Henderson/MLK CSO
Water Body Type	Marine

Dilution Factors:	Acute	Chronic
Aquatic Life	2.5	180.0
Human Health Carcinogenic		180.0
Human Health Non-Carcinogenic		180.0

Pollutant, CAS No. & NPDES Application Ref. No.			SILVER - 7740224 11M dependent on hardness.	ZINC- 7440666 13M hardness dependent
Effluent Data	# of Samples (n)		9	9
	Coeff of Variation (Cv)		0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		0.045	67.7
	Calculated 50th percentile Effluent Conc. (when n>10)			
Receiving Water Data	90th Percentile Conc., ug/L		0.022	4.93
	Geo Mean, ug/L			1.28
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	1.9	90
		Chronic	-	81
	WQ Criteria for Protection of Human Health, ug/L		-	2900
	Metal Criteria Translator, decimal	Acute	0.85	0.946
		Chronic	-	0.946
	Carcinogen?		N	N

Aquatic Life Reasonable Potential

Effluent percentile value			0.950	0.950
s	$s^2=\ln(CV^2+1)$		0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.717	0.717
Multiplier			1.81	1.81
Max concentration (ug/L) at edge of...		Acute	0.041	49.359
		Chronic	0.022	5.547
Reasonable Potential? Limit Required?			**NO**	**NO**

Comments/Notes:

References: WAC 173-201A,

Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

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.

West Point WWTP

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.

INPUT	
1. Chronic Dilution Factor at Mixing Zone Boundary	229.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	12.8 °C
3. 1DADMax Effluent Temperature (95th percentile)	23.5 °C
4. Aquatic Life Temperature WQ Criterion	13.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	12.85 °C
6. Incremental Temperature Increase or decrease:	0.05 °C
7. Maximum Incremental Temperature Increase 12/(T-2)	1.11 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	13.00 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	NO
10. **If YES - Use TMDL-based or performance-based limit - Do Not use this spreadsheet**	---
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) of the criterion	
11. Does temp fall within this Incremental temp. range?	YES
12. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT
C. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
13. Does temp fall within this Incremental temp. range?	NO
14. Temp increase allowed at mixing zone boundary, if required:	---
RESULTS	
15. Do any of the above cells show a temp increase?	**NO**
16. Temperature Limit if Required?	**NO LIMIT**

Carkeek CSO Treatment Plant

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.

INPUT	
1. Chronic Dilution Factor at Mixing Zone Boundary	102.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	12.8 °C
3. 1DADMax Effluent Temperature (95th percentile)	20.4 °C
4. Aquatic Life Temperature WQ Criterion	13.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	12.87 °C
6. Incremental Temperature Increase or decrease:	0.07 °C
7. Maximum Incremental Temperature Increase 12/(T-2)	1.11 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	13.00 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	NO
10. **If YES - Use TMDL-based or performance-based limit - Do Not use this spreadsheet**	---
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) of the criterion	
11. Does temp fall within this Incremental temp. range?	YES
12. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT
C. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
13. Does temp fall within this Incremental temp. range?	NO
14. Temp increase allowed at mixing zone boundary, if required:	---
RESULTS	
15. Do any of the above cells show a temp increase?	**NO**
16. Temperature Limit if Required?	**NO LIMIT**

Alki CSO Treatment Plant

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.

INPUT	
1. Chronic Dilution Factor at Mixing Zone Boundary	82.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	12.8 °C
3. 1DADMax Effluent Temperature (95th percentile)	20.4 °C
4. Aquatic Life Temperature WQ Criterion	13.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	12.89 °C
6. Incremental Temperature Increase or decrease:	0.09 °C
7. Maximum Incremental Temperature Increase 12/(T-2)	1.11 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	13.00 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	NO
10. **If YES - Use TMDL-based or performance-based limit - Do Not use this spreadsheet**	---
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) of the criterion	
11. Does temp fall within this Incremental temp. range?	YES
12. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT
C. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
13. Does temp fall within this Incremental temp. range?	NO
14. Temp increase allowed at mixing zone boundary, if required:	---
RESULTS	
15. Do any of the above cells show a temp increase?	**NO**
16. Temperature Limit if Required?	**NO LIMIT**

Elliott West CSO Treatment Plant

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.

INPUT	
1. Chronic Dilution Factor at Mixing Zone Boundary	39.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	12.9 °C
3. 1DADMax Effluent Temperature (95th percentile)	20.4 °C
4. Aquatic Life Temperature WQ Criterion	16.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	13.09 °C
6. Incremental Temperature Increase or decrease:	0.19 °C
7. Maximum Incremental Temperature Increase 12/(T-2)	1.10 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	14.00 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	NO
10. **If YES - Use TMDL-based or performance-based limit - Do Not use this spreadsheet**	---
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) of the criterion	
11. Does temp fall within this Incremental temp. range?	NO
12. Temp increase allowed at mixing zone boundary, if required:	---
C. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
13. Does temp fall within this Incremental temp. range?	YES
14. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT
RESULTS	
15. Do any of the above cells show a temp increase?	**NO**
16. Temperature Limit if Required?	**NO LIMIT**

Henderson MLK CSO Treatment Plant

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.

INPUT	
1. Chronic Dilution Factor at Mixing Zone Boundary	44.0
2. Annual max 1DADMax Ambient Temperature (Background 90th percentile)	16.6 °C
3. 1DADMax Effluent Temperature (95th percentile)	20.4 °C
4. Aquatic Life Temperature WQ Criterion	19.0 °C
OUTPUT	
5. Temperature at Chronic Mixing Zone Boundary:	16.69 °C
6. Incremental Temperature Increase or decrease:	0.09 °C
7. Maximum Incremental Temperature Increase 12/(T-2)	0.82 °C
8. Maximum Allowable Temperature at Mixing Zone Boundary:	17.42 °C
A. If ambient temp is warmer than WQ criterion	
9. Does temp fall within this warmer temp range?	NO
10. **If YES - Use TMDL-based or performance-based limit - Do Not use this spreadsheet**	---
B. If ambient temp is cooler than WQ criterion but within 12/(T_{amb}-2) of the criterion	
11. Does temp fall within this Incremental temp. range?	NO
12. Temp increase allowed at mixing zone boundary, if required:	---
C. If ambient temp is cooler than (WQ criterion - 12/(T_{amb}-2))	
13. Does temp fall within this Incremental temp. range?	YES
14. Temp increase allowed at mixing zone boundary, if required:	NO LIMIT
RESULTS	
15. Do any of the above cells show a temp increase?	**NO**
16. Temperature Limit if Required?	**NO LIMIT**

Appendix E — Monitoring Data Summary

The following appendix contains monitoring data reported by the West Point WWTP on monthly Discharge Monitoring Reports and in Whole Effluent Toxicity monitoring reports for the period between January 2015 and December 2021.

West Point WWTP	Influent											
Parameter	BOD5	BOD5	BOD5	BOD5	CBOD5	CBOD5	CBOD5	CBOD5	TSS	TSS	TSS	TSS
Units	Lbs/Day	Lbs/Day	mg/L	mg/L	Lbs/Day	Lbs/Day	mg/L	mg/L	Lbs/Day	Lbs/Day	mg/L	mg/L
Statistical Base	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum	Monthly Average	Monthly Maximum
Jan-15	166,507	224,116	222	337	132,375	195,126	174	236	**185,548**	282,882	242	327
Feb-15	**173,116**	276,443	204	389	130,287	199,371	152	215	**195,092**	419,191	218	284
Mar-15	**180,646**	408,800	230	390	134,220	230,995	174	283	170,033	316,820	215	310
Apr-15	164,879	236,175	246	328	132,289	168,205	198	256	148,614	287,720	219	325
May-15	166,511	276,935	290	457	124,552	164,828	217	277	137,247	227,139	238	319
Jun-15	150,538	232,198	280	414	120,406	222,663	224	397	139,615	250,146	260	446
Jul-15	149,520	196,573	285	372	132,950	227,803	253	421	155,933	234,042	297	442
Aug-15	154,033	265,913	278	533	120,914	197,124	216	285	155,680	430,088	265	349
Sep-15	144,079	234,598	267	446	114,484	167,345	212	297	151,828	286,170	274	492
Oct-15	146,484	195,797	248	371	121,495	190,247	203	286	165,427	384,768	267	374
Nov-15	146,220	200,699	177	291	121,450	174,803	147	225	170,496	262,613	197	300
Dec-15	141,906	213,091	117	265	111,574	155,202	92	174	180,752	248,125	142	265
Jan-16	136,174	211,903	137	251	114,388	148,297	114	212	174,538	322,246	165	252
Feb-16	147,907	242,654	149	228	121,117	177,059	122	179	**192,891**	265,392	194	307
Mar-16	146,676	198,673	148	253	118,342	148,376	119	203	**193,553**	336,989	188	320
Apr-16	156,974	360,359	238	387	127,335	168,602	196	262	177,128	320,319	268	405
May-16	142,448	279,383	241	480	117,937	173,530	200	232	159,802	265,627	269	456
Jun-16	138,995	197,162	234	287	118,186	155,703	200	245	161,825	282,515	271	310
Jul-16	136,035	197,786	254	294	115,616	155,853	216	276	156,312	233,576	292	458
Aug-16	133,785	159,377	268	314	112,300	149,648	225	292	146,910	175,724	295	346
Sep-16	126,243	169,194	251	339	111,133	197,787	220	369	141,555	280,170	278	370
Oct-16	139,928	293,889	176	312	119,702	197,241	151	264	175,040	335,310	209	324
Nov-16	145,863	252,211	140	248	125,003	211,112	119	185	177,308	352,478	163	242
Dec-16	148,229	245,296	176	275	120,981	193,784	144	219	151,931	240,390	178	294
Jan-17	148,163	258,683	177	269	125,481	205,925	149	207	177,164	422,805	200	301
Feb-17	**178,702**	391,403	162	370	149,396	308,891	135	292	**235,878**	617,555	211	530
Mar-17	164,690	295,388	159	243	133,793	261,075	130	215	**212,757**	393,851	203	396
Apr-17	144,653	175,767	166	226	124,431	151,997	144	206	139,499	220,359	159	214
May-17	**193,019**	319,357	255	358	154,088	273,348	202	303	**193,514**	299,510	253	400
Jun-17	**185,466**	248,788	288	388	151,301	253,460	234	320	168,110	320,037	257	396
Jul-17	**180,306**	285,014	315	454	152,617	216,045	267	384	**187,632**	304,518	328	484
Aug-17	155,634	178,349	283	317	135,727	182,637	247	331	159,180	210,671	290	390
Sep-17	158,083	206,420	287	343	136,180	174,317	248	336	170,096	355,663	304	376
Oct-17	162,547	261,308	253	343	144,971	266,170	225	315	174,734	335,447	266	363
Nov-17	165,264	228,664	174	269	141,385	212,213	150	257	**187,676**	266,501	191	320
Dec-17	168,683	332,439	206	301	138,821	250,500	171	252	168,857	449,495	198	258
Jan-18	168,889	227,656	135	252	140,168	192,766	113	254	**197,505**	352,915	151	236
Feb-18	**174,002**	264,404	204	281	151,781	212,879	178	255	166,668	258,618	190	302
Mar-18	**171,978**	247,637	228	376	156,208	224,275	207	329	164,510	330,935	215	516
Apr-18	**188,095**	265,521	206	286	157,674	226,869	173	253	**187,820**	368,457	195	246
May-18	166,873	195,709	269	314	151,140	181,081	243	290	161,826	193,600	261	310
Jun-18	158,395	195,037	266	341	147,442	195,306	248	307	160,866	232,827	269	366
Jul-18	151,008	178,521	283	327	139,089	165,066	261	294	153,055	186,401	287	340
Aug-18	167,821	336,770	319	594	143,088	222,813	272	393	159,120	239,375	302	432
Sep-18	158,780	191,434	318	371	137,220	186,274	274	361	157,262	219,884	294	370
Oct-18	163,696	213,370	285	361	148,463	205,658	258	319	166,647	428,771	273	328
Nov-18	162,349	215,777	258	350	141,635	174,014	227	303	164,287	331,787	247	330
Dec-18	163,267	304,389	193	286	137,883	217,926	164	257	181,040	280,433	206	276
Jan-19	159,637	198,504	202	298	130,135	176,834	165	231	171,202	241,420	213	314
Feb-19	157,648	224,558	182	252	130,301	193,143	151	214	171,990	306,226	193	260
Mar-19	159,500	260,300	242	311	137,188	212,490	209	262	171,389	426,750	255	360
Apr-19	157,848	223,725	238	297	138,160	207,825	208	261	167,133	288,856	248	313
May-19	154,470	246,426	267	300	129,968	202,871	225	281	163,705	279,665	282	420
Jun-19	151,735	242,358	281	324	128,445	188,786	238	310	162,568	345,430	298	372
Jul-19	145,720	185,980	266	314	128,560	177,172	235	300	153,969	250,891	279	344
Sep-19	148,402	210,019	250	403	123,552	184,155	208	274	166,405	258,644	278	492
Oct-19	161,088	229,811	274	340	134,808	185,671	230	289	164,153	281,678	274	398
Nov-19	164,515	268,392	287	412	139,133	175,182	244	314	150,462	228,948	261	309
Dec-19	156,039	243,089	222	332	131,295	215,420	188	289	165,068	363,645	215	300
Jan-20	160,672	221,013	152	235	129,152	181,088	121	204	**188,011**	333,272	169	230
Feb-20	152,230	186,741	170	263	117,003	152,844	130	213	168,460	275,904	178	246
Mar-20	154,375	280,721	224	399	118,624	218,715	172	248	152,391	292,682	217	416
Apr-20	127,448	190,112	209	317	105,198	178,494	171	238	132,717	266,157	215	282
May-20	135,731	230,516	221	339	120,959	199,683	198	261	146,932	340,636	231	308
Jun-20	124,601	182,779	215	303	104,205	127,402	180	240	137,363	198,378	237	300
Jul-20	123,591	150,285	239	284	101,451	195,040	196	382	132,731	176,744	257	334
Aug-20	130,780	180,116	253	315	102,644	139,556	198	250	136,698	222,739	264	324
Sep-20	122,548	180,741	229	288	103,783	163,403	195	251	144,251	299,020	257	336
Oct-20	132,572	269,226	231	543	111,603	171,551	200	346	151,509	297,550	257	484
Nov-20	132,069	196,889	183	252	110,063	147,933	154	236	151,425	283,820	199	268
Dec-20	127,934	260,937	163	269	100,347	147,444	129	233	153,006	363,115	183	244
Jan-21	125,625	184,353	117	181	99,823	137,612	94	168	164,565	290,304	145	208
Feb-21	144,574	193,084	148	188	114,395	143,529	119	166	161,450	297,037	160	200
Mar-21	148,422	212,457	188	247	124,104	156,546	158	204	152,632	251,801	191	248
Apr-21	137,601	215,233	224	342	107,968	146,006	175	232	148,817	218,963	241	306
May-21	130,582	162,464	226	258	108,040	143,314	188	252	135,729	213,782	233	304
Jun-21	137,777	192,990	229	289	108,811	152,474	180	236	143,975	241,238	237	290
Jul-21	147,301	192,678	284	362	121,712	148,841	235	286	149,516	179,168	288	350
Aug-21	132,805	160,683	261	310	109,650	153,324	216	288	143,004	250,616	281	476
Sep-21	147,007	284,947	257	323	123,813	212,503	219	301	158,037	466,862	267	320
Oct-21	152,375	225,430	241	333	123,835	168,718	195	270	156,033	376,589	237	314
Nov-21	150,382	190,615	142	228	123,889	155,609	117	189	176,710	275,635	160	232
Dec-21	144,613	213,321	153	229	122,431	159,482	130	201	161,996	280,014	167	212
AVE:	152,100	232,271	224	325	126,796	187,384	188	268	164,057	296,687	234	336
MIN:	122,548	150,285	117	181	99,823	127,402	92	166	132,717	175,724	142	200
MAX:	193,019	408,800	319	594	157,674	308,891	274	421	235,878	617,555	328	530
5th %tile:												
95th %tile:	180,146	331,131	288	457	151,733	253,164	257	381	193,549	428,569	297	484
Limits	201,000								218,000			
Nov-April												

Value >85% of design capacity
Value exceeds design capacity

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West Point WWTP — **Effluent - page 1**

er	Flow	Flow	CBOD5	CBOD5	CBOD5	CBOD5	CBOD5	TSS	TSS	TSS	TSS	TSS
	MGD	MGD	Lbs/Day	Lbs/Day	mg/L	mg/L	Percent	Lbs/Day	Lbs/Day	mg/L	mg/L	Percent
Statistical Base	Monthy Average	Maximum	Monthy Average	Weekly Average	Monthy Average	Weekly Average	Monthy Average	Monthy Average	Weekly Average	Monthy Average	Weekly Average	Monthy Average
ı-15	95	248	4392	5787	5	6	97	4979	7413	6	7	98
Feb-15	120	287	6354	13466	5	8	96	7411	13443	6	9	97
Mar-15	105	319	6569	9933	7	9	96	7385	15330	7	9	97
Apr-15	82	115	4682	4912	7	7	97	4549	5133	7	7	97
May-15	69	93	4401	4747	8	8	96	4077	4730	7	9	97
Jun-15	64	71	3819	4670	7	8	97	4339	5128	8	10	97
Jul-15	63	71	3581	4699	7	9	97	3653	4918	7	9	98
Aug-15	72	191	6203	12630	10	17	95	9989	24360	14	29	95
Sep-15	66	119	4138	7099	7	9	97	6388	12008	11	24	96
Oct-15	77	219	9112	16599	15	27	93	12265	19487	19	28	93
Nov-15	120	356	9724	19384	9	11	94	17972	38818	14	20	93
Dec-15	173	347	14619	28409	9	12	90	29156	29156	17	17	88
Jan-16	146	342	12343	17886	9	13	92	23124	36568	16	26	90
Feb-16	125	257	10185	12201	10	11	92	10724	13649	10	12	95
Mar-16	133	229	11276	15850	10	14	91	16774	41313	13	25	93
Apr-16	133	204	11230	11763	11	14	91	13301	28746	11	22	94
May-16	71	116	5142	7441	9	13	96	4816	5309	8	9	97
Jun-16	72	115	4644	5855	8	9	96	5719	6797	9	11	97
Jul-16	64	84	4371	4999	8	10	96	5229	5890	10	11	97
ı-16	60	64	3836	4811	8	10	97	4585	4885	9	10	97
Sep-16	61	109	3233	3404	6	7	97	3954	4405	8	9	97
Oct-16	117	276	15511	24511	13	17	91	30379	62733	25	41	88
Nov-16	142	299	16481	25405	13	16	89	24911	48377	17	29	89
Dec-16	106	257	7371	10654	8	9	95	8627	14283	9	12	95
Jan-17	113	365	9718	27103	7	13	95	13343	37429	10	19	95
Feb-17	145	225	79664	109171	70	109	48	73840	87761	61	87	71
Mar-17	131	204	115085	125500	110	132	16	119599	145940	110	140	46
Apr-17	108	186	55639	70574	59	69	59	66902	92119	70	88	56
May-17	94	167	7821	16434	10	19	95	13190	30966	16	35	94
Jun-17	78	140	6198	7290	9	12	96	7690	10215	12	13	96
Jul-17	69	75	6527	8894	11	16	96	7132	8699	12	15	96
Aug-17	66	72	4498	7384	8	13	97	5780	9342	10	17	96
Sep-17	67	116	5914	9073	10	14	96	7158	9253	13	14	96
Oct-17	85	223	15495	30359	19	38	91	23519	48490	27	58	90
Nov-17	130	261	14127	29548	13	37	92	28065	54925	25	64	87
Dec-17	111	328	10419	28309	7	14	96	21002	65596	13	29	94
Jan-18	165	298	10895	17058	7	10	94	16709	23929	11	14	93
Feb-18	108	178	7173	15668	8	15	96	8662	19576	9	19	95
Mar-18	93	159	10742	21254	12	20	94	17404	41056	18	37	92
Apr-18	123	289	9218	11386	9	10	95	12268	14164	11	15	94
May-18	74	84	5213	6108	8	10	97	6148	6899	10	11	96
Jun-18	72	98	7979	10098	13	16	95	8084	10618	13	16	95
Jul-18	64	67	4469	4948	8	9	97	5017	5844	9	11	97
Aug-18	63	69	4702	5540	9	10	97	5542	6956	11	13	97
Sep-18	65	95	3338	3574	7	10	97	4902	5261	9	10	97
Oct-18	74	182	4741	8206	7	9	97	5830	10228	8	13	97
Nov-18	88	252	7058	11644	9	13	96	9268	15956	11	16	95
Dec-18	111	236	5892	8161	6	6	96	7145	11157	7	8	97
Jan-19	100	181	5406	6321	6	8	96	6370	8082	7	9	97
Feb-19	114	262	8816	17339	8	12	95	10598	21756	10	15	95
Mar-19	81	212	5037	6831	7	8	97	5321	8596	7	9	97
Apr-19	82	136	4107	4250	6	7	97	5136	5388	8	9	97
May-19	70	137	4128	4719	7	8	97	4454	4454	7	7	97
Jun-19	65	111	5090	8109	9	12	96	7422	13634	12	18	96
Jul-19	67	104	3806	4539	7	8	97	5669	7447	10	11	97
Sep-19	73	124	4111	5825	7	9	97	6164	7980	10	12	96
Oct-19	74	192	5367	8175	8	11	96	6895	6895	11	11	96
Nov-19	70	118	4290	6237	7	9	97	4889	7261	8	10	97
Dec-19	108	391	7198	17655	7	10	96	11208	30771	9	15	96
Jan-20	142	270	8466	15292	6	9	95	14309	30555	10	16	94
Feb-20	133	351	6422	11621	5	5	96	10339	21468	7	10	96
Mar-20	88	193	4586	6939	6	7	96	4622	5032	6	7	97
Apr-20	75	127	2664	5126	4	5	98	2519	5875	4	6	98
May-20	77	176	5689	7629	8	9	96	5626	7901	8	10	97
Jun-20	70	123	2935	3411	5	6	97	3579	3909	6	6	97
Jul-20	62	65	3187	3330	6	6	97	3494	3740	7	7	97
Aug-20	62	82	2697	3569	5	6	97	3283	3941	6	8	98
Sep-20	70	168	3649	5565	6	9	97	4998	9419	8	9	97
Oct-20	74	178	3398	3732	6	7	97	4004	4936	6	7	98
Nov-20	96	206	5504	7179	7	8	96	6406	9591	7	8	96
Dec-20	107	316	4914	7440	5	7	96	7292	12845	7	9	96
Jan-21	157	370	6134	9715	4	5	96	10777	19030	7	9	95
Feb-21	127	278	5348	8339	4	5	96	8005	11526	7	8	96
Mar-21	97	189	5904	7803	7	10	96	7860	10483	9	12	95
Apr-21	74	108	4844	5370	8	9	96	5523	7362	9	12	96
May-21	70	94	4446	5329	8	9	96	4919	6275	8	10	96
Jun-21	75	165	3917	5158	6	6	97	4475	6098	7	8	97
Jul-21	62	65	3132	3930	6	8	97	4431	5044	9	10	97
Aug-21	61	66	3511	4218	7	8	97	4332	4952	9	10	97
Sep-21	73	193	5569	8789	8	9	96	9110	18182	12	17	96
Oct-21	86	271	5488	9369	7	8	96	7596	17975	8	12	96
Nov-21	142	261	8048	10713	6	8	94	11753	15810	9	11	94
Dec-21	121	235	10946	17479	9	12	90	20677	34388	16	23	93
VE:	93	189	9,331	13,704	11	14	94	12,079	19,565	13	18	94
MIN:	60	64	2,664	3,330	4	5	16	2,519	3,740	4	6	46
MAX:	173	391	115,085	125,500	110	132	98	119,599	145,940	110	140	98
tile:												
tile:	144.45	350.39	15,509.35	29,434.10	14.64	36.00	97.00	29,046.49	61,952.20	25.23	56.30	97.90
nits	215		44800	71700	25	40	85	53800	80700	30	45	85
April							80					80

Value exceeds permit limit

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West Point WWTP	Effluent - page 2											
er	Fecal Coliform	Fecal Coliform	Chlorine Residual	Chlorine Residual	pH - low	pH - high	Total Ammonia	Total Ammonia	Total Kjeldahl Nitrogen	Nitrate + Nitrite	Total Phosphorus	Soluble Reactive Phosphorus
	#/100ml	#/100ml	ug/L	ug/L	Standard Units	Standard Units	Lbs/Day	mg/L - as N	mg/L - as N	mg/L - as N	mg/L - as P	mg/L - as P
Statistical Base	Monthly geometric mean	Weekly Geometric Mean	Monthy Average	Daily Maximum	Daily Minimum	Daily Maximum	Monthy Average	Monthy Average	Monthy Average	Monthy Average	Monthy Average	Monthy Average
-15	<1	<1	89	150	7.1	6.3	15961	24	25.9	3.80	2.24	2.08
Feb-15	2	5	99	140	6.9	6.2	15607	10.9	14.2	3.27	0.70	1.31
Mar-15	1	2	96	150	7.1	6.1	11515.3	14.875	19.775	2.63	2.51	1.71
Apr-15	2	3	89	150	7.1	6.2	12197.3	19.9333	27.4	5.72	2.24	2.49
May-15	2	2	85	200	7.3	6.5	17465	31.1667	31.5333	4.00	3.41	2.83
Jun-15	1	2	82	280	7.6	6.5	17279.7	32.2333	33.5667	2.59	3.52	3.06
Jul-15	2	5	91	180	7.3	6.9	16721	31.4	32	2.70	3.17	2.80
Aug-15	3	5	99	230	7.2	6.2	14410.3	27.5	33.6	4.24	3.08	2.25
Sep-15	2	6	100	190	7.1	6.4	12447	24.65	31.25	21.70	3.23	2.80
Oct-15	2	4	106	160	7.2	6.2	12206.3	19.4333	27.4333	2.65	5.60	3.77
Nov-15	2	4	108	170	7.1	6.0	9622.5	10.15	12.8	4.15	0.98	0.93
Dec-15	2	3	131	290	7.2	6.3	8183.5	4.55	10.9	4.77	1.54	0.69
Jan-16	2	3	128	230	7.3	6.4	12406.7	14.7333	17.4667	3.97	1.90	1.53
Feb-16	2	2	117	220	7.8	6.4	12525	16.1	19.8	4.15	2.36	1.99
Mar-16	2	2	96	130	7.2	6.4	10591	8.3	9.9	2.41	0.96	0.72
Apr-16	2	1	104	163	7.6	6.6	12549.29	13.12166	15.10334	2.66	1.78	1.44
May-16	1	3	95	170	7.8	6.7	13727	24.1	28	3.34	3.21	2.88
Jun-16	2	2	105	170	7.3	6.6	17697	32	34.7	3.10	3.84	3.36
Jul-16	1	2	109	160	7.3	6.8	11561.5	21.45	33.2	3.85	3.75	3.34
-16	1	2	95	140	7.3	7.3	12166.3	24.6	29.3333	5.05	4.17	3.92
Sep-16	1	2	106	330	7.4	6.8	14331.7	25.2	28.9667	4.30	3.68	3.38
Oct-16	8	74	107	330	7.4	6.4	13780	13.9	24.3333	3.06	2.89	2.05
Nov-16	8	15	106	230	7.4	6.4	9199.33	10.2333	15.5	4.58	1.63	1.35
Dec-16	2	6	105	210	7.2	6.4	11923	14.8	17.7667	4.09	1.49	1.70
Jan-17	2	6	115	240	7.3	6.5	16830.2	18.66	21.62	1.81	2.23	1.93
Feb-17	12	39	133	290	8.0	6.4	14202.7	11.3333	18.5333	1.48	2.17	1.26
Mar-17	104	222	139	350	7.7	6.1	12609.5	12.775	21.725	1.56	2.90	1.65
Apr-17	13	120	148	630	7.6	6.2	9606	11.6333	21.5	2.15	3.12	1.74
May-17	2	3	88	280	6.8	6.3	8846	12.7667	18	6.48	2.56	2.06
Jun-17	3	5	90	220	7.0	6.2	8224.33	13.1333	17.5667	11.20	3.21	2.75
Jul-17	3	19	65	140	7.1	6.7	12538	21.525	29.675	6.52	3.62	3.29
Aug-17	2	3	73	150	7.2	6.8	14627	27.3	34.65	1.74	3.70	2.98
Sep-17	6	13	65	150	7.3	6.8	16914.9	29.1	36.5545	1.33	3.66	3.16
Oct-17	25	97	78	140	7.3	6.6	16091.5	29.2	34.8	2.25	3.82	3.16
Nov-17	8	50	92	200	7.2	6.5	22899	16.75	19.95	0.44	1.84	1.40
Dec-17	7	12	93	170	7.1	6.3	16328.3	21.7	24.2667	1.03	2.05	1.72
Jan-18	19	45	99	140	7.5	6.2	17611.3	15.35	17.25	1.08	1.39	1.14
Feb-18	4	12	103	170	7.3	6.4	15113.8	18.55	22.05	1.66	1.90	1.77
Mar-18	3	5	108	180	7.0	6.4	16505	23.95	28.325	0.63	2.17	1.80
Apr-18	3	6	102	160	6.9	6.3	17566.2	21.64	23.26	0.92	2.17	1.93
May-18	8	12	100	160	7.1	6.6	16968.8	27.575	32.075	0.65	2.97	2.67
Jun-18	5	18	98	210	7.1	6.7	17977.8	30.9	35.025	0.38	3.35	2.75
Jul-18	23	38	104	230	7.2	6.8	18011.6	34.72	38.74	0.88	3.75	3.28
Aug-18	14	56	95	170	7.2	6.8	17740	34.4667	42.0333	0.46	7.73	3.35
Sep-18	6	10	109	190	7.6	6.9	18202.2	32.42	36.3	0.45	3.07	2.64
Oct-18	9	15	107	170	7.4	6.3	16168.5	27.85	33.15	0.46	3.07	2.76
Nov-18	6	10	80	140	7.3	6.2	14817	26.8667	34.7333	2.85	3.43	3.10
Dec-18	3	11	77	130	7.0	6.3	18633.7	17.8	21.2	2.02	2.14	1.86
Jan-19	4	9	95	140	7.3	6.2	17922.7	22.2333	25.3667	2.03	2.52	2.27
Feb-19	3	6	99	160	7.1	6.4	16676	17.6	19.6	1.47	1.93	1.59
Mar-19	2	6	108	170	7.4	6.2	18670.5	29.35	32.725	0.66	3.10	2.76
Apr-19	2	3	112	180	7.4	6.5	18048.8	30.475	33	0.69	2.82	2.56
May-19	4	16	105	240	7.3	6.6	16628.3	30.2	34.5	1.61	3.52	3.16
Jun-19	13	31	102	210	7.5	6.7	15742	29.275	34.65	2.22	3.83	3.44
Jul-19	5	13	91	150	7.3	6.4	16326.5	29.3	33.025	2.81	3.33	3.05
Sep-19	6	21	88	220	7.5	6.4	15493.3	25.45	29.775	0.54	2.77	2.37
Oct-19	4	13	96	140	7.4	6.3	17270	29.6	34.525	2.27	3.53	2.98
Nov-19	3	7	94	200	7.3	6.4	20820	28.9	33.6667	1.62	3.52	2.87
Dec-19	4	9	108	190	7.2	6.2	15067.7	28.2	30.45	2.53	3.16	2.81
Jan-20	6	13	110	190	7.2	6.2	15448	14.6333	17.3667	3.46	2.42	1.59
Feb-20	2	4	112	140	7.2	6.3	14802.3	16.8667	20.2	1.20	1.67	1.51
Mar-20	4	4	113	180	7.4	6.3	16838.6	23.84	27.74	0.96	2.47	2.15
Apr-20	1	4	90	130	7.2	6.5	15048.3	25.3	26.5	3.57	3.02	2.76
May-20	3	8	99	150	7.7	6.3	14116.3	25.25	28.6	3.87	3.28	2.89
Jun-20	6	8	108	160	7.5	6.6	12788	22.5	23.56	4.56	2.83	2.58
Jul-20	12	23	91	140	7.8	7.0	14208.5	27.3	28	2.66	3.44	2.86
Aug-20	3	6	118	307	7.8	6.7	14975.6	29.14	31.9	2.35	3.58	3.11
Sep-20	5	15	124	190	7.4	6.5	15092	31.8	33.95	1.59	3.59	3.06
Oct-20	4	41	112	190	7.3	6.6	13473.7	23.8667	25.7667	1.88	2.87	2.40
Nov-20	5	18	102	170	7.4	6.6	15730.8	20.5	22.825	3.94	2.92	2.52
Dec-20	2	4	109	160	7.2	6.6	10698.7	17.6333	20.6	5.52	2.55	2.24
Jan-21	2	3	130	220	7.0	6.4	11585.3	8.525	9.675	3.72	1.46	1.31
Feb-21	3	6	101	140	7.1	6.6	12941	10.1	12.2	5.14	1.67	1.37
Mar-21	1	2	103	160	7.1	6.3	11559.4	14.44	16.16	3.62	1.75	1.46
Apr-21	2	2	116	180	7.1	6.7	13673.5	22.225	25.225	2.42	2.95	2.51
May-21	3	5	102	170	7.3	6.7	14399.3	23.825	26.675	5.02	3.37	2.90
Jun-21	3	6	88	260	7.6	6.5	12820.8	18.075	26.525	1.43	2.21	1.89
Jul-21	6	20	102	220	7.3	6.7	16020.3	30.8	36.2333	1.99	3.91	3.61
Aug-21	9	17	94	350	7.7	6.8	16423.7	32.25	38.6	0.84	3.75	3.38
Sep-21	9	18	109	190	7.6	6.3	15754	29.5	25.6	1.00	2.60	2.30
Oct-21	4	12	92	220	7.7	6.1	13951	25.4	25.8	3.80	3.24	2.91
Nov-21	5	7	100	150	7.2	6.2	12193	12	14.8	4.70	1.91	1.69
Dec-21	3	7	105	140	7.6	6.4	13214	14.3	15.5	3.70	1.80	1.51
VE:	6	17	102	196	7	6	14,669	22	26	3	3	2
MIN:	1	1	65	130	7	6	8,184	5	10	0	1	1
MAX:	104	222	148	630	8	7	22,899	35	42	22	8	4
tile:					7.0							
tile:	13.95	55.70	129.48	327.70		6.80	18,186.86	32.21	36.29	5.70	3.84	3.38
nits	200	400	139	364	6.0	9.0						
pril												

Value exceeds permit limit

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WET Test Results Summary for West Point (WA0029181)

Scheduled	Test Code	Collected	Start Date	Duration	Organism	Endpoint	NOEC	LOEC	PMSD	Effluent Survival (100%)	Met Performance Standard?
2017 March	CDUD0095	3/21/2017	3/21/2017	Acute	*Ceriodaphnia dubia*	48-Hour Survival	100%	>100%	NA	100.0%	**Yes**
					Water Flea						
2017 March	CDUD0096	3/21/2017	3/21/2017	Acute	*pimephales promelas*	96-Hour Survival	100%	>100%	9.8%	92.7%	**Yes**
					Fathead Minnow						
2017 April	CDUD0097	4/5/2017	4/5/2017	Chronic	*Americamysis bahia*	7-Day Survival	50%	100%	14.0%	NA	**Yes**
					Mysid Shrimp	7-Day Biomass	12.5%	25%	17.20%		
						7-Day Weight	12.5%	25%	15.50%		
2017 April	CDUD0098	4/5/2017	4/5/2017	Chronic	*Atherinops Affinis*	7-Day Survival	50%	100%	12.2%	NA	**Yes**
					Topsmelt	7-Day Growth	50%	100%	19.50%		
						7-Day Weight	100%	>100%	na		
2017 July	CDUD0100	7/18/2017	7/18/2017	Acute	*pimephales promelas*	96-Hour Survival	100%	>100%	18.4%	95.0%	**Yes**
					Fathead Minnow						
2017 July	CDUD0099	7/18/2017	7/18/2017	Acute	*Ceriodaphnia dubia*	48-Hour Survival	100%	>100%	na	100.0%	**Yes**
2017 October	CDUD0101	10/25/2017	10/25/2017	Chronic	*Americamysis bahia*	7-Day Survival	25%	50%	12.9%	NA	**Yes**
					Mysid Shrimp	7-Day Biomass	25%	50%	15.2%		
						7-Day Weight	12.5%	25%	12.3%		
2017 October	CDUD0102	10/25/2017	10/25/2017	Chronic	*Atherinops Affinis*	7-Day Survival	50%	100%	12.5%	NA	**Yes**
					Topsmelt	7-Day Growth	25%	50%	16.7%		
						7-Day Weight	25%	50%	14.1%		

*The acute test result showed less than 65% survival in 100% effluent. An acute WET limit is needed if the testing was for effluent characterization (WAC 173-205-050(2)(a)(ii)) or compliance monitoring (WAC 173-205-120(1)(a)). Another effluent characterization for acute WET (WAC 173-205-060(3)(a)) is needed if the testing was an end of permit term check (WAC 173-205-030(8)). Note: This does not necessarily mean that the asterisked test was out of compliance with the effluent limits set forth in the permit.

LOEC = Lowest observed effect concentration.
NOEC= No observed effect concentration.
PMSD= Percent minimum significant difference.

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Summary of reported DMR violations

The following tables list each numeric limit violation reported on DMRs for at each treatment plant between February 2015 and December 2021.

West Point Treatment Plant Violations

Month	Parameter	Statistical Base	Units	Limit	Value
2/2017	$CBOD_5$	Average Monthly	lbs/day	44,800	79,664
2/2017	$CBOD_5$	Average Monthly	mg/L	25	70
2/2017	$CBOD_5$	Average Monthly	% removal	85	48
2/2017	$CBOD_5$	Average Weekly	lbs/day	71,700	109,171
2/2017	$CBOD_5$	Average Weekly	mg/L	40	109
2/2017	TSS	Average Monthly	lbs/day	53,800	73,840
2/2017	TSS	Average Monthly	mg/L	30	61
2/2017	TSS	Average Monthly	% removal	>85	71
2/2017	TSS	Average Weekly	lbs/day	80,700	87,761
2/2017	TSS	Average Weekly	mg/L	45	87
3/2017	$CBOD_5$	Average Monthly	lbs/day	44,800	115,085
3/2017	$CBOD_5$	Average Monthly	mg/L	25	109,548
3/2017	$CBOD_5$	Average Monthly	% removal	>85	16
3/2017	$CBOD_5$	Average Weekly	lbs/day	71,700	125,500
3/2017	$CBOD_5$	Average Weekly	mg/L	40	132
3/2017	Chlorine, Total Residual	Average Monthly	µg/L	139	139
3/2017	TSS	Average Monthly	lbs/day	53,800	119,599
3/2017	TSS	Average Monthly	mg/L	30	110
3/2017	TSS	Average Monthly	% removal	>85	46
3/2017	TSS	Average Weekly	lbs/day	80,700	145,940
3/2017	TSS	Average Weekly	mg/L	45	140
4/2017	$CBOD_5$	Average Monthly	lbs/day	44,800	55,639
4/2017	$CBOD_5$	Average Monthly	mg/L	25	59
4/2017	$CBOD_5$	Average Monthly	% removal	>85	59
4/2017	$CBOD_5$	Average Weekly	mg/L	40	69
4/2017	Chlorine, Total Residual	Average Monthly	µg/L	139	148
4/2017	TSS	Average Monthly	lbs/day	53,800	66,902
4/2017	TSS	Average Monthly	mg/L	30	70
4/2017	TSS	Monthly Average	% removal	>85	56
4/2017	TSS	Average Weekly	lbs/day	80,700	92,119
4/2017	TSS	Average Weekly	mg/L	45	88
4/2017	Chlorine, Total Residual	Maximum Daily	µg/L	364	630
4/2017	Chlorine, Total Residual	Maximum Daily	µg/L	364	420
10/2017	TSS	Average Weekly	mg/L	45	58
11/2017	TSS	Average Weekly	mg/L	45	64

Alki CSO Treatment Plant Violations

Month	Parameter	Statistical Base	Units	Limit	Value
10/2016	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	733
10/2016	Chlorine, Total Residual	Maximum Daily	µg/L	234	362
1/2017	Chlorine, Total Residual	Maximum Daily	µg/L	234	298
2/2017	Chlorine, Total Residual	Maximum Daily	µg/L	234	446
2/2017	pH	Instantaneous Minimum	Standard Units	6	4.83
2/2017	Chlorine, Total Residual	Maximum Daily	µg/L	234	478
3/2017	Chlorine, Total Residual	Maximum Daily	µg/L	234	659
10/2018	pH	Instantaneous Minimum	Standard Units	6	2.7
11/2018	pH	Instantaneous Minimum	Standard Units	6	5.57
12/2019	pH	Instantaneous Minimum	Standard Units	6	3.84
1/2020	pH	Instantaneous Minimum	Standard Units	6	5.49

Carkeek CSO Treatment Plant Violations

Month	Parameter	Statistical Base	Units	Limit	Value
11/2015	Chlorine, Total Residual	Maximum Daily	µg/L	490	2218
11/2016	Chlorine, Total Residual	Maximum Daily	µg/L	490	512
12/017	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	1871
11/2018	pH	Instantaneous Minimum	Standard Units	6	5.95
10/2021	Chlorine, Total Residual	Maximum Daily	µg/L	490	3139
10/2021	Chlorine, Total Residual	Maximum Daily	µg/L	490	1140

Henderson/MLK CSO Treatment Plant Violations

Month	Parameter	Statistical Base	Units	Limit	Value
3/2015	Chlorine, Total Residual	Maximum Daily	µg/L	39	1100
1/2017	pH	Instantaneous Minimum	Standard Units	6	4.1
2/2017	Chlorine, Total Residual	Maximum Daily	µg/L	39	152
2/2017	Chlorine, Total Residual	Maximum Daily	µg/L	39	799

Elliott West CSO Treatment Plant Violations

Month	Parameter	Statistical Base	Units	Limit	Value
2/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	324
2/2015	pH	Instantaneous Minimum	Standard Units	6	5.2
3/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	148
3/2015	pH	Instantaneous Minimum	Standard Units	6	5.89
8/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	2630
8/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	517
10/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	787
10/2015	pH	Instantaneous Minimum	Standard Units	6	5.88
10/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	995
10/2015	pH	Instantaneous Minimum	Standard Units	6	4.9
11/2015	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	577
11/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	580
11/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	737
12/2015	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	471
12/2015	pH	Instantaneous Minimum	Standard Units	6	5.96
12/2015	pH	Instantaneous Minimum	Standard Units	6	5.54
12/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	232
12/2015	pH	Instantaneous Minimum	Standard Units	6	5.39
12/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	212
12/2015	pH	Instantaneous Minimum	Standard Units	6	5.74
12/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	153
12/2015	pH	Instantaneous Minimum	Standard Units	6	5.98
12/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	221
12/2015	Chlorine, Total Residual	Maximum Daily	µg/L	109	111
12/2015	pH	Instantaneous Minimum	Standard Units	6	5.81
1/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	571

Month	Parameter	Statistical Base	Units	Limit	Value
1/2016	pH	Instantaneous Minimum	Standard Units	6	5.9
1/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	512
1/2016	pH	Instantaneous Minimum	Standard Units	6	5.71
2/2016	pH	Instantaneous Minimum	Standard Units	6	5.87
2/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	622
2/2016	pH	Instantaneous Minimum	Standard Units	6	5.49
3/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	594
10/2016	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	651
10/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	410
10/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	728
10/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	388
10/2016	pH	Instantaneous Minimum	Standard Units	6	5.88
10/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	216
10/2016	pH	Instantaneous Minimum	Standard Units	6	5.71
10/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	1248
11/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	557
11/2016	pH	Instantaneous Minimum	Standard Units	6	5.74
11/2016	Chlorine, Total Residual	Maximum Daily	µg/L	109	208
11/2016	pH	Instantaneous Minimum	Standard Units	6	5.59
1/2017	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	1054
1/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	811
1/2017	pH	Instantaneous Minimum	Standard Units	6	5.7
1/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	191
2/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	147
2/2017	pH (Hydrogen Ion) Daily Max	Summary Only	Standard Units	9	9.7
2/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	278

Month	Parameter	Statistical Base	Units	Limit	Value
2/2017	pH (Hydrogen Ion) Daily Max	Summary Only	Standard Units	9	9.2
3/2017	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	977.5
3/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	210
3/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	383
3/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	136
4/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	3412
4/2017	pH	Instantaneous Minimum	Standard Units	6	5.79
10/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	540
10/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	658
11/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	239
11/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	710
11/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	243
11/2017	Chlorine, Total Residual	Maximum Daily	µg/L	109	225
11/2017	pH	Instantaneous Minimum	Standard Units	6	5.53
11/2017	pH	Instantaneous Minimum	Standard Units	6	5.27
12/2017	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	619.2
12/2017	pH	Instantaneous Minimum	Standard Units	6	5.95
1/2018	Chlorine, Total Residual	Maximum Daily	µg/L	109	148
1/2018	pH	Instantaneous Minimum	Standard Units	6	5.24
1/2018	Chlorine, Total Residual	Maximum Daily	µg/L	109	257
1/2018	pH	Instantaneous Minimum	Standard Units	6	3.19
1/2018	pH	Instantaneous Minimum	Standard Units	6	4.44
1/2018	pH	Instantaneous Minimum	Standard Units	6	3.04
11/2018	Chlorine, Total Residual	Maximum Daily	µg/L	109	208
11/2018	pH	Instantaneous Minimum	Standard Units	6	5.62
11/2018	Chlorine, Total Residual	Maximum Daily	µg/L	109	733

Month	Parameter	Statistical Base	Units	Limit	Value
11/2018	pH	Instantaneous Minimum	Standard Units	6	5.38
12/2018	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	49000
12/2019	Chlorine, Total Residual	Maximum Daily	µg/L	109	268
12/2019	Chlorine, Total Residual	Maximum Daily	µg/L	109	1059
12/2019	Chlorine, Total Residual	Maximum Daily	µg/L	109	113
1/2020	Chlorine, Total Residual	Maximum Daily	µg/L	109	300
1/2020	pH	Instantaneous Minimum	Standard Units	6	5.77
1/2020	pH	Instantaneous Minimum	Standard Units	6	5.87
2/2020	pH	Instantaneous Minimum	Standard Units	6	5.64
2/2020	pH	Instantaneous Minimum	Standard Units	6	5.52
2/2020	pH	Instantaneous Minimum	Standard Units	6	5.62
12/2020	Chlorine, Total Residual	Maximum Daily	µg/L	109	694
1/2021	Chlorine, Total Residual	Maximum Daily	µg/L	109	467
1/2021	pH	Instantaneous Minimum	Standard Units	6	5.69
1/2021	Chlorine, Total Residual	Maximum Daily	µg/L	109	152
1/2021	pH	Instantaneous Minimum	Standard Units	6	5.86
1/2021	pH	Instantaneous Minimum	Standard Units	6	5.57
11/2021	Fecal Coliform	Monthly Geometric Mean	#/100ml	400	330000
11/2021	pH	Instantaneous Minimum	Standard Units	6	5.9

CSO treatment plant TSS percent removal comparison

The following tables compare the TSS percent removal rates for the CSO treatment plants reported by KC-WTD in the 2015-2021 CSO annual reports to the at-site removal rates calculated two methods:

Calculation method 1: this method calculates percent removal based on the annual average concentration measure at each treatment plant during discharge events. This method only includes influent concentration measured during storm events that resulted in a discharge from the CSO treatment plant. It excludes influent data from events that did not result in a discharge (facility operates in storage-only mode). The calculation uses the following equation.

$$\%\ \text{Removal} = 100 \times \frac{(\text{annual average influent concentration (mg/L)} - \text{annual average effluent concentration (mg/L)})}{\text{annual average influent concentration (mg/L)}}$$

Calculation method 2: this method calculates percent removal based on the annual total mass of TSS removed at the CSO treatment plant. Like method 1, this method does not use influent data measured during storm events that do not result in a discharge. This method first calculates influent and effluent TSS mass for each storm event using the daily measured concentration and the daily measured volume. The method then calculates the total mass that entered the facility during a discharge event and the total mass discharged during the event. The calculation uses the following equations.

$$\text{TSS daily Mass (kg)} = \text{total daily volume (MG)} \times \text{daily concentration (mg/L)} \times 3.785$$

$$\%\ \text{Removal} = 100 \times \frac{(\sum \text{TSS daily influent Mass (kg)} - \sum \text{TSS daily effluent Mass (kg)})}{\sum \text{TSS daily influent Mass (kg)}}$$

Carkeek CSO Treatment Plant

Year	Reported TSS Removal (Percent)	TSS Removal Method 1 (Percent)	TSS Removal Method 2 (Percent)
2015	51.3	67.0	66.2
2016	49.4	79.3	69.4
2017	28.2	66.4	61.6
2018	79.5	77.2	89.3
2019	55.2	74.5	72.6
2020	62.1	74.8	69.3
2021	73.3	82.0	82.5

Alki CSO Treatment Plant

Year	Reported TSS Removal (Percent)	TSS Removal Method 1 (Percent)	TSS Removal Method 2 (Percent)
2015	33.7	50.7	55.1
2016	42.8	50.5	64.6
2017	24.5	53.5	59.0
2018	39.5	34.1	36.9
2019	42.8	47.9	47.2
2020	58.2	55.7	68.2
2021	36.0	36.3	42.5

Elliott West CSO Treatment Plant

Year	Reported TSS Removal (Percent)	TSS Removal Method 1 (Percent)	TSS Removal Method 2 (Percent)
2015	57.7	20.9	47.8
2016	52.8	29.6	36.7
2017	21.4	-10.5	24.5
2018	49.4	-51.9	37.8
2019	62.0	72.9	8.9
2020	60.9	-4.0	23.5
2021	58.3	-129.0	18.6

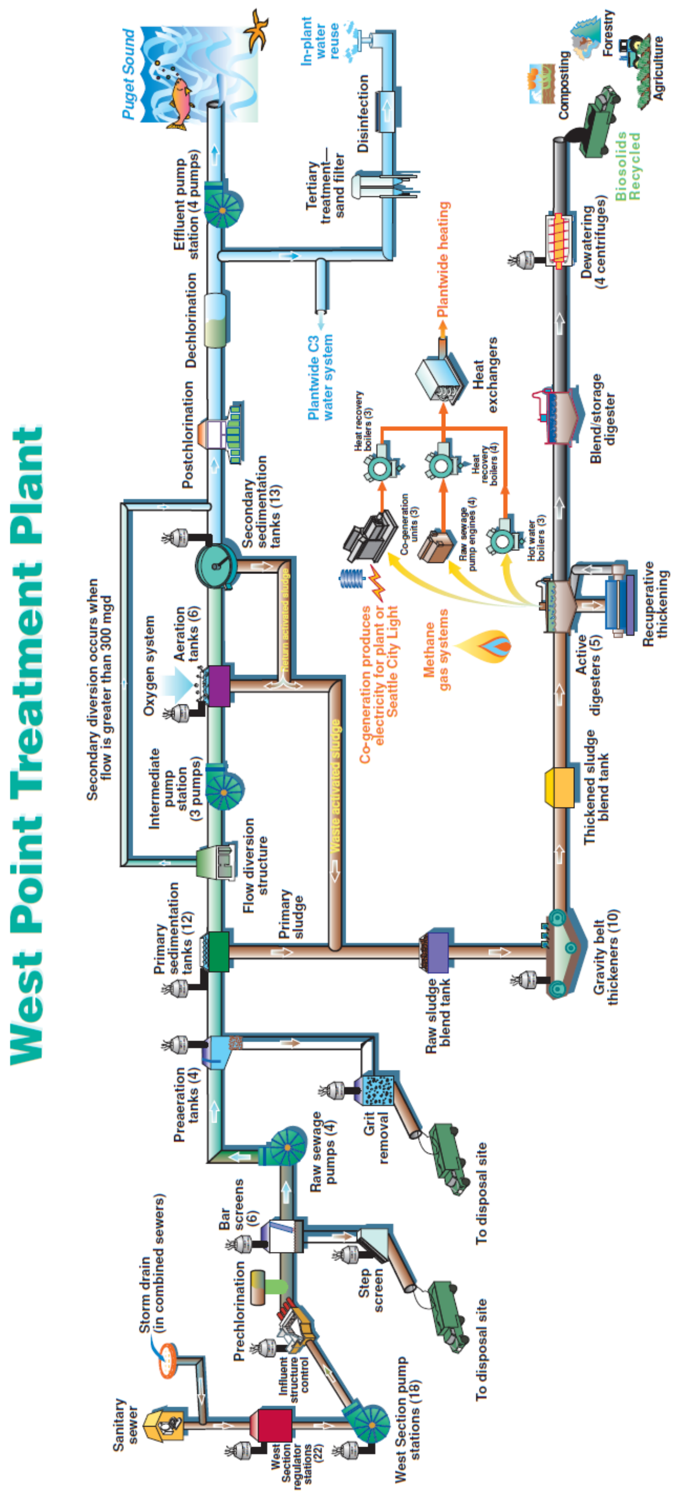
Henderson/MLK CSO Treatment Plant

Year	Reported TSS Removal (Percent)	TSS Removal Method 1 (Percent)	TSS Removal Method 2 (Percent)
2015	59.8	71.1	78.8
2016	No Discharge	No Discharge	No Discharge
2017	46.0	61.3	70.1
2018	86.4	83.5	91.8
2019	60.0	71.4	76.3
2020	78.0	58.3	86.7
2021	64.0	57.5	73.0

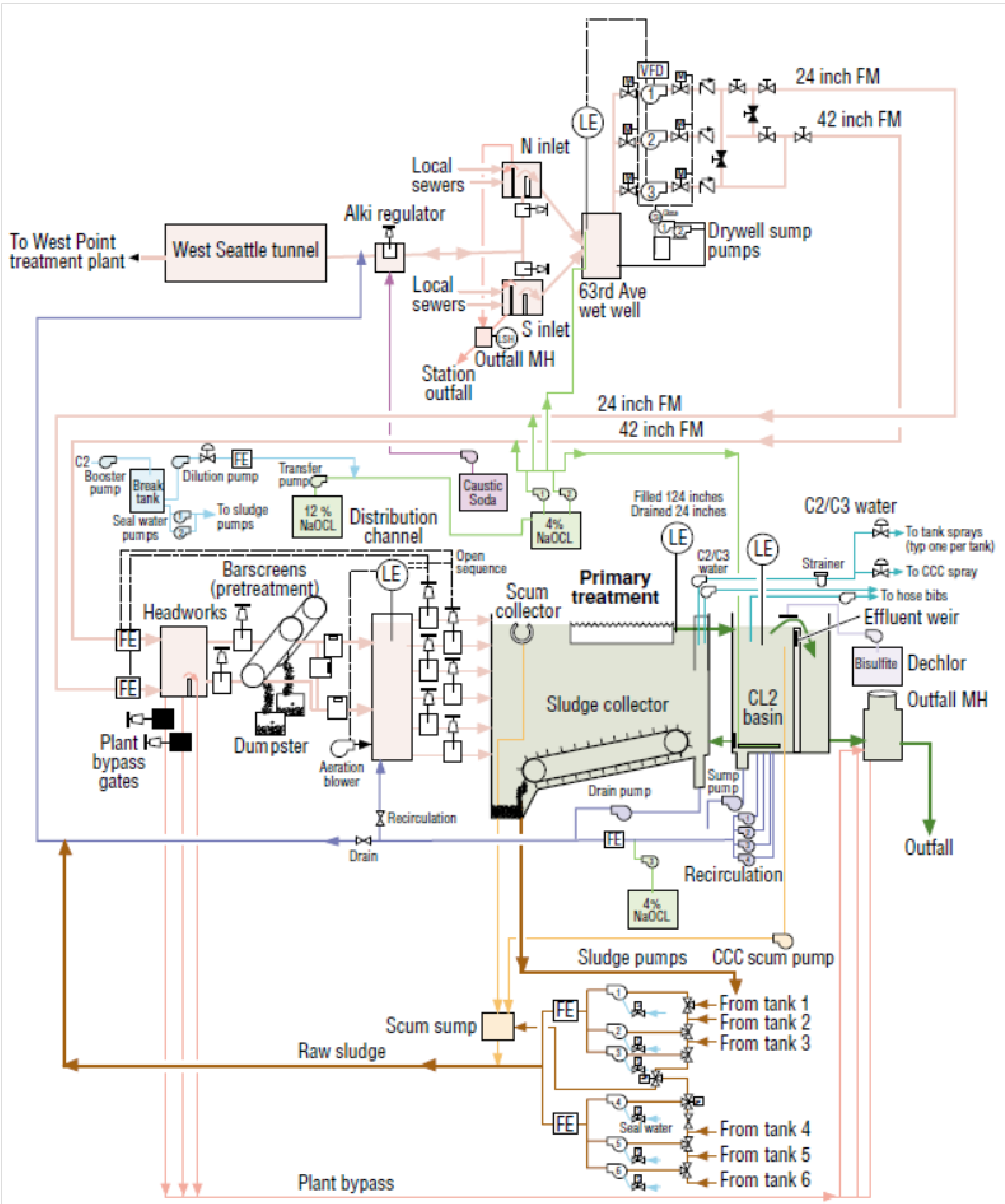
Appendix F — Process Flow Diagram

The following diagrams provide a general illustration of the process flow at each treatment facility.

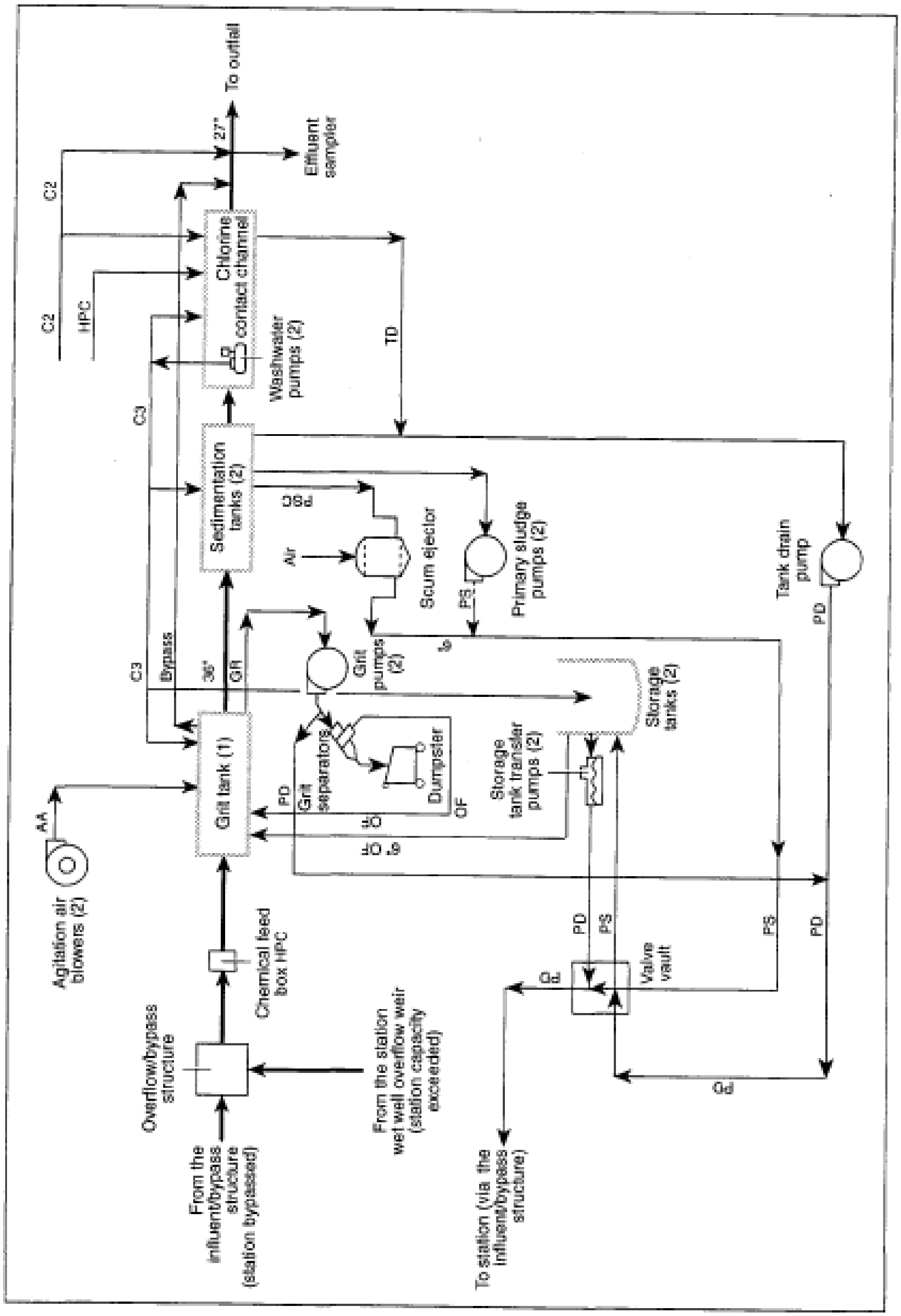
West Point WWTP



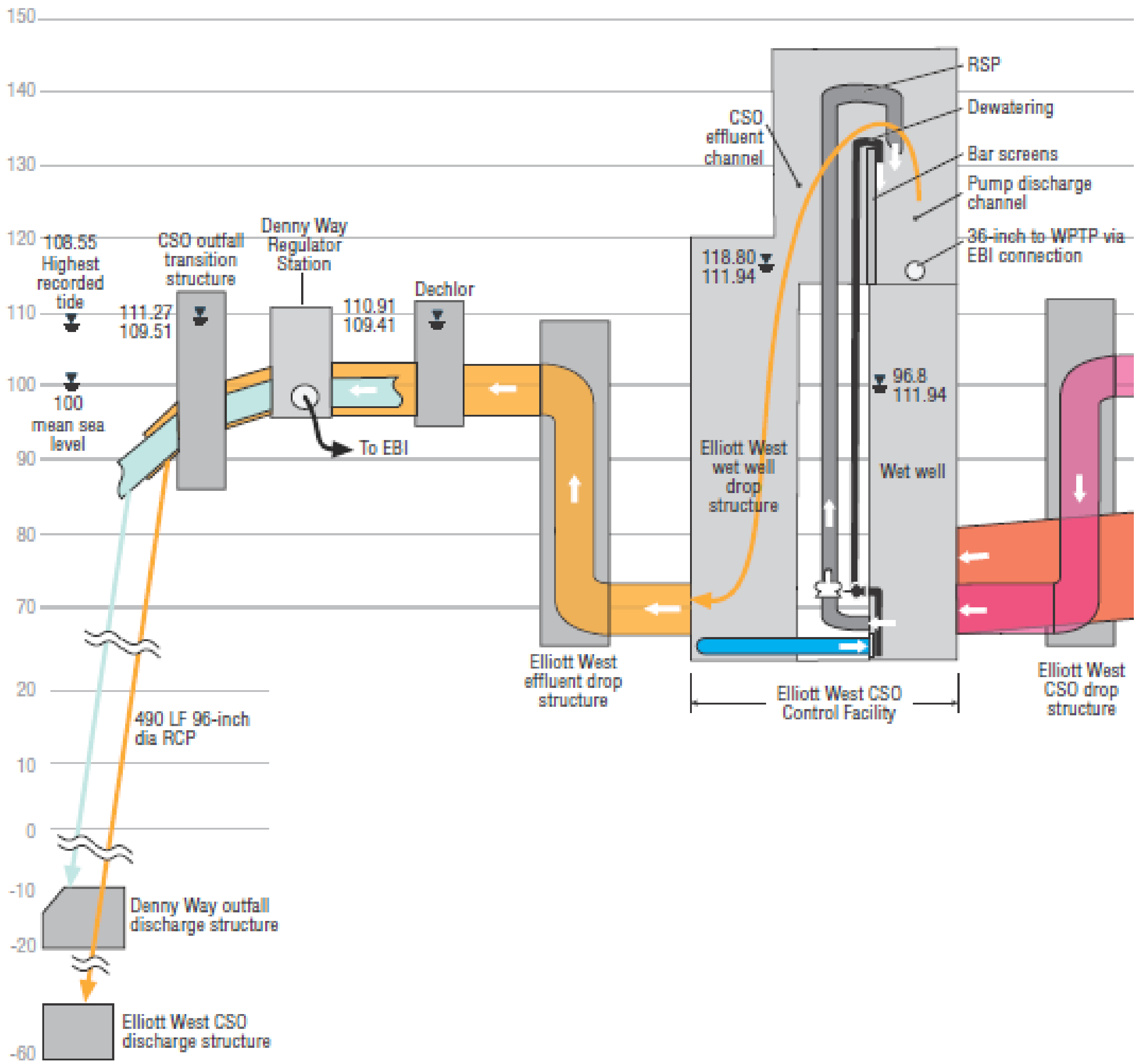
Alki CSO Treatment Plant



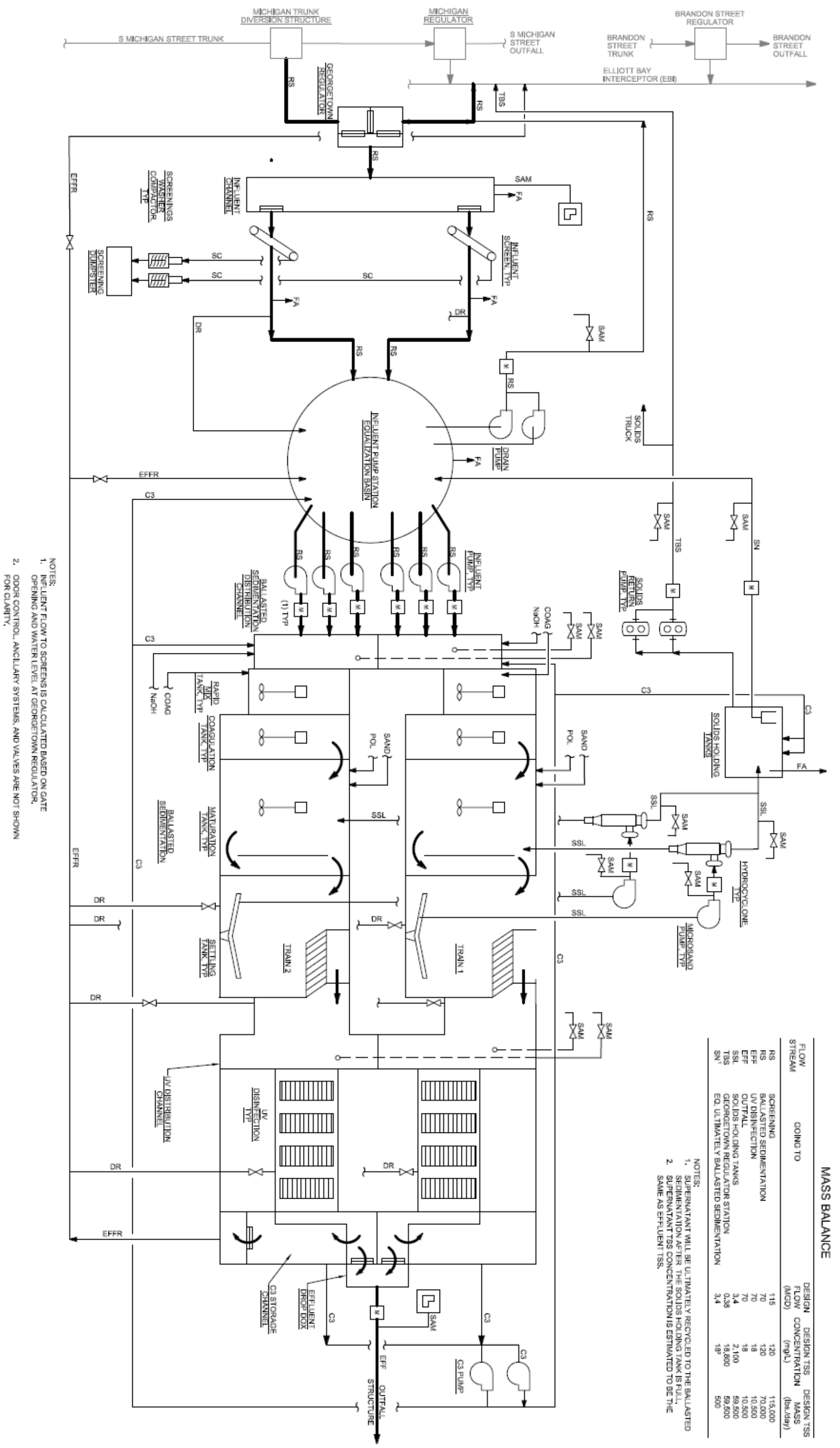
Carkeek CSO Treatment Plant



Elliott West CSO Treatment Plant



Georgetown CSO Treatment Plant



Appendix G — Response to Comments

[Ecology will complete this section after the public notice of draft period.]