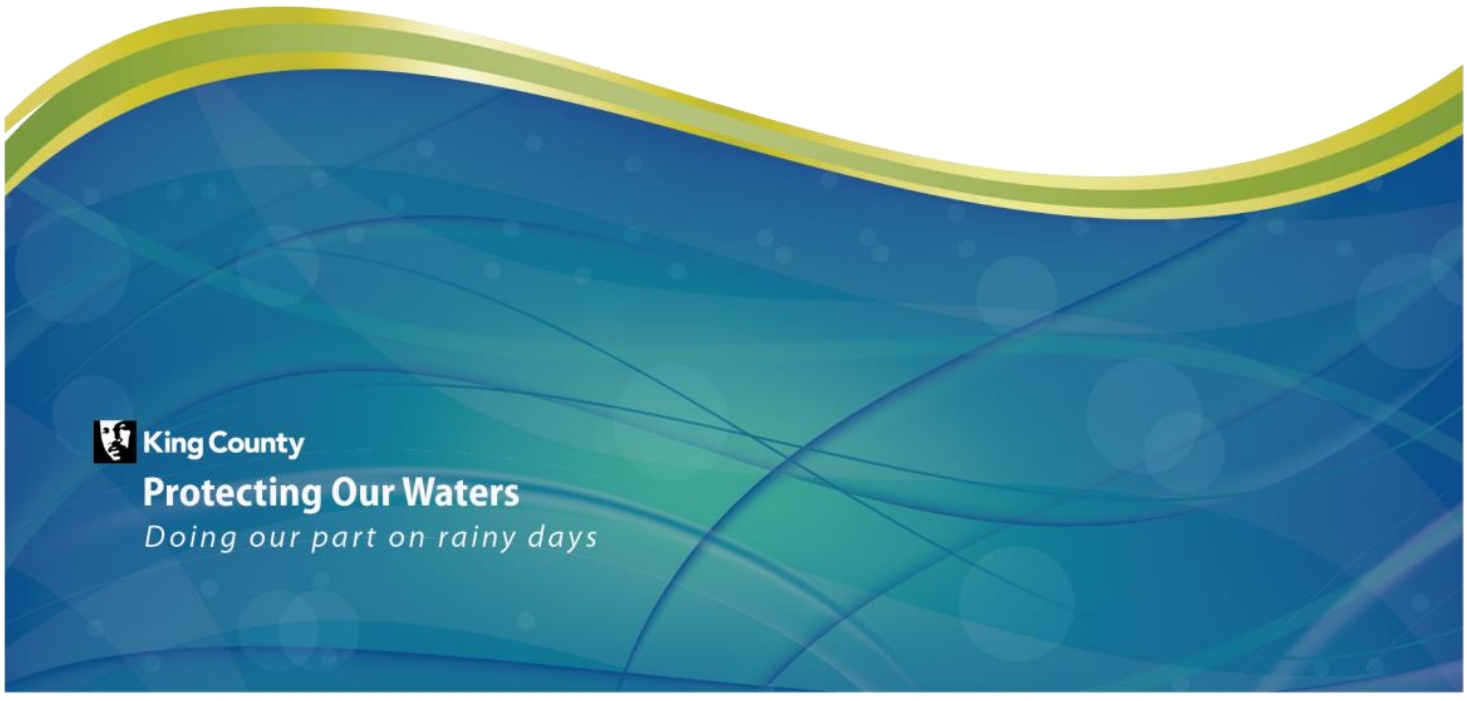
Combined Sewer Overflow Control Program

2023 Annual CSO and Consent Decree Report

July 2024



For comments or questions, contact:
Faon O'Connor
King County Wastewater Treatment Division
201 S Jackson St.
KSC-NR-0503
Seattle, WA 98104-3855
206-477-4499
faon.oconnor@kingcounty.gov

Alternative Formats Available
206-477-5371 TTY Relay: 711

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List of Abbreviations and Acronyms

ARV	air relief valve
BMPs	best management practices
BSP	Business Services Program Team
CD	consent decree
CECs	contaminants of emerging concern
cfu	colony-forming unit
County	King County
CPARB	Capital Projects Advisory Review Board
CSO	combined sewer overflow
DNRP	Department of Natural Resources and Parks
DOJ	Department of Justice
DSN	discharge serial number
DWO	dry weather overflow
eCSO	exacerbated combined sewer overflow
EPA	U.S. Environmental Protection Agency
ERTS	Environmental Report Tracking System
EWWTS	Elliott West Wet Weather Treatment Station
FOG	fats, oils, and grease
ft	foot/feet
GC/CM	general contractor/construction manager
gpd/ft^2	gallons per day per square foot
GSI	green stormwater infrastructure

HLKK	Hanford/Lander/King/Kingdome
in.	inch(es)
hr	hour
JOIST	Joint Operations Information Sharing Team
JOSOP	Joint Operations and System Optimization Plan
JPA	joint project agreement
KCIW	King County Industrial Waste Program
L	liter
LTCP	Long-Term Control Plan
Metro	Municipality of Metropolitan Seattle
µg/L	micrograms per liter
MG	million gallons
MGD	million gallons per day
ml	milliliter
MLK	Martin Luther King
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PCBs	polychlorinated biphenyls
PCMP	Post-Construction Monitoring Plan
PFAS	per-and polyfluoroalkyl substances
PRC	Project Review Committee
PRV	pressure relief valve
PS	pump station
RS	regulator station

RWSP	Regional Wastewater Services Plan
SBS	sodium bisulfite
SCADA	supervisory control and data acquisition
Seattle	City of Seattle
SQGs	small quantity generators
SPU	Seattle Public Utilities
SS	settleable solids
SSO	sanitary sewer overflow
SSOP	Sewer System Operations Plan
SCIP	Source Control Implementation Plan
SMS	Sediment Management Standards
South Plant	South Treatment Plant in Renton
SOR	surface overflow rate
TBM	tunnel boring machine
TRC	total residual chlorine
TSS	total suspended solids
TEPS	Tunnel Effluent Pump Station
UV	ultraviolet
WAC	Washington Administrative Code
West Point	West Point Treatment Plant
WTD	Wastewater Treatment Division
WWTS	wet weather treatment station
VFD	variable frequency drive

1 Introduction

The King County (County) Wastewater Treatment Division (WTD) is responsible for managing the County's regional wastewater system, which consists of both separate and combined systems. This document presents WTD's annual combined sewer overflow (CSO) and consent decree (CD) report for calendar year 2023 for the combined portion of the regional system. The report includes a description of the progress made implementing WTDs' Combined Sewer Overflow Control Program. Furthermore, this annual report fulfills requirements under the National Pollutant Discharge Elimination System (NPDES) permit for the County's West Point Treatment Plant (West Point) (WA0029181) in Seattle and requirements in Washington Administrative Code (WAC) 173-245-090. King County submits CSO annual reports to the Washington State Department of Ecology (Ecology).

The NPDES permit for West Point was renewed on December 19, 2014, and became effective on February 1, 2015. The application for renewal of the NPDES permit for West Point was submitted in January 2019. The current NPDES permit expired on January 31, 2020, and Ecology issued a new permit, effective June 1, 2024.

On July 3, 2013, a CD, Civil Action No. 2:13-cv-677, between the U.S. Environmental Protection Agency (EPA), Ecology, and King County was finalized. Section VIII of the CD requires submittal of an annual report detailing implementation of the CD. With agreement from EPA and Ecology, beginning with the 2014 annual report, the CSO and CD annual reports were consolidated into one report. This annual report meets the CD, WAC, and NPDES requirements.

CSO control is critical to King County because CSOs are a recognized source of water pollution that can result in temporary increases in bacterial counts, aesthetic degradation of shorelines, long-term adverse impacts on sediment quality at discharge points, and raised public health concerns in areas where there is potential for human contact. Protection of water quality and compliance with environmental regulations are top priorities for King County. WTD is working to ensure the County is able to meet the required milestones and actions of the CD.

This report documents King County's CSO Control Program and CD implementation activities and information for the 2023 calendar year on the following topics:

- Implementation of early action and long-term CSO control plan measures
- CSO volumes and frequency of overflows (including overflow durations and associated rainfall data)
- Information on any CSO-related bypasses at West Point
- Information on any dry weather overflows (DWOs)
- Updates on implementation of the CD
- Sewer System Operations Plan (SSOP) implementation

- Implementation of the Joint Operations and System Optimization Plan (JOSOP) between WTD and Seattle Public Utilities (SPU)
- Coordination between WTD and SPU on CSO control programs and projects
- NPDES permit compliance for the King County wet weather treatment stations (WWTSs)
- Coordination with SPU on implementation of source control best management practices (BMPs) in King County CSO basins

The following sections provide background on King County's wastewater system, its CSO Control Program, and NPDES and CD requirements.

1.1 King County CSO System

King County provides wholesale wastewater conveyance and treatment of flows from 34 constituent agencies in the greater Seattle metro area, including 18 cities, 15 local sewer utilities, and one tribal government. King County's wastewater service area includes more than 1.9 million residents of King, Pierce, and Snohomish counties.

The majority of WTD's service area has separate pipes to (a) convey wastewater to WTD's treatment systems and (b) convey stormwater to local receiving water bodies. However, much of the City of Seattle (Seattle) is served by a combined sewer system that conveys wastewater and stormwater runoff in the same pipes. Within Seattle, WTD's responsibility begins where the City of Seattle's pipes have collected sewage from areas greater than 1,000 acres and conveyed the sewage to WTD's system. WTD conveys most of the flow from Seattle (including most of the combined sewage flows) to West Point in Discovery Park. A small amount of sewage from Seattle is treated at WTD's South Treatment Plant in Renton (South Plant).

When large storms occur and flows exceed the capacity of the County's combined conveyance system, CSOs may occur at any of the 38 County CSO locations that discharge to Lake Washington, Lake Union, the Lake Washington Ship Canal (Ship Canal), the Duwamish River, Elliott Bay, and Puget Sound (Figure 1). CSOs may also occur at Seattle's 82 CSO locations in their local sewer system. SPU is responsible for separately managing and reporting on those locations.

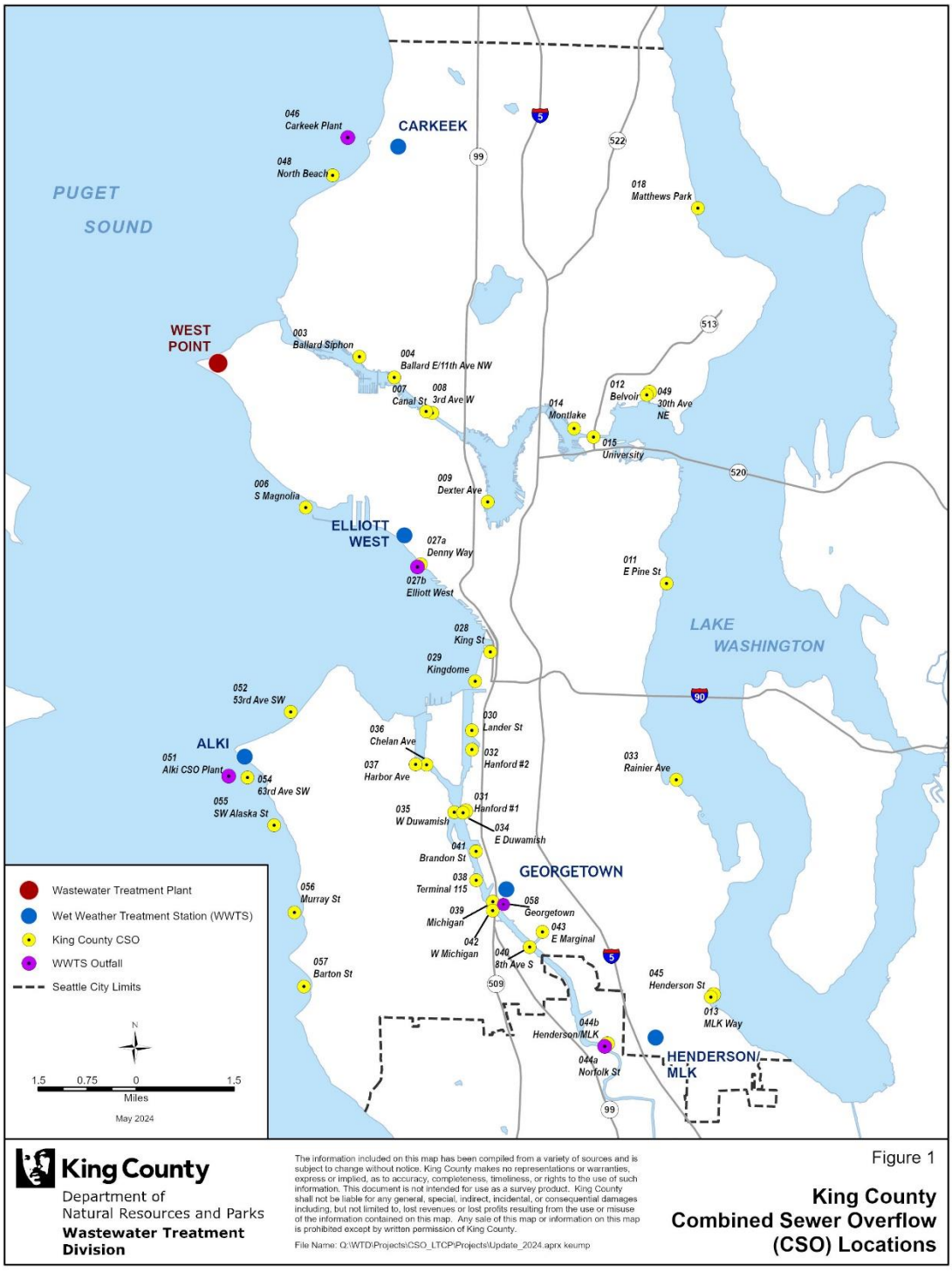

Figure 1. King County CSO Locations

1.2 CSO Long-Term Control Plans, Amendments, and Updates

Since the 1970s, the Municipality of Metropolitan Seattle (Metro) and its successor, King County, have been implementing CSO control projects to improve water quality in the Seattle area. King County does this under a long-term control plan (LTCP) that is amended or updated with each renewal of West Point's NPDES permit. Before each CSO Control Plan update, the County reviews the plan and progress made toward CSO control and compares its existing program against conditions that may have changed since the last update (e.g., flow patterns, scientific developments, changed regulations, new technologies, and public priorities). Significant changes may require adjustment of the CSO Control Plan and, potentially, the CD.

1.2.1 CSO Control, 1968–2012

In 1968, the Forward Thrust Bond issue was approved, and extensive sewer separation was completed through 1977 in the Seattle area.

Metro first formalized CSO control with the 1979 CSO Control Program, which was developed in cooperation with EPA and Seattle. The 1979 program identified nine Metro projects to reduce the number of CSO events into fresh water (Lake Washington, Lake Union, and the Ship Canal). In 1985, the Washington State Water Pollution Control Act (Chapter 90.48 RCW [Revised Code of Washington]) introduced new regulations that required all municipalities with CSOs to develop plans for "the greatest reasonable reduction at the earliest possible date." Metro prepared the 1986 Final Supplemental Plan for Secondary Treatment Facilities and Combined Sewer Overflow Control to meet this requirement.

Before the 1986 Plan could be implemented, Ecology promulgated new regulations (WAC 173-245-020) that defined "greatest reasonable reduction" to mean "control of each CSO such that an average of one untreated discharge may occur per year." Metro worked with Ecology to develop an interim goal of 75 percent reduction of CSO volumes system-wide by the end of 2005. Metro's Final 1988 Combined Sewer Overflow Control Plan identified 11 CSO control projects designed to meet this interim goal.

King County took over responsibility for operating and maintaining the regional wastewater system from Metro in 1994. As part of the 1995 NPDES permit renewal for West Point, King County prepared an update and amendment to the 1988 Plan. The 1995 CSO Control Plan Update assessed the effectiveness of CSO reduction efforts to date, reevaluated priorities for control of CSO sites, and identified three control projects for completion between 1995 and 2000.

In the late 1990s, King County developed a major update to its comprehensive sewerage plan, including both the combined and separated systems, called the 1999 Regional Wastewater Services Plan (RWSP). During that period, Ecology agreed to discontinue the 75 percent volume reduction interim target for County CSO control to allow prioritization of control projects according to public health and environmental

benefit rather than volume. The final RWSP adopted by the King County Council in 1999 included a revision to the 1995 Plan Update that consisted of 21 control projects to complete system control by 2030. The revision was included with the June 2000 submission of the West Point NPDES permit renewal application as the Year 2000 CSO Control Plan Update. The 2000 Plan Update described King County's progress in CSO control, documented its compliance with CSO control requirements, and identified two large control projects—Denny Way/Lake Union and Henderson/Martin Luther King (MLK)/Norfolk CSO control projects—for completion in the next five-year NPDES permit cycle. The resulting Elliott West Wet Weather Treatment Station (Elliott West WWTS)/Mercer Street Treatment Tunnel (Mercer St. Treatment Tunnel) and Henderson/Martin Luther King Jr. Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS) came online in spring 2005.

In the RWSP, the King County Council called for a review of the County's CSO Control Program ahead of the NPDES permit renewal application and update to the 2000 Plan Update that was expected to be due in 2005. Issuance of the NPDES permit took longer than expected, pushing back the due date for the next application to 2008. King County completed the review in 2006 as the basis for the 2008 CSO Control Plan Update, which was then submitted as a part of the NPDES permit renewal application in 2008. The 2008 Plan Update described the County's wastewater system, control status of its CSOs, and overall progress toward CSO control; outlined how the County met EPA's Nine Minimum Controls; and summarized the scientific studies that have shaped the control program over time. The 2008 Plan Update also described planned, in-progress, and completed CSO control projects. No changes to the 1999 RWSP CSO Control Plan were recommended, and King County committed to implementing the first four of the RWSP CSO projects: Barton Street, Murray Avenue, South Magnolia, and North Beach, collectively known as the "Puget Sound Beach Projects."

In 2012, the County completed a three-year review of the CSO Control Program. The 2012 Long-Term Control Plan (LTCP) Amendment (2012 LTCP) was approved by the King County Council in September 2012. The 2012 LTCP was submitted to Ecology and EPA on November 20, 2012, ahead of the June 2013 application date for the NPDES permit renewal and as part of the CD negotiations.

The approved projects in the 2012 LTCP emerged from an evaluation of new conditions, opportunities, science, regulations, and community input since the last major CSO plan update in 1999. Project alternatives were developed for all uncontrolled CSOs to determine which were the most cost-effective. The approved 2012 LTCP is the County's current plan to construct nine projects to control 14 CSOs by the end of 2030. The approved plan includes conducting green stormwater infrastructure (GSI) early, ahead of traditional CSO control projects, for four projects, to reduce the size of the gray infrastructure needed to control CSOs. The plan is consistent with the CSO CD, which governs the completion of these projects.

1.2.2 CSO Control Planning

In January 2019, King County submitted its 2018 CSO Program Update as part of West Point's NPDES permit renewal, consistent with WAC 173-245-090 and King County Code 28.86.080. Since that time, King County has continued CSO planning efforts to understand the impact of changing conditions that influence program implementation and success. Section 1.3 of this report contains more information on the related proposal for CD modification. The next LTCP amendment deadline is December 1, 2028.

1.2.3 Future Updates to King County's Comprehensive Sewer Plan

In 2018, concurrent with LTCP implementation, King County began working on an update to the RWSP, its comprehensive wastewater plan. The updated process was called the Clean Water Plan. The purpose of the Clean Water Plan effort, as defined in 2018, was to assess all the demands on King County as the regional wastewater utility, including CSOs, and to plan a future direction for the regional system that makes the right investments at the right time. An overall objective of the Clean Water Plan was to amend the RWSP.

At the end of 2021, King County decided to pause the Clean Water Plan process to fully consider external feedback received and to develop adjustments that respond to that feedback. In addition, the County also recognized that two major regulatory efforts underway, Ecology's Puget Sound Nutrient General Permit and negotiations with Ecology and EPA regarding CSOs, have significant financial and policy effects on the Clean Water Plan and that the associated uncertainty affects long-term planning.

The County continued the pause in the Clean Water Plan process through 2023, allowing for the possibility of more regulatory clarity, which will give the County the opportunity to be responsive, adjust the planning process, and restart planning.

King County is restarting the planning process in 2024 to:

- develop a vision for clean water that will guide wastewater investments over the next 50 years;
- update RWSP policies in King County Code; and
- develop a capital plan that ensures the County continues to meet legal obligations and protect water quality, public health, and the environment through its wastewater system.

1.3 Consent Decree

After the King County Council approved the 2012 LTCP, King County submitted the LTCP to Ecology and EPA for approval. EPA and Ecology approved the County's LTCP as meeting federal requirements on March 7, 2013. This approved version became the basis for settlement of a complaint under the Clean Water Act brought by EPA and

Ecology, resulting in the CD between King County, EPA, and Ecology. The CD was formally filed in U.S. District Court on July 3, 2013.

The CD commits King County to implement various CSO control measures and compliance activities to achieve full compliance with the Clean Water Act, applicable state law and regulations, and terms and conditions of the West Point NPDES permit, and to meet the requirements of EPA's CSO control policy. The CD also commits King County to complete construction of all CSO control projects by December 31, 2030. Compliance activities described in the CD include the following:

- Implementation of CSO control projects in accordance with milestones established in the CD
- Development of a SSOP and JOSOP
- Establishment of conditions for developing supplemental compliance plans to implement remedial measures for CSO control projects
- Establishment of requirements for proposals to substitute, in part, GSI control measures for gray infrastructure control measures

Meeting the conditions set forth in the CD is a high priority for King County. To date, the County has met all conditions outlined in the CD with four exceptions, that is, for one milestone associated with the Chelan CSO control project, one milestone associated with the West Duwamish CSO control project, and one milestone each associated with the University and Montlake CSO control projects. On October 28, 2019, King County submitted a formal request to EPA and Ecology to delay the interim CD milestones for the Chelan CSO control project (specifically, "Completion of Bidding" and "Construction Completion" milestones) to match the milestones in the CD for Hanford #2, Lander, King, and Kingdome (HLKK) Wet Weather Station (retitled as the "Mouth of Duwamish Wet Weather Facilities").

On June 9, 2021, King County submitted a force majeure claim to EPA and Ecology for the West Duwamish CSO control project. The County submitted the claim anticipating missed milestones due to unanticipated additional time for coordination of parties involved with the plan for cleanup of legacy contaminants and the associated process to complete the property purchase from the Port of Seattle. Additional supporting information was sent in 2022. The force majeure claim was rejected by EPA and Ecology in October 2022. King County invoked the dispute resolution process, which has been extended through mid-2024 based on continued progress with the negotiations discussed below to modify the CD.

In conjunction with the October 28, 2019, request to align the Chelan CSO control project with the Mouth of Duwamish project (HLKK) milestones, the County also requested to initiate negotiations to modify the CD to accommodate changed conditions from 2013 when the CD was filed. The changed conditions include climate change that has increased the size of CSO control projects necessary to achieve compliance, additional wastewater system asset management needs, rising costs and other regional financial factors, and additional regulatory compliance obligations. The County, EPA,

Ecology, and the Department of Justice (in coordination with the City of Seattle) were engaged throughout 2023 in negotiations to modify the CD to address these changed conditions.

1.4 Sediment Sampling and Analysis

In 1999, King County prepared a sediment management plan to address contaminated sediment at County CSO locations. The plan was updated, and the resulting King County Sediment Management Plan (SMP) 2018 Update was sent to Ecology on November 2, 2018. The SMP update proposes a strategy for assessing and managing potential or determined sediment impacts related to the County's CSOs to meet permit obligations as well as providing information needed to plan for required or anticipated future cleanup actions. The SMP update also describes all King County CSO discharge locations, summarizes ongoing and previously performed sediment cleanup work, summarizes the results of CSO discharge modeling, and provides the status of existing sediment quality.

As part of the update process, a predictive sediment contamination model for CSO discharges was developed. Supplemental sediment sampling data at CSO outfall locations were collected in 2012 (ten locations), 2014 (six locations), 2015 (one location), 2018 (one location), and 2022 (one location). The sediment quality data report for the 2022 sampling at MLK Jr. Way/Henderson Pump Station overflow was submitted to Ecology in 2023. Sediment data were collected in 2023 at the Barton Street Pump Station Overflow location. A sediment quality data report will be submitted to Ecology in 2024.

The NPDES permit (§S13.B, p. 41) requires post-construction monitoring once CSO control projects are completed. The County's approved Post-Construction Monitoring Plan (PCMP) requires characterization by sampling or modeling to calibrate and verify model performance. The post-construction monitoring results for several overflows per the approved quality assurance project plan were provided to Ecology in 2018 and 2019. No post-construction monitoring was required in 2023.

In 2023, the County developed an addendum for sediment characterization at Barton Street Pump Station to the PCMP's Appendix C ("Sampling and Analyses Plan") for characterizing sediment quality at CSO outfall locations (King County 2022).

1.5 Organization of this Report

Subsequent sections and appendices in this report present the following information:

- Information on implementation of EPA's Nine Minimum Controls (Section 2)
- Table showing the 20-year average frequency of untreated CSO events (Table 3)
- Status of CSO control projects in design or construction (Section 4)
- Discussion of 2023 rainfall and untreated and treated CSO events (Section 5)

- Detailed individual event-based table for unpermitted overflows in 2023 (Table 6)
- Summary of CD violations in 2023 (Section 6)
- Description of post-construction monitoring (Section 7)
- Detailed individual event-based tables for untreated CSOs in 2023 (Appendix A)
- Detailed individual event-based tables for treated CSOs in 2023 (Appendix B)
- Annual reports for the four satellite wet weather treatment stations (WWTSs): Alki Wet Weather Treatment Station (Alki WWTS), Carkeek Wet Weather Treatment Station (Carkeek WWTS), Elliott West WWTS, and Henderson/MLK Jr. Way WWTS (Appendices C through F)

This report meets the requirements of annual reporting as defined by the CD, WAC, and the NPDES permit. The crosswalks shown in Table 1 indicate where information meeting the requirements of each can be found in this report.

Table 1. Consent Decree, Washington Administrative Code, and National Pollutant Discharge Elimination System Permit Regulations Crosswalks

CD Section	Content	Annual Report Location
VIII.43.a	(i) the status of all CD compliance measures, including Currently Underway and Early Action CSO Control Measures, the implementation of all CSO Control Measures in Appendix B, PCMP, SSOP, and Information Sharing/Coordination Program Plan Between County and the City of Seattle. (ii) any problems anticipated or encountered, along with the proposed or implemented solutions. (iii) any anticipated or ongoing operation and maintenance activities relating to all CSO Control Measures. (iv) remedial activities that will be performed in the upcoming year to comply with the requirements of this CD.	(i) 4.1 Project Summaries 4.2.1 Sewer System Operations Plan 4.2.2 JOSOP 4.2.3 WTD Coordination with SPU on CSO Control Projects 7.0 Post-construction monitoring (ii) Included in sections above, 5.4, and Appendices C–F for WWTSs (iii) 2.1 Reducing CSOs through Operations and Maintenance Appendices C–F for WWTSs (iv) All of the above
VIII.43.b	A description of any noncompliance with the requirements of this CD and an explanation of the likely cause and duration of the violation and any remedial steps taken, or to be taken, to prevent or minimize such violation.	2.1 Reducing CSOs through Operations and Maintenance 6.0 Summary of CD Violations Appendices C–F for WWTSs

WAC Section	Content	Annual Report Location
WAC 173-245-090(1)(a)	Details the past year's frequency and volume of combined sewage discharged from each CSO site or group of CSO sites in close proximity. The report shall indicate whether a CSO site or group of sites has increased over the baseline annual condition.	3.0 Control Status of CSO Locations 5.0 Summary of Rainfall and CSO Events Appendix A Untreated CSO Events Appendix B Treated CSO Events Appendices C–F for WWTSs
WAC 173-245-090(1)(b)	Explains the previous year's CSO reduction accomplishments.	4.1 Project Summaries
WAC 173-245-090(1)(c)	Lists the projects planned for the next year.	4.1 Project Summaries

NPDES Permit WA0029181	Content	Annual Report Location
S11.C.2	The CSO Annual Report must include the following information: a. A summary of the number and volume of untreated discharge events per outfall for that year. b. A summary of the 20-year moving average number of untreated discharge events per outfall, calculated once annually. c. An event-based reporting form (provided by Ecology) for all CSO discharges for the reporting period, summarizing all data collected according to the monitoring schedule in Special Condition S11.B.9. d. An explanation of the previous year's CSO reduction accomplishments. e. A list of CSO reduction projects planned for the next year. f. A list of which permitted CSO outfalls can be categorized as meeting the one untreated discharge per year on a 20-year moving average performance standard. This annual assessment may be based on historical long-term discharge data, modeling, or other reasonable methods as approved by Ecology. The Permittee must submit paper and electronic copies of the report, and Excel spreadsheet copies of significant spreadsheets.	3.1 Twenty-Year Moving Average of Event Frequencies Electronic Template submitted electronically with annual report; hardcopy of content in Appendices A and B
S11.B	The Permittee must document compliance with the nine minimum controls in the annual CSO report as required in Special Condition S11.C.	2.0 Programs to Meet EPA's Nine Minimum Controls
S11.F.b	The Permittee must report the running 20-year average number of overflow events per year during this permit term from these existing controlled CSO outfalls in the CSO annual report required in Section S11.C.	3.1 Twenty-Year Moving Average of Event Frequencies

2 Programs to Meet EPA's Nine Minimum Controls

The EPA's Nine Minimum Controls are actions that can be taken to minimize CSO impacts while long-term capital projects are underway. King County has implemented a number of programs to satisfy the requirements of the Nine Minimum Controls, which are part of EPA's codified CSO Control Policy and included in the West Point NPDES permit. The following sections describe King County's programs and activities regarding each of the Nine Minimum Controls, with emphasis on activities undertaken in 2023.

2.1 Control 1 – Reducing CSOs through Operations and Maintenance

Implement proper operations and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs. The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections.

West Point and South Plant staff manage proper facility operation using King County's supervisory control and data acquisition (SCADA) system. The SCADA system provides monitoring and control capabilities for the treatment plant collection systems. See Control 2 (Section 2.2) for information on King County's use of the SCADA system.

Under its Asset Management Program, King County employs asset management tools, including a standardized inventory system and condition rating systems, and is developing long-range asset replacement and renewal forecasts, including action plans, to replace assets. King County's 2018 Strategic Asset Management Plan Update set the priorities of the Asset Management Program and work plan, and WTD is now working on implementation of the plan's recommendations. The next Strategic Asset Management Plan Update will take place in 2024.

The Asset Management Program, implemented by West Point, South Plant, and Conveyance Inspection staff, ensures regular maintenance of CSO outfalls, regulator stations, and pump stations. Conveyance inspection staff inspect sewers on a specified schedule and perform corrective actions when deficiencies are found. In 2023, Conveyance Inspection staff inspected about 25,155 linear feet of sewers in the combined system. Maintenance schedules and records of visits are available for inspection upon request.

2.2 Control 2 – Storing CSOs in Collection System

Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system to reduce the magnitude, frequency, and duration of CSOs.

The West conveyance system is essentially a deep in-line tunnel system that conveys and stores a wide range of flows. Figure 2 shows the sizing of the largest in-line tunnels.

Maximizing storage in the conveyance system works in concert with maximizing conveyance to West Point to minimize overflows and obtain high-quality treatment for service area flows. The system has been built to operate as much as possible based on gravity flow and levels in the interceptors and trunks, with little operator intervention.

When levels reach predetermined set points, programmable logic controllers automatically adjust gates and pumps to manage the flows. These set points have been determined over the years by operational experience, hydraulic analysis, and modeling to balance conveyance to the treatment plant while maximizing storage in the pipelines and offline storage facilities and minimizing overflows and backups. Critical alarms and process data are communicated to the treatment plant operators using monitoring systems that report data in independent communication pathways from the control system.

To manage flows to and through West Point, operators at West Point's Main Control will remotely take control of certain facilities, primarily Interbay Pump Station (Interbay PS), to force storage in the Mercer St. Treatment Tunnel, and the West Seattle Pump Station to then force storage in the West Seattle Tunnel. The intent of this operations strategy is to avoid customer overflows and backups, avoid surges and oscillations in the plant, protect the biological system and avoid plant shutdown, optimize conveyance of flows to the plant for treatment, and maximize the use of system storage capacity.

Senior operators assess a range of system factors in making decisions to begin manual control, including the direction storms come from, how fast flows are changing, and antecedent conditions. Decisions require extensive senior operator experience, a sense for antecedent conditions, and the ability to anticipate changing flows.

Figure 2. King County Wastewater West System Pipeline Storage

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2.3 Control 3 – Optimizing Pretreatment Program

Review and modify, as appropriate, existing pretreatment program to minimize CSO impacts from discharges due to nondomestic users.

The King County Industrial Waste Program (KCIW) issues permits and discharge authorizations that set pollutant limits and other conditions on industrial discharges to protect worker safety, local and regional sewer infrastructure, treatment plants, recycled products, and water quality. The program includes the following activities: permitting, inspecting, sampling, monitoring, enforcement actions, engineering reviews and approvals of pretreatment systems, and technical assistance to businesses on appropriate waste pretreatment and disposal techniques. KCIW has a cost recovery program to recoup program costs as well as an awards program for companies and other entities who demonstrate excellent compliance.

For permit issuance, KCIW works with Ecology and local sewer agencies during the permit application and renewal process to allow for review and comment. Local discharge limits are reviewed on a regular basis according to Ecology requirements. KCIW submits an annual pretreatment report to Ecology detailing permitting, sampling, inspections, and enforcement actions taken during the previous calendar year, as well as an evaluation of influent, effluent, and biosolids data focusing on loading and removal rates.

Influent and effluent quality at West Point is assessed for trends that would suggest concurrent changes in CSO discharges. In addition, biosolids quality data from West Point are tracked as an indicator of changed loading to the system that could influence CSO quality. No specific new trends were observed in 2023 in pollutant concentrations. Biosolids concentrations are relatively stable and well below EPA standards. Beginning in 2016, KCIW began to include the downstream CSOs to which each permitted industrial discharger contributes in its annual pretreatment report submitted to Ecology.

The Hazardous Waste Management Program (HWMP) implements the 2021 Hazardous Waste Management Plan approved by the Washington State Department of Ecology. The plan guides management of moderate risk wastes, defined as hazardous wastes generated by residents and small quantity generators (typically small businesses and other organizations generating less than half a drum of hazardous waste per month).

The Hazardous Waste Management Program provides on-site technical assistance visits to small-quantity generators (SQGs) that often fall below the threshold for receiving a discharge authorization or permit from KCIW. The Program provides assistance to prevent discharges of hazardous material and waste to sanitary sewer system and storm drains. The Program offers financial incentives, such as vouchers to reimburse eligible businesses 75 percent of their costs (up to $599), for most recommended improvements or pollution prevention equipment. In 2023, the team also offered vouchers for 75 percent of costs up to $5,000 to replace hazardous degreasers

with safer products. Collateral materials are another financial incentive the Program offers during a visit, such as spill kits, spill management plans, secondary containment tubs, and other items to encourage immediate adoption of common best practices. Residents and eligible SQGs can use the Program's hazardous waste disposal locations.

King County is currently implementing the third five-year Source Control Implementation Plan (SCIP) for the Lower Duwamish Waterway, which covers activities from 2024 to 2028. Per the SCIP, King County submits Source Control Annual Reports documenting source control activities for that period. The Source Control Annual Report documenting 2022 activities was submitted to Ecology in October 2023. The Source Control Annual Report for 2023 activities will be submitted in 2024.

KCIW and the Sediment Management Program (as well as King County Stormwater Services and the King County International Airport) participate in the Lower Duwamish Waterway Source Control Work Group, which was formed to promote discussions of source control issues that may affect sediment remediation of the Lower Duwamish Waterway. The group's participants include King County, City of Seattle, Port of Seattle, the City of Tukwila, Washington State Department of Transportation, and the two agencies with regulatory responsibility for different aspects of Lower Duwamish Waterway sediment remediation (i.e., Ecology and EPA). Ecology is the lead agency for this group, which has been meeting regularly for several years.

2.4 Control 4 – Maximizing Flow to Treatment Plant

Operate the POTW [publicly owned treatment works] at maximum treatable flow during all wet weather flow conditions to reduce the magnitude, frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.

The 2014 SSOP describes how maximizing storage in the conveyance system works in concert with maximizing conveyance to the treatment plant to minimize CSOs and obtain high-quality treatment for service area flows. As described in Control 2 (Section 2.2) and shown in Figure 2, the West conveyance system is essentially a deep in-line tunnel system that can convey a wide range of flows to West Point. SCADA is used to maximize flow to the secondary treatment plant while protecting the biological treatment system via operation of regulators and pump stations.

The parallel Fort Lawton Tunnel was built in 1992 to convey up to 440 million gallons per day (MGD) of flow to West Point. West Point provides secondary treatment for all base flows (defined by Ecology as 2.25 times the average wet weather flow) up to 300 MGD, and primary treatment for all flows between 300 MGD and the designed instantaneous peak hydraulic capacity of 440 MGD. CSO/primary treated flows are mixed with secondary effluent for disinfection, dechlorination, and discharge from the deep marine outfall. The resulting effluent must meet secondary effluent quality limits,

with a small reduction (i.e., 80 percent instead of 85 percent removal during the wet season months of November through April) in total suspended solids (TSS) percent removal requirements.

Up to 24 MGD of combined flows are conveyed to South Plant from southeast Seattle to receive full secondary treatment. This conveyance minimizes CSOs to the Duwamish River along the Elliott Bay Interceptor.

Where captured CSOs cannot be conveyed to secondary treatment plants because of conveyance system limitations, flows are conveyed to WWTSs where they receive primary treatment and disinfection before being discharged. King County currently operates five Wet Weather Treatment Stations (WWTSs): Alki WWTS, Carkeek WWTS, Elliott West WWTS, Henderson/MLK Jr. Way WWTS, and Georgetown WWTS. The Georgetown WWTS came online at the end of 2022.

Treatment process stability is monitored and optimized to manage flows based on information from automatic sensors and an array of analytical tests. Process control laboratories at each plant conduct testing and analysis, and then recommend adjustments to the processes, if necessary, to ensure that quality treatment is provided.

2.5 Control 5 – Preventing Dry Weather Overflows

Dry weather overflows from CSO outfalls are prohibited. The Permittee must report each dry weather overflow to the permitting authority as soon as it becomes aware of the overflow. When it detects a dry weather overflow, the Permittee must begin corrective action immediately and inspect the dry weather overflow each subsequent day until it has eliminated the overflow.

The County provides enough capacity in the combined sewer system to transfer 2.25 times the average wet weather flow to secondary treatment, as negotiated with Ecology. As a result, overflows during dry weather are not the result of a lack of capacity. During dry weather, the County only experiences overflows in the combined system when problems such as power outages, mechanical failures, or human error occur. Similarly, during wet weather, CSOs occurring as a result of precipitation may be exacerbated by power outages, mechanical failures, or human error. King County takes each of these overflows seriously, and they are immediately corrected and reported to Ecology (see Section 5.2).

To minimize the risk of a DWO due to power loss at a pump station, generators and automatic power transfer systems were installed at pump stations throughout the system, greatly reducing the risk of overflows associated with a loss of power. To minimize the risk of mechanical failure, the King County Asset Management Program maintains a Strategic Asset Management Plan that is updated on a five-year cycle. The plan, which was updated in 2018, includes an assessment to determine the criticality of pump station equipment. This assessment identifies assets essential to pumping sewage; inspection and maintenance routines have been developed to increase service time and reduce failures for these assets. Assessments and evaluations are

continuously updated to reduce the likelihood of system failure. These efforts will contribute to reducing overflows by decreasing the probability of mechanical failures. The next Strategic Asset Management Plan update will take place in 2024.

Operations and maintenance (O&M) programs, as described for Control 1 (Section 2.1), focus on eliminating DWOs and exacerbated CSOs. The conveyance system is monitored through SCADA and direct inspection, and corrective action is taken immediately if a problem occurs. Equipment problems are immediately reviewed, and repair or replacement is undertaken in a timely manner.

2.6 Control 6 – Controlling Solids and Floatables

Implement measures to control solid and floatable materials in CSOs.

The majority of floatables in the King County system are captured in the large volume of wastewater transferred to the treatment plants before overflows occur.

The County routinely engages in the following practices to control floatables:

- Capturing the "first flush" (maximizing flow to treatment plants) so that most solids and floatables that do enter the sewer are conveyed to the secondary treatment plants for removal and disposal before pipelines reach overflow conditions.
- Constructing facilities with gates and weirs that retain and minimize the release of solid and floatable materials. Gates are set to maximize flow containment. Baffles are used in front of weirs to help hold back all but the smallest items in the flow that passes over them.
- Coordinating with SPU on measures to reduce the washing of street solids and trash into sewers via stormwater and to promote proper disposal of trash so that it is not flushed down toilets. SPU's catch basin maintenance program limits the introduction of floatable materials to sewers.
- Educating the public on keeping trash and grease out of the sewers (http://www.kingcounty.gov/services/environment/wastewater/education/protect-environment/flush-trouble.aspx).

2.7 Control 7 – Preventing Pollution

Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters.

The following section describes the programs that comprise King County's pollution prevention program to reduce sources of flows and contaminant loading within the combined basins. It also describes ongoing efforts in 2023 to coordinate with SPU programs to ensure pollution prevention programs align, cover the geographic area

fully, and are comprehensive in addressing all pollution types (i.e., solid waste, wastewater, stormwater, hazardous waste, etc.). This section is divided into subsections that describe existing industrial and commercial programs, community programs, and stormwater programs.

Programs to Support Pollution Prevention with Industrial and Commercial Discharges

KCIW, along with the County's Hazardous Waste Management Program, implements activities to provide source control within the combined sewer system. Industrial facilities throughout Seattle that are permitted by KCIW are required to limit the discharge of chemicals and other substances to sanitary sewers that might adversely impact the environment and the wastewater treatment process. KCIW also manages construction dewatering permits within Seattle that propose to discharge wastewater to the sanitary sewer system.

KCIW established local discharge limits in public rule for various pollutants of concern, including the discharge of fats, oils, and grease (FOG) from a petroleum or mineral origin (nonpolar FOG) to 100 milligrams per liter. Industries must use oil/water separators to pretreat oily wastewater to prevent harm to the biological phase of wastewater treatment. They also must submit plans for the separators to the local sewer utility or to KCIW for review and approval before installing the separators. FOG from an animal or a vegetable origin (polar FOG) can block sewer lines. Although polar FOG has no hard numerical limit, dischargers are required to minimize free-floating polar FOG and may be required to complete a FOG control plan for KCIW's review and approval. Polar FOG has a screening level, but limits can be established on a case-by-case basis.

King County also prohibits discharge to the sanitary sewer of materials such as ashes, sand, grass, and gravel. Industrial wastewater must contain less than 7 milliliters per liter of solids capable of settling. Food waste, including food-grinder waste, must be capable of passing through a 0.25-inch sieve.

King County is currently implementing the third five-year SCIP for the Lower Duwamish Waterway, which covers activities from 2024 to 2028. The Plan includes working with Lower Duwamish businesses on pollution prevention as well as County-performed source tracing activities and compliance with water quality permits and regulations at County-owned and -operated facilities. The activities conducted under the Plan are summarized in a series of source control annual reports that are submitted to Ecology. The 2022 activities report was prepared in 2023 and submitted to Ecology in October 2023. The 2023 source control activities associated with the third five-year Plan will be summarized in a report developed in 2024.

The Hazardous Waste Management Program's Business Services team provided on-site education and assistance to small-quantity generators of hazardous waste in Seattle. Best practices reviewed on-site included proper storage, management, and

disposal of hazardous products and hazardous wastes, including spill prevention and preparedness. Eligible sites with over-accumulated or abandoned hazardous waste received help through no-charge disposal at collection facilities and financial incentives. The safer degreaser project helped businesses use safer products instead of hazardous degreasers, ranging from aerosols to parts washers. Business Services team began a partnership with Seattle Housing Authority to help them achieve their goal of using safer cleaning products instead of hazardous products. Business Services checked SQG wastewater discharges and pretreatment structures. Business owners and property managers are educated on discharge limits (KCIW and stormwater) and proper use and maintenance of on-site structures. For example, sites with oil/water separators overdue for maintenance were provided with financial assistance to pump out and repair them. Business Services team responds to referrals for assistance from SPU's stormwater and pollution prevention program.

Programs to Support Community Pollution Prevention

King County and Seattle manage several general public education and outreach efforts and specific waste collection/reduction programs for the purpose of reducing contaminant discharges to the sanitary sewer and stormwater systems in combined basins (e.g., water conservation programs, Adopt-a-Road, Adopt-a-Street, recycling resources). Both KCIW and the Hazardous Waste Management Program maintain extensive online program information and availability of resources and events. The Hazardous Waste Management Program manages no-charge hazardous waste collection services for household and eligible business wastes (e.g., seasonal events and hazardous waste collection facilities). The Program emphasizes resource investments for system change to reduce the threat of hazardous materials to health and the environment.

For example, the Hazardous Waste Management Program works with partners to extend producer responsibility for collection and proper disposal of hazardous products at end of life. Such programs include standards for convenient public access to safe collection sites, such as retail, thrift stores, and mail-back options. In 2023, the Washington State Legislature passed a law creating a product stewardship program for batteries, with a statewide collection system to be established by 2027. Existing product stewardship programs in Washington include safe medication return, mercury lamps, paint, solar panels, and E-waste.

The Haz Waste Program earned the EPA Safer Choice Partner of the Year, for the sixth year in a row, for promoting the use of Safer Choice certified products. A summary of activities and video are available at this link: 2023 Safer Choice Partner of the Year Award Winners | US EPA.

King County and Seattle also collaborate on various campaigns, including "Puget Sound Starts Here" and "Don't Drip and Drive," that provide free clinics to educate owners on how to inspect and repair automotive fluid leaks (e.g., oil and antifreeze). The agencies also promote proper pest waste disposal, and Seattle maintains "Mutt Mitt" plastic bag

stations throughout the city. Seattle also stencils facilities or posts other signs to prevent dumping or discharge of wastes in the storm drainage systems. Educational materials on controlling trash disposal to sewers are also addressed as part of the larger public information programs described in Control 6 (Section 2.6).

In partnership with SPU, WTD has administered the RainWise Program since 2013. This program provides rebates to homeowners living in specific combined sewer areas for installing rain gardens and cisterns on their own property. RainWise helps to slow, detain, or retain stormwater, which reduces both the volume and timing of combined sewer flows as well as sources of pollution into the combined system. As of December 31, 2023, WTD has rebated 1,125 projects in King County CSO basins. These projects capture runoff from over 1.37 million square feet of roof area on private property, controlling an estimated 15.79 million gallons (MG) of stormwater per year.

WTD funds and administers the WaterWorks Grant Program to help nonprofit organizations, local agencies, educational institutions, and community groups implement small-scale projects to improve water quality and to support the success of King County's CSO projects by controlling new and ongoing sources of pollution that could harm the environment or re-contaminate cleaned-up areas in local waterways. The projects also help promote partnerships around source control, develop local expertise in water quality protection, and enhance small-scale environmental and economic opportunities in the community. The projects are all within the sewer service area and help King County residents protect their long-term investment in water quality.

Since the WaterWorks Grant Program started in 2015, the program has funded 305 projects at a total funding of $22.8 million. The grant cycle is biennial, and the next grant cycle begins in 2025. In 2023, 61 new projects were awarded $5.5 million in funding. These projects are expected to protect water quality, control pollution, and build healthy communities. The projects include a variety of approaches, such as restoring stream and riverbanks, installing rain gardens, educating students and teachers, training youth in water quality job skills, monitoring water quality, and conducting research. In addition, 39 previously funded projects were also completed in 2023.

Implementation of Source Control Actions in CSO Basins

WTD and SPU staff coordinate the mutual tracking and sharing of information on stormwater pollution prevention BMPs that are implemented within combined basins consistent with the provisions of each agency's NPDES permit. Because all of King County's CSOs serve areas within the City of Seattle's boundaries, Seattle's management and maintenance activities under their Stormwater Code and Side Sewer Code provide many of the source control actions commonly recognized as most effective for reducing contaminant discharges in CSO systems. Seattle provides area-wide services for solid waste collection, street sweeping, spill response, water quality complaint investigations, stormwater system maintenance, and catch basin cleaning. At WTD-owned facilities within Seattle, O&M staff also perform spill response, drainage facility maintenance, and catch basin cleaning. Both King County and SPU maintain

hotlines for the reporting of illegal dumping. The County routes reports to the appropriate jurisdictional entity for cleanup of sites.

Seattle Municipal Code, Chapters 22.800 through 22.808, contains the City of Seattle's Stormwater Code, which is Seattle's primary means of implementing the following requirements: (a) to practice stormwater pollution prevention during construction; (b) to reduce the introduction of pollutants into stormwater runoff as close to the source as possible; and (c) to install flow control, stormwater treatment facilities, or both depending on the size and nature of a project. The Stormwater Code is implemented through the "Directors' Rule," promulgated jointly by the director of SPU and the director of the Seattle Department of Construction and Inspections. The Stormwater Code and Manual establish SPU's authority to implement mandatory citywide BMP requirements as follows:

- Illicit Connection Identification and Elimination: Under this provision, sanitary side sewer systems must be inspected for illicit connections of sanitary or process wastewater flows. In addition, SPU and WTD also conduct inspections for illicit connections when they are suspected or determined to exist within a basin.
- Routine Maintenance: This program requires property owners to annually inspect, maintain, and periodically clean approved stormwater facilities such as collection, conveyance, catch basins, and treatment systems (e.g., oil/water separator), and properly dispose of wastes.
- Proper Disposal of Fluids and Wastes: The City of Seattle requires all real property to implement proper liquid waste storage, disposal, and runoff prevention measures.
- Proper Storage of Solid Wastes: The City of Seattle requires all real property to implement proper solid waste storage and disposal practices.
- Spill Prevention and Cleanup: This provision requires businesses and real properties that load, unload, store, or manage liquids or erodible materials (e.g., stockpiles) to maintain spill plans, equipment, and practices to prevent and clean spills as well as notification procedures for spills to the drainage and sewer systems.
- Provide Oversight and Training for Staff: Businesses and public entities that have activities requiring BMPs are required to have trained personnel for their implementation.
- Site Maintenance: Businesses and public entities that involve materials or wastes that may come into contact with stormwater are required to implement proper housekeeping practices to minimize discharge of contaminants such as inspections; avoidance measures (containment, covering, or locating activities away from drainage systems); and sweeping and cleaning procedures.
- Rooftop Dog Runs: Rooftop dog runs must be sized to minimize the volume of stormwater discharged to the sanitary sewer or combined sewer systems.

Ecology has determined that the City of Seattle's Stormwater Code and Manual are equivalent to Ecology's Surface Water Design Manual for Western Washington. This equivalency establishes the city's legal authority to control discharges to and from municipal stormwater systems. SPU has a citywide pollution prevention program and performs actions such as spill response and catch basin inspection and cleaning. These actions are conducted in WTD CSO basins in the spirit of coordination. Finally, both WTD and SPU conduct stormwater drainage and mapping programs to document the boundaries of separated, partially separated, and combined basins.

In reviewing the pollution prevention programs in combined basins described above, both WTD and SPU have determined that existing legal authorities are sufficient to effectively administer and implement these programs. Accordingly, WTD and SPU will implement the pollution prevention program that is consistent with each agency's NPDES permits and provide benefits to each agency's combined sewer system.

King County coordinates with SPU to implement pollution prevention actions (e.g., spill response, water quality complaint response, and street sweeping) in areas of the city served by County CSO facilities. SPU provides pollution prevention actions in County CSO basins, as follows, but is not responsible for the County's NPDES permit compliance:

- Water Quality Complaints: SPU inspectors respond to complaints as they are received through the water quality hotline, webpage, or agency referrals. This program provides outreach and education on proper BMPs to residents and businesses within the City of Seattle.
- Spill Response: SPU's on-call spill response coordinators are dispatched through the SPU Operations Response Center to assist with spill investigation and cleanup activities as they are received.
- Street Sweeping: SPU coordinates with the Seattle Department of Transportation to conduct street sweeping on arterials in Seattle using high-efficiency regenerative air street sweepers.

Actions to Address Contaminants of Emerging Concern

King County interested parties are eager to learn and understand the direction and influence of new scientific as well as federal and state regulatory developments aimed at addressing the potentially harmful effects of contaminants of emerging concern (CECs) in the environment. In late 2022, King County, working in conjunction with a consortium of research professionals (Washington State University, Puyallup Research and Extension Center, University of Washington Tacoma, and the National Oceanic and Atmospheric Administration), issued a final report to the King County Council in response to Ordinance 19210 (Toxics in King County Wastewater Effluent, Evaluating the Presence of Toxic Elements in the Effluent of Treatment Plants). The report presented initial investigative information about the presence and potential effects of exposures to CECs for a suite of currently regulated and unregulated chemicals in the

effluent of the County's regional wastewater treatment plants (West Point, South Plant, and Brightwater). The tests included analyses for the emerging class of PFAS compounds (per-and polyfluoroalkyl substances, coined as "forever chemicals" due to their persistence in the environment); pharmaceutical and personal care product categories of chemicals; and other legacy pollutants such as polychlorinated biphenyls (PCBs).

In October 2023, the King County Council adopted a related motion requesting WTD to continue work "to identify, prioritize, reduce, and control sources, exposures, and risk" from persistent chemicals including sampling from potential major sources, new regulations or limits on PCBs and PFAS, voluntary action plans, and coordination with agencies and partners.

In 2023, EPA continued its rapid implementation of activities under the "Strategic Roadmap" for PFAS, which is focused on developing analytical laboratory methods, initiating rules to adopt environmental protection standards for sensitive uses of water (e.g., protection of aquatic life and public health), treatment technology assessment, and regulatory guidance under the Clean Water Act. In 2023, WTD staff continued implementation and participation in research and planning projects related to understanding CECs, including initiating a one-year-long sampling effort to evaluate CECs in the regional treatment systems on a monthly basis through 2024.

Additionally, WTD participated in ongoing scientific research with other utility and academic organizations, and continued existing work plans, studies, and other leadership initiatives. WTD also coordinated with other efforts in support of the King County Council's resolutions and the Department of Natural Resources and Parks' (DNRP) other divisional programs with related management, science, and laboratory services responsibilities for chemicals (Solid Waste, Water and Land Resources), as well the programs of the County's Executive Leadership.

2.8 Control 8 – Notifying the Public

Implement a public notification process to inform the citizens of when and where CSOs occur. The process must include (a) a mechanism to alert persons of the occurrence of CSOs and (b) a system to determine the nature and duration of conditions that are potentially harmful for users of receiving waters due to CSOs.

King County operates a CSO Notification and Posting Program as a joint project with the City of Seattle and Public Health–Seattle & King County. This program includes signs at publicly accessible CSO locations, an information phone line, websites, and other public outreach activities. In 2017, SPU and DNRP developed a new CSO outfall sign design with more languages, a link to the CSO overflow website, and a new phone number that is staffed 24 hours a day. DNRP fabricated and installed the new signs in 2019.

Installation of the signs at SPU's CSO outfalls was partially completed in 2021 and 2022 due to O&M staffing reductions resulting from the COVID-19 pandemic. SPU is planning to complete installation of the signs at their remaining CSO outfalls in 2024.

King County maintains a mobile-friendly website that provides real-time notification of recent and current CSO discharges within the City of Seattle (https://kingcounty.gov/en/dept/dnrp/waste-services/wastewater-treatment/sewer-system-services/cso-status.aspx). The website presents a map with overflow status for the majority of Seattle and County CSOs, with links to and from each agency's independent websites. This information helps people make decisions about using local waters for recreational activities. King County responds to inquiries from the public who have questions about using the map and the data it presents.

In 2023, the "CSO status" webpages had 9,616 page views (representing 8,204 unique page views). This represented a nine percent increase in page views from 2022, during which there were 8,839 page views.

2.9 Control 9 – Monitoring CSO Outfalls

Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls.

This must include collection of data that will be used to document the existing baseline conditions, evaluating the efficacy of the technology-based controls, and determining the baseline conditions for the LTCP. These data must include:

- Characteristics of the combined sewer system, including the population served by the combined portion of the system and locations of all CSO outfalls in the combined sewer system.
- Total number of CSO events and the frequency and duration of CSOs for a representative number of events.
- Locations and designated uses of receiving water bodies.
- Water quality data for receiving water bodies.
- Water quality impacts directly related to CSOs (e.g., beach closing, floatables, wash-up episodes, fish kills).

In 1986, Metro began a sampling program to characterize each CSO and identify high-priority sites for early control. The program included collecting overflow quality data for five CSO sites per year and collecting sediment samples at each site. In the 1990s, sampling was expanded to assess compliance with Washington State Sediment Management Standards. The County's extensive monitoring for its 1999 CSO Water Quality Assessment of the Duwamish River and Elliott Bay found that the majority of risks to people, wildlife, and aquatic life would not be reduced by removal of CSOs because most risk-related chemicals come from sources other than CSOs. Under the

previous NPDES permit for West Point effective July 1, 2009, King County developed a comprehensive sediment quality summary report for all CSO discharge locations (submitted December 2009 and supplemented in 2018).

A summary of the report includes discussion of receiving water characteristics based on sampling results from the County's long-term marine ambient and point source monitoring program. Overall, the study showed that ambient water in the Duwamish area met the Washington State water quality standards for aquatic life or EPA's recommended human health criteria for metals.

The report can be found at: http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/SedQuality/0912_CompSedQualSumRptCSODischargeLoc.pdf. https://www.kingcounty.gov/~/media/services/environment/wastewater/cso/docs/sed-qual/2018-Comprehensive-Sediment-Quality-Summary-Report.ashx?la=en.

Using all sediment data collected over the years, the County tracks sediment quality status at all CSO locations. Two locations identified as needing further investigation had sediment data collected in 2022 (at the MLK Jr. Way/Henderson Pump Station Overflow location) and in 2023 (at the Barton Street Pump Station Overflow location). A sediment quality data report for MLK Jr. Way/Henderson Pump Station Overflow was submitted to Ecology in 2023. A sediment quality data report for Barton Street Pump Station Overflow will be submitted to Ecology in 2024. The sediment quality status will be updated to reflect the results. The status can be found at: Plan implementation - King County, Washington

King County's PCMP is designed to assess, document, and report on the effectiveness of its CSO Control Program in achieving performance requirements and complying with state water and sediment quality standards. (See also Section 7 for additional information.) The King County PCMP was submitted to Ecology in July 2010 and was approved on September 28, 2012. It can be found at: http://your.kingcounty.gov/dnrp/library/wastewater/cso/docs/ProgramReview/2012/AppH_CSO_PostConstructionMonitoringPlan,Sept2012.pdf.

The County provided the post-construction monitoring results for several overflows per the approved quality assurance project plan to Ecology in 2018 and 2019. No post-construction monitoring was required in 2023.

3 Control Status of CSO Locations

3.1 Twenty-Year Moving Average of Event Frequencies

The Washington State CSO performance standard is defined in WAC 173-245-020(22) as “control of each CSO in such a way that an average of one untreated discharge may occur per year.” According to the West Point NPDES permit, effective July 1, 2009, Ecology evaluates compliance with the CSO performance standard annually based on a 20-year moving average. The CD also recognizes this performance standard. The number of untreated discharges that occurred over each of the previous 20 years is reported for each outfall in Table 3 along with the 20-year moving average. This moving average is used each year to assess compliance with the CSO performance standard.

However, since the upgraded SCADA system was fully brought online in 2005 and began to report data for all sites over time, a full 20 years of data are not available for all sites. Locations lacking the full 20 years of measured data are noted. For sites where new control facilities have been built and lack the 20 years of post-construction measured data, the table substitutes modeled data of the new facilities’ simulated performance with the historic rainfall over those years for the unavailable measured data.

The following 17 CSO outfalls, with the corresponding discharge serial number (DSN), were identified as controlled through the monitoring and modeling data:

1. 53rd Avenue Southwest Pump Station Overflow, 052 (53rd Ave. SW PS)
2. 8th Avenue South Overflow, 040 (8th Ave. S)
3. Ballard Siphon Overflow, 003
4. Canal Street Overflow, 007 (Canal St.)
5. Dexter Ave. Regulator Station Overflow, 009 (Dexter Ave. RS)
6. East Duwamish Pump Station Overflow, 034 (E Duwamish PS)
7. East Marginal Way Pump Station Overflow, 043 (E Marginal Way PS)
8. East Pine Street Pump Station Overflow, 011 (E Pine St. PS)
9. Harbor Avenue Regulator Station Overflow, 037 (Harbor Ave. RS)
10. Henderson Street Pump Station Overflow, 045 (Henderson St. PS)
11. Martin Luther King Junior Way Overflow, 013 (MLK Jr. Way)
12. Matthews Park Pump Station Overflow, 018 (Matthews Park PS)
13. Murray Avenue Pump Station Overflow, 056 (Murray PS)
14. Norfolk Street Overflow, 044a (Norfolk St.)
15. Rainier Avenue Pump Station Overflow, 033 (Rainier Ave. PS)
16. Southwest Alaska Street Overflow, 055 (SW Alaska St.)
17. West Duwamish Overflow, 035 (W Duwamish)

The following four CSOs, with the corresponding DSN, are out of control and were identified as needing supplemental compliance activities according to the requirements of the CD:

1. Denny Way Regulator Station Overflow, 027a (Denny Way RS)
2. Barton Street Pump Station Overflow, 057 (Barton St. PS)
3. South Magnolia Overflow, 006 (S Magnolia)
4. Hanford #1 Overflow, 031 (Hanford #1)

Section 4.1 of this report contains more details on supplemental compliance actions.

The following outfalls, with the corresponding DSN, were in control when the CD was signed, but have since trended out of control. A letter was submitted to Ecology in December 2017 acknowledging that Belvoir PS Overflow fell out of control in 2016. Another letter was submitted to Ecology in May 2018 acknowledging that 63rd Ave. SW PS Overflow fell out of control in 2017. Additionally, 2023 represents the second consecutive year that the 20-year moving average for 30th Avenue Northeast Overflow and North Beach Pump Station Wet Well Overflow have exceeded one event/year after previously being controlled. Per the West Point NPDES permit, the County is initiating corrective action to review monitoring information and maintenance practices at the following outfalls:

1. 63rd Avenue Southwest Overflow, 054 (63rd Ave. SW)
2. Belvoir Pump Station Overflow, 012 (Belvoir PS)
3. 30th Ave. Northeast, 049 (30th Ave NE)
4. North Beach Pump Station Wet Well, 048a (North Beach PS)

Section 4.2 of this report contains more details on corrective actions.

The following two outfalls, with the corresponding DSN, were identified as needing post-construction monitoring to determine their control status after CSO project construction completion in 2022:

1. Brandon Street Regulator Station Overflow, 041 (Brandon St. RS)
2. South Michigan Street Regulator Station Overflow, 039 (S Michigan St. RS)

Table 2 and Figure 3 further demonstrate the control status of all King County CSOs. The table and figure are broken down by control status category and differentiate between uncontrolled CSOs that have projects currently underway, CSOs that have drifted out of control due to operational changes and climate change, and future projects that are planned.

Table 2. Outfall Control Status by Category

Outfall Status	Number of Outfalls
Controlled	17
Uncontrolled – project underway	9

Uncontrolled – under supplemental compliance[a]	4
Uncontrolled – previously controlled[b]	4
Uncontrolled – future project	2
Project complete – post-construction monitoring	2

[a] Supplemental compliance projects are a requirement of the CD and are only applicable to the projects contained within.

[b] These projects were considered controlled at the time the CD was signed and have since trended out of control.

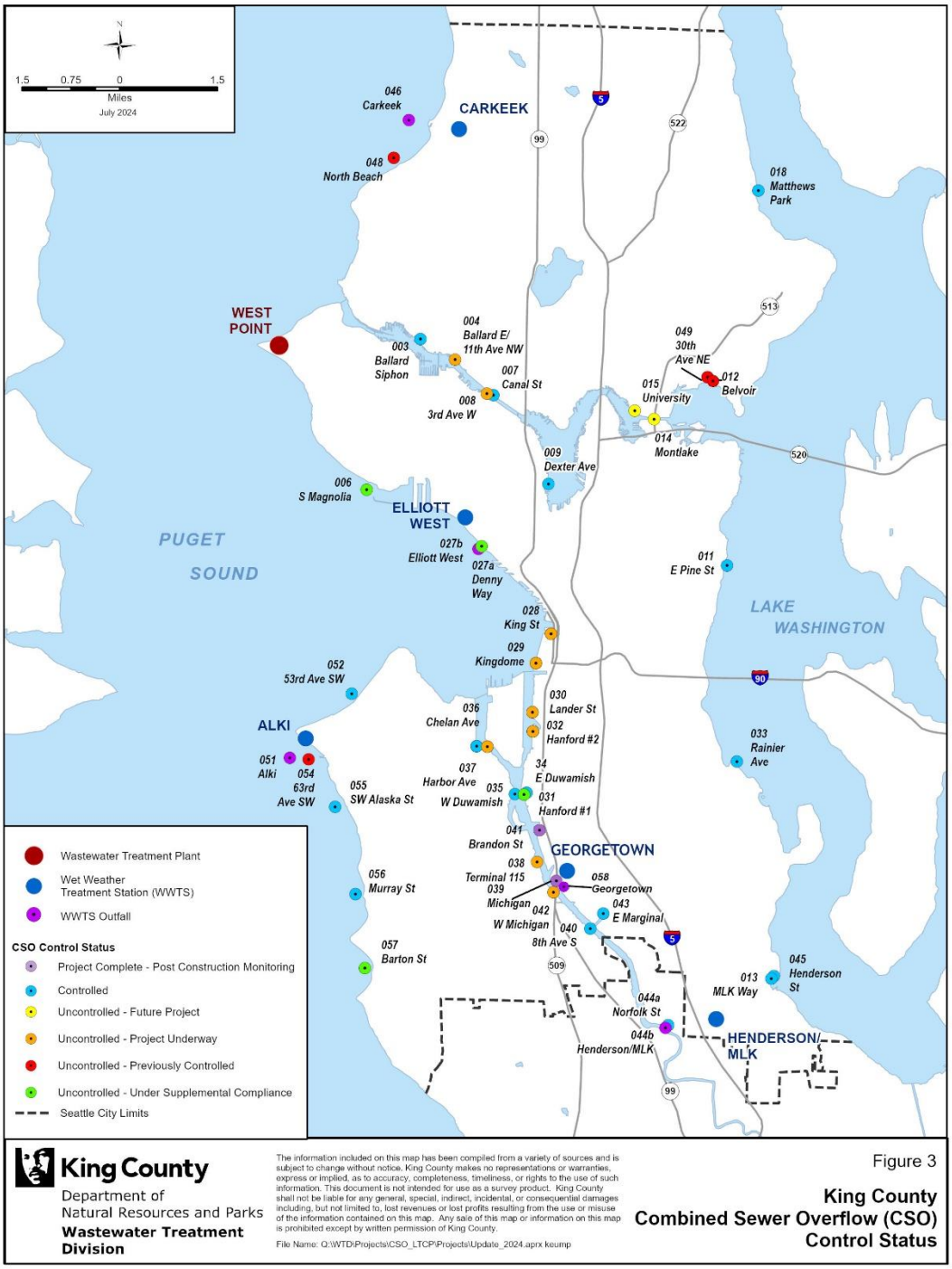

Figure 3. King County CSO Outfall Control Status

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Table 3. King County Untreated CSO Events, Averages and Baselines, 2004–2023[8]

Overflow Name	Discharge Serial Number (DSN)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	20-Year Average[1]	5-year Average	1983 Baseline (24-hr inter-event)
Ballard Siphon	003	***0***	***1***	***0***	***0***	***0***	***0***	***0***	***1***	***0***	***0***	2	0	0	0	0	0	1	0	0	1	0.3	**0.4**	13
11th Ave. NW[2]	004	6	11	22	10	7	16	19	16	20	12	25	17	22	21	13	10	18	20	9	14	**15.4**	**14.2**	16
S Magnolia[2,10]	006	***1***	***0***	***0***	***1***	***0***	***1***	***2***	***2***	***1***	***3***	***1***	***4***	***1***	***0***	***0***	2	2	1	3	1	**1.3**	**1.8**	25
Canal St.	007	0	0	0	1	0	1	1	0	1	0	1	1	0	0	0	1	1	1	0	0	0.5	**0.6**	1
3rd Ave. W[3]	008	4	5	13	6	3	9	8	7	13	5	12	7	5	6	7	2	9	6	10	4	**7.1**	**6.2**	17
Dexter Ave. RS	009	***1***	***0***	***1***	***1***	***0***	***0***	***0***	***0***	***0***	***0***	***1***	***3***	0	0	0	0	1	0	0	0	0.4	**0.2**	15
E Pine St.	011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	**0.0**	1
Belvoir PS	012	2	0	1	1	0	0	2	0	1	1	1	5	2	2	1	1	1	2	5	2	**1.5**	**2.2**	1
MLK Jr. Way[4]	013	***0***	***0***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	**0.0**	16
Montlake RS	014	5	6	NM	0	1	3	10	8	18	7	22	15	16	12	7	6	11	9	13	6	**9.2**	**9.0**	6
University RS	015	4	3	12	5	3	9	8	6	13	4	14	11	9	7	7	2	7	4	9	3	**7.0**	**5.0**	13
Matthews Park PS	018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	**0.0**	1
Denny Way RS	027a	***1***	***0***	***2***	***2***	***0***	***1***	***2***	***1***	***1***	***1***	***2***	***4***	***2***	***1***	***0***	0	1	1	2	0	**1.2**	**0.8**	32
King St. RS	028	15	20	27	7	3	15	18	15	13	2	22	19	14	3	4	3	6	7	6	8	**11.4**	**6.0**	16
Kingdome RS	029	2	5	4	5	1	8	6	2	11	6	22	17	12	16	15	5	16	7	8	5	**8.7**	**8.2**	29

Control Status of CSO Locations

Lander St. RS	030	9	8	28	8	6	19	17	15	25	8	29	17	25	21	19	9	28	23	20	16	**17.5**	**19.2**	26
Hanford #1[2]	031	***0***	***0***	***4***	***1***	***0***	***3***	***2***	***2***	***2***	***3***	***3***	***3***	***2***	***3***	***1***	2	7	4	5	3	**2.5**	**4.2**	30
Hanford #2 RS	032	16	15	26	12	8	17	17	15	23	9	26	16	24	18	17	9	28	23	18	15	**17.6**	**18.6**	28
Rainier Ave. PS	033	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	**0.0**	1
E Duwamish PS[2]	034	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	**0.3**	**0.4**	1
W Duwamish[2, 5]	035	NM	1	0	1	0	0	1	0	0	1	0	1	0	1	0	1	1	1	2	0	**0.6**	**1.0**	1
Chelan Ave. RS	036	1	2	5	2	0	0	3	4	13	4	12	13	9	10	8	2	5	4	10	4	**5.6**	**5.0**	7
Harbor Ave. RS	037	***0***	***1***	***1***	***2***	***0***	***1***	***2***	***1***	***1***	***0***	***1***	***3***	***1***	***2***	***0***	1	1	0	0	0	**0.9**	**0.4**	30
Terminal 115[2, 6]	038	0	2	7	4	0	3	3	0	1	1	0	1	1	2	1	1	1	1	2	1	**1.6**	**1.2**	4
S Michigan St. RS[11]	039	***0***	***1***	***2***	***2***	***0***	***1***	***2***	***0***	***1***	***1***	***0***	***1***	***1***	***1***	***0***	***0***	***1***	***0***	***1***	1	**0.8**	**0.6**	5
8th Ave. S	040	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	2	5	1	**0.6**	**2.0**	6
Brandon St. RS[7,11]	041	***0***	***1***	***2***	***2***	***0***	***0***	***1***	***0***	***1***	***3***	***1***	***1***	***0***	***0***	***0***	***1***	***1***	***0***	***2***	***1***	**0.9**	**1.0**	36
W Michigan St.	042	1	3	8	4	0	8	9	3	5	2	3	6	9	6	4	1	3	4	6	2	**4.4**	**3.2**	34
E Marginal Way PS	043	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	**0.0**	1
Norfolk St.[4]	044a	***0***	***0***	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	**0.2**	**0.4**	20
Henderson St. PS [4]	045	***0***	***0***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**	**0.0**	12
North Beach PS[2, 9]	048	***0***	***0***	***0***	***1***	***0***	***0***	***1***	***2***	***1***	***1***	***1***	***2***	1	3	2	1	1	2	4	1	**1.2**	**1.8**	18
30th Ave. NE[2]	049	NM	NM	NM	NM	NM	NM	NM	NM	NM	0	2	3	1	0	1	0	1	2	2	1	**1.2**	**1.2**	1

Control Status of CSO Locations

53rd Ave. SW PS	052	0	0	2	1	1	0	0	0	1	0	0	1	0	1	0	0	2	2	1	0	**0.6**	**1.0**	<1
63rd Ave. SW	054	0	1	0	0	0	0	1	1	3	2	2	4	5	5	1	1	2	2	3	1	**1.7**	**1.8**	2
SW Alaska St.[2]	055	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	**0.4**	**0.4**	1
Murray St. PS	056	***0***	***0***	***2***	***1***	***1***	***1***	***1***	***0***	***1***	***2***	***1***	***2***	***0***	1	1	1	1	0	0	0	**0.8**	**0.4**	5
Barton St. PS	057	***0***	***2***	***1***	***3***	***2***	***2***	***0***	***0***	***1***	***3***	***1***	***2***	***0***	***0***	***1***	2	2	1	2	3	**1.4**	**2.0**	9

Notes: Modeled numbers are shown in *italics* with an underline and a blue background. NM = not monitored.

[1] Blue 20-year averages are those that meet the no more than one event per year on a 20-year average and, therefore, are in control. Black 20-year averages are for uncontrolled basins.

[2] Portable monitors are used at 11th Ave. NW, 30th Ave NE, SW Alaska St., E Duwamish, W Duwamish, Hanford #1, S Magnolia, North Beach PS Inlet, and Terminal 115. The Hanford #1 (Bayview North) monitor was installed in 2010; the Hanford #1 (Bayview South) monitor was installed in 2011.

[3] The 3rd Ave. W monitor was down June 2006 through November 2006.

[4] Henderson, MLK Jr. Way, and Norfolk St. were controlled as of 2006. Modeled data through 2005 (in italics) have been substituted to simulate how current facilities would have performed under historic rain patterns during that time

[5] Monitoring began at W Duwamish in June 2005.

[6] Monitoring began in June 2003 at Terminal 115.

[7] The monitor at Brandon St. RS was down June 2006 to March 2008. A portable monitor was installed in March 2008. Monitoring by SCADA was restored beginning with the 2009 period.

[8] A quality control check was performed on Table 3, Untreated CSO Events, Averages and Baselines, 2004-2023, to identify and correct previous counting errors.

[9] Per West Point Treatment Plant's 2024 NPDES permit, DSN 048b (North Beach Pump Station Inlet Structure) will no longer be reported as a separate outfall from DSN 048a (North Beach Pump Station Wet Well). These outfalls have been combined in this table.

[10] Review of monitoring data found that two CSO events previously reported at S Magnolia (one in 2020 and one in 2021) did not occur. These events were removed from this table and annual averages have been updated.

[11] Post construction monitoring is taking place at S Michigan St. RS and Brandon St. RS and operational adjustments were being made through 2023 after Georgetown WWTS came online in 2022. Modeled data have been used to simulate how current facilities would have performed under historic rain patterns during that time.

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4 CSO Control Measures Currently Underway

This section describes the progress made toward implementing current CSO control projects and other projects that affect CSO control. It includes project-specific summaries of progress made in 2023, planned activities for 2024, and the status of each project relative to the schedule of CD milestones.

The CD requires the County to report on projects that are underway and the status of early action CSO control measures. Table 4 summarizes the CD milestone statuses through 2023. Figure 3 shows the locations of the CSOs and the status of the related project(s).

Table 4. Summary of King County Consent Decree Milestones through 2023

CSO Name (Project Name)	DSN	Current CD Commitment	Current Status
Barton Street Pump Station (Barton St. Roadside Raingardens and Barton St. PS Upgrades)	057	Updated Supplemental Compliance Plan submitted to Ecology August 30, 2022. Ongoing conversations took place with Ecology through 2023 and a revised amendment to the Supplemental Compliance Plan was submitted on December 21, 2023. Control status to be reported in Annual Reports.	Corrective actions being performed per Supplemental Compliance Plan.
Ballard Siphon Regulator (Ballard Siphon Project)	003	CSO outfall controlled by December 31, 2014	Outfall controlled December 2014.
Chelan Ave. (Chelan Ave. CSO Project)[i]	036	Completion of bidding by December 31, 2020	Request to modify milestones submitted to regulators 10/25/2019 and reiterated in a 3/25/2021 letter.
Brandon St./S. Michigan St. (Georgetown Wet Weather Treatment Station)[i]	039, 041	Construction completion by December 31, 2022	Construction completion milestone achieved. Performing post-construction monitoring.
Hanford #2 /Lander St. /King St. /Kingdome (Mouth of Duwamish Wet Weather Facilities)[i]	032 030 028 029	Submit Facility Plan by December 31, 2024	Project planning underway. Request to modify CD submitted on October 28, 2019. Request included combination with Chelan milestones and extending

CSO Name (Project Name)	DSN	Current CD Commitment	Current Status
			completion beyond 2030.
Montlake (Project Name TBD)[i]	014	Submit Facility Plan by December 31, 2023	Uncontrolled – future project. Request to modify CD submitted on October 28, 2019. Request included extending completion beyond 2030.
Murray Street Pump Station (Murray Wet Weather Storage Project)	056	CSO controlled by December 31, 2017	Outfall controlled December 2017
North Beach Pump Station (North Beach Wet Weather Storage Project)	048a, 048b	CSO outfall controlled by December 31, 2016	Outfall controlled December 2016. In 2022, 048a trended out of control. Initiating corrective action per West Point NPDES permit.
Hanford #1 (Rainier Valley Wet Weather Storage Project)[i]	031	Did not meet control performance standard; Supplemental Compliance Plan submitted August 28, 2020; progress reported annually; control status to be determined in July 2024	Corrective actions being performed per Supplemental Compliance Plan
11th Ave. NW/3rd Avenue West (Ship Canal Water Quality Project)[ii]	004, 008	(For King County) construction completion by December 31, 2025	Project construction underway
South Magnolia (South Magnolia Wet Weather Storage Project)	006	Updated Supplemental Compliance Plan submitted to Ecology August 30, 2022. Progress reported annually. Ongoing conversations took place with Ecology through 2023 and a revised amendment to the Supplemental Compliance Plan was submitted on March 20, 2024.	Corrective actions being performed per Supplemental Compliance Plan.
University (Project Name TBD)[i]	015	Submit Facility Plan by December 31, 2023	Uncontrolled – future project. Request to modify CD submitted on October 28, 2019. Request included

CSO Name (Project Name)	DSN	Current CD Commitment	Current Status
			extending completion beyond 2030.
W. Michigan St. Regulator/Terminal 115 (West Duwamish Wet Weather Storage Project)[i]	038, 042	Completion of bidding by December 31, 2022	Project design underway. Site was part of Ecology cleanup order but concluded in 2023 that no cleanup was needed.
Dexter Ave. Regulator (Dexter Ave. Supplemental Compliance Plan)	009	Supplemental Compliance Plan submitted August 2013; control status to be reported in 2016 Annual Report	Outfall controlled July 2016
Denny Way Regulator (Denny Way Supplemental Compliance Plan)	027a	Updated Supplemental Compliance Plan submitted to Ecology August 30, 2022. Progress reported annually. Control status to be determined in 2034 Annual Report after completion of the Mouth of Duwamish Wet Weather Facilities.	Corrective actions being performed per Supplemental Compliance Plan
Harbor Ave. Regulator (Harbor Ave. Supplemental Compliance Plan)	037	Updated Supplemental Compliance Plan submitted to Ecology August 30, 2022. Control status to be determined in 2023, 2024, and 2025 Annual Reports.	Monitoring for achievement of performance standard. Based on 2004–2023 data, outfall is controlled.

[i] Capital project set forth in Appendix B of the CD.

[ii] Per October 25, 2016, Non-Material CD Modification. CD Appendix A refers to two stand-alone CSO outfalls, East Ballard (aka 11th Ave. NW) and 3rd Ave. W and Ewing St. (aka 3rd Ave. NW). The referenced CD modification allows these two outfalls to be controlled as part of the Ship Canal Water Quality Project in collaboration with the City of Seattle. SPU interim CD milestones will be used to measure progress but are not part of the King County CD modification because SPU is the project lead, and their dates are earlier than the County's CD dates for a collaborative project in the non-material CD modification.

Project Summaries

A summary project status page for 2023 for each active project follows. These project summaries do not include past completed projects or upcoming projects.

Projects in progress include the following:

- Georgetown Wet Weather Treatment Station
- Ship Canal Water Quality Project
- West Duwamish Wet Weather Storage Project
- Chelan Ave. CSO Project
- Mouth of Duwamish Wet Weather Facilities
- Elliott West Wet Weather Treatment Station Project

CD/CSO Report Project Status

Georgetown Wet Weather Treatment Station

CSO(s): DSN 041 (Brandon St. RS Overflow) and DSN 039 (S. Michigan St. Overflow)

Project Description: Construct a WWTS, associated conveyance, and marine outfall. For more information, see:
https://kingcounty.gov/depts/dnrp/wtd/capital-projects/active/georgetown.aspx

Milestones	CD Milestone Date (Actual Date)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Submission of Facilities Plan	12/31/2015 (Draft submitted 11/2/2015)												
Completion of Bidding	12/31/2017 (11/30/2017)												
Construction Completion	12/31/2022 (11/22/2022)												
Achievement of Performance Standard	4/30/2025 (N/A)												

2023 Accomplishments:

- Completed commissioning of the facility with contractor
- Achieved Final Acceptance on the treatment station
- Continued to verify performance compliance for CD

2023 Challenges and Corrections:

- As storm and treatment events occur, continued to tune and optimize the treatment processes.

2024 Activities in Progress or Expected:

- Continue to fine tune the treatment processes
- Continue verifying performance compliance for CD

CD/CSO Report Project Status

Ship Canal Water Quality Project

CSO(s): DSN 008 (3rd Ave. W Outfall) and DSN 004 (11th Ave. NW Outfall)

Project Description: The Ship Canal Water Quality Project (Ship Canal Project) is a joint SPU–WTD project that will control CSOs from SPU's Wallingford, Fremont, and Ballard areas (Outfalls 147, 150, 151, 152, and 174) and WTD's 3rd Avenue West (DSN 008) and 11th Avenue Northwest (DSN 004) outfalls.

SPU is the lead agency for design and construction, and will own, operate, and maintain the tunnel and its related structures. (WTD will continue to own its two outfall structures.) WTD is coordinating with SPU on the project through a Joint Project Agreement (JPA) approved by the Seattle and King County councils in July 2016. The JPA guides implementation, operation, and cost-sharing of the Ship Canal Project. The County is providing funding and technical expertise and participates in the JPA-mandated Joint Oversight and Project Review and Change Management Committees.

This project is in both King County and the City of Seattle's CDs. For more information, see: https://www.seattle.gov/utilities/neighborhood-projects/ship-canal

As project lead, more details are also provided in SPU's Annual CD/CSO Report.

Milestones	CD Milestone Date (Actual Date)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Submission of Draft Facilities Plan	3/31/2017 (1/15/2016)[1]													
Completion of Bidding	7/1/2021 (12/26/2019)[2]													
Construction Completion	12/31/2025[3] (N/A)													
Achievement of Performance Standard	12/31/2026[4] (N/A)													

Notes: CD Milestones and Actual Dates are SPUs except for Construction Completion, which is the same for both agencies. WTD's CD does not have interim milestones for the joint City–County storage tunnel.

[1] The formal County submittal date was 1/22/2016.

[2] This was the completion of bidding for the tunnel construction contract, which, per Ecology, qualified as achieving this CD milestone. Bidding (Notice to Proceed) for the remaining major portions (pump station, conveyance, etc.) is projected to be completed by 2024.

[3] The CD calls for construction to be complete by the end of 2025. However, regulators have been notified that construction is behind schedule and will likely not be complete by the end of 2025. Both SPU and King County have submitted supporting information and documentation to regulators regarding the delay. No determination has yet been made or extension granted.

[4] Achievement of Performance Standard will follow one year after construction completion.

2023 Accomplishments:

- Construction of the Storage Tunnel work package continued. Mining was completed on both the 2.7-mile-long, 18-ft and10-in.-diameter storage tunnel and the 8-ft-diameter conveyance tunnel under the Ship Canal. Significant progress was made at each of the five drop shaft sites, including below-grade piping and structures, as well as build-out of the facilities inside the drop shafts.
- The Tunnel Effluent Pump Station (TEPS)/Ballard Conveyance work package team opened construction bids and ultimately decided not to award the contract after receiving only one bid for approximately $65M over the project budget. The work package team evaluated changes to the contract documents to attract more bidders for a future rebid. Updated rebid documents were then completed by the end of 2023.
- The Wallingford Conveyance work package started construction and completed structural work on the new flow diversion structure and new piping.

2023 Challenges and Corrections:

- The storage tunnel work package's tunnel boring machine (TBM), MudHoney, encountered buried tiebacks, which were previously installed to support construction of a below-grade parking garage. MudHoney was able to successfully mine through the tiebacks using special, reduced-speed operations and frequent interventions, as recommended by the boring machine manufacturer.
- The storage tunnel's electrical subcontractor went out of business in 2023, causing a delay in completion of some work. The prime contractor is working with the bonding company to procure a replacement contractor. This delay is not expected to impact the critical path of the overall program.
- The single, very high bid received for the TEPS/Ballard Conveyance work package caused the project team to pivot and evaluate options for awarding the contract or rebidding the contract. Following a decision to rebid, a separate effort was made to evaluate changes that could be made to the project and contract terms to attract more bidders and reduce costs. The result of the rebid process is an approximate 11-month delay to the work package and to the critical path of the overall program. The decision to rebid and its rationale were shared with EPA and Ecology.
- Slower-than-planned tunnel mining of the 2.7-mile-long, 18-ft and10-in.-diameter storage tunnel caused a delay for the Wallingford Conveyance work package. The Wallingford Conveyance contractor had to delay work on N 35th St. until the tunnel boring machine had completed tunnel mining in that street and had been successfully dismantled and removed from the East Shaft site. With the decision to rebid the TEPS/Ballard Conveyance contract, this delay did not impact the critical path of the overall program.
- Both SPU and King County are working with regulators to address the project delay and CD requirements and have submitted force majeure notices and

provided routine updates to address the potential effects of construction-related delays on the project milestones.

2024 Activities in Progress or Expected:

- The storage tunnel work package will complete construction but will not be placed into service until completion of the TEPS/Ballard Conveyance work package. SPU will monitor equipment and alarms and perform maintenance on equipment until the entire facility is put into operation.
- The combined TEPS/Ballard Conveyance work package will complete the rebidding process and begin construction. Bids are expected in late March 2024. The conformed documents will be submitted to Ecology and EPA for approval of final plans and specifications.
- The Wallingford Conveyance work package will achieve substantial completion but will not be placed into service until completion of the TEPS/Ballard Conveyance work package. SPU will monitor equipment and alarms, as well as perform maintenance on equipment, until the entire facility is put into operation.
- Conduct outreach to contractors ahead of the bid advertisement for the combined TEPS/Ballard Conveyance work package.
- Deliver project briefings at organizations, boards, and/or associations focused on potential project impacts to trees, bicycles, pedestrians, residents, and industry.
- Continue to deliver listserv updates, notices, and mailers along the project work areas, as appropriate and necessary.
- Continue stakeholder briefings and attend community meetings. Community outreach regarding construction impacts will be a focus prior to the start of construction for the TEPS/Ballard Conveyance work package.
- Provide project information via fact sheets, website, listserv, and other materials.

CD/CSO Report Project Status

West Duwamish Wet Weather Storage Project

CSO(s): DSN 038 (Terminal 115 Overflow) and DSN 042 (West Michigan Regulator Overflow)

Project Description: Construct a storage tank. For more information, see: https://kingcounty.gov/depts/dnrp/wtd/capital-projects/active/west-duwamish-cso-control.aspx

Milestones	CD Milestone Date (Actual Date)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Submission of Facilities Plan	12/31/2020 (12/22/2020)											
Completion of Bidding	12/31/2022 (N/A)											
Construction Completion	12/31/2025 (N/A)											
Achievement of Performance Standard	(N/A)											

2023 Accomplishments:

- Submittal and review of the 60 percent and 90 percent design packages, including plan drawings, specifications, equipment list, basis of design report, 3-D design, permitting package, geotechnical data, and geotechnical engineering reports.
- Acceptance by Ecology's Toxics Cleanup Program of the final Remedial Investigation Report for the parcel intended for construction. No further cleanup action is indicated.
- Approval of tax separation of the parcel (in lieu of sub plat).
- Submittal of all required building and construction permit packages to the various permitting agencies.
- Continued community briefings through project website, mailings, and community events. Initiated partnerships with community groups and a local college to promote education and family wage jobs in the trades and with King County.

- Continued RainWise Program activities in South Park and Highland Park.

2023 Challenges and Corrections:

- King County and Ecology continued confidential negotiations regarding the CD milestones.
- Additional monitoring and updating of reports and State Environmental Policy Act checklist was required in compliance with the shoreline substantial development permit and Section 106 requirements related to State Revolving Fund loans. With the status of “no action required” related to the soil and groundwater, approvals of the various permitting agencies are now on the critical path.

2024 Activities in Progress or Expected:

- Development of the pre-100-percent package, specifications, construction bid package.
- Initiation of construction contractor procurement.
- Continue submittal and review responses of all construction-related permitting.
- Procurement of Construction Management Services.
- Continue acquisition of proposed storage tank property.
- Additional borings in compliance with Inadvertent Discovery Plan requirements.
- Continue community outreach and benefit activities, community workforce agreement activities.
- Continue RainWise Program activities in South Park and Highland Park.

CD/CSO Report Project Status

Chelan Avenue CSO Control Project

CSO(s): DSN 036 (Chelan Ave. RS Overflow)

Project Description: This project will control the Chelan Avenue CSO to one event per year on a 20-year moving average. On October 28, 2019, King County sent a letter to EPA and Ecology to formally request initiation of negotiations to modify the CD. The letter also requested a delay of two interim milestone dates associated with the Chelan Avenue CSO to match the milestones in the CD for the Mouth of Duwamish Wet Weather Facilities.

WTD continued capital delivery work on Chelan Avenue CSO in 2023. WTD is taking a program management approach to delivery of Chelan Avenue CSO. Chelan CSO is included with Hanford #2, Lander St., Kingdome, and King St. (Mouth of Duwamish Wet Weather Facilities) project. For more information, see the Mouth of Duwamish Wet Weather Facilities project status in this report.

For more information, see: https://kingcounty.gov/zh-cn/dept/dnrp/waste-services/wastewater-treatment/programs/mdcso

Milestones	CD Milestone Date (Actual Date)	2017	2018	2019	2020	2021	2022	2023	2024	2025
Submission of Facilities Plan	12/31/2018 (N/A)									
Completion of Bidding	12/31/2020 (N/A)									
Construction Completion	12/31/2023 (N/A)									
Achievement of Performance Standard	N/A									

2023 Accomplishments:

- See the Mouth of the Duwamish Wet Weather Facilities project status in this report.

2023 Challenges and Corrections:

- See the Mouth of Duwamish Wet Weather Facilities project status in this report.

2024 Activities in Progress or Expected:

- See the Mouth of Duwamish Wet Weather Facilities project status in this report.

CD/CSO Report Project Status

Hanford #2, Lander St., Kingdome, and King St. (Mouth of Duwamish Wet Weather Facilities)

CSO(s): DSN 032 (Hanford #2 Outfall), DSN 030 (Lander St. Outfall), DSN 029 (Kingdome Outfall), and DSN 028 (King St. Outfall)

Project Description: The Mouth of Duwamish Wet Weather Facilities project will control CSOs from WTDs Hanford #2 (DSN 032), Lander St. (DSN 030), Kingdome (DSN 029), and King St. (DSN 028). On October 28, 2019, the County sent a letter to EPA and Ecology to formally request initiation of negotiations to modify the CD. The letter also requested a delay of two interim milestone dates associated with the Chelan Avenue CSO to match the milestones in the CD for the Mouth of Duwamish Wet Weather Facilities.

WTD continued capital delivery work on the Mouth of Duwamish Wet Weather Facilities in 2023. WTD is taking a program management approach to delivery of the Mouth of Duwamish Wet Weather Facilities. Chelan CSO (DSN 036) is included in the program. Collectively, the capital delivery work is called the MDCSO Program. A multidisciplinary team was assembled to advance the program and WTD staff were assigned. Consultant procurements were completed to support WTD staff with a range of work, including program management and engineering services. Efforts advanced during 2023 include drafting a program management plan and initiating an alternatives evaluation for an engineering report.

For more information, see: https://kingcounty.gov/zh-cn/dept/dnrp/waste-services/wastewater-treatment/programs/mdcso

Milestones	CD Milestone Date (Actual Date)	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Submission of Facilities Plan[1]	12/31/2024												
Completion of Bidding	12/31/2026												
Construction Completion	12/31/2030												
Achievement of Performance Standard	4/30/2033												

2023 Accomplishments:

- Formally chartered the MDCSO Program with the objective of achieving the greatest reasonable reduction for the Mouth of Duwamish CSO outfalls [DSN 032 (Hanford #2 Outfall), DSN 030 (Lander St. Outfall), DSN 029 (Kingdome Outfall), DSN 028 (King St. Outfall), and DSN 036 (Chelan Ave. RS Overflow)] in accordance with Chapter 90.48 RCW, Chapter 173-245 WAC, the West Point NPDES permit, and the 2013 federal CD to comply with the Clean Water Act and abate water pollution. This is generally defined as control of each CSO to an average of one untreated discharge per year on a 20-year moving average per outfall.
- Assembled multidisciplinary team including internal staff and procurement of consultant team members to advance the program.
- Established program governance including processes and structures designed to promote decision-making, manage risks, and optimize resource allocation throughout the life cycle of the program.
- Began and progressed an alternatives evaluation process with the goal of defining a best apparent system alternative to control CSOs at the Mouth of the Duwamish River.
- Progressed preparation of a Program Management Plan that includes the following:
    - Program Governance Framework
    - Program Roles and Responsibilities
    - Equity and Social Justice Assessment and Action Plan
    - Interagency Agreements Strategy and Standards
    - Internal Program Communication Strategy and Plan
    - External Program Communication Strategy and Plan
    - Document Management Plan
    - Cost Management Plan
    - Schedule Management Plan
    - Program Scope Management Plan
    - Risk Management Plan
    - Change Management Plan
    - Quality Management Plan
    - Master Program Schedule
- Prepared for community outreach to begin in 2024, including developing a public-facing website and fact sheet to introduce the MDCSO Program to the community.
- Continued negotiation with regulators regarding CD modification request.
- Coordinated with SPU.

2023 Challenges and Corrections:

- There are no specific challenges or corrections identified. The MDCSO Program represents a large amount of facilities to deliver in a densely developed urban environment characterized by challenging conditions for heavy civil infrastructure, including poor soils and geology. These attributes, combined with national and regional conditions including inflation uncertainty and a competitive construction contracting environment, create challenges. In addition to delivery challenges, the program budget is large. Accommodating the budget and balancing the full WTD capital program portfolio will be a challenge during implementation. WTD is preparing to proactively manage these challenges and associated risks that come with them.

2024 Activities in Progress or Expected:

- Fully initiate all program management activities, including developing delivery strategy.
- Advance the alternatives evaluation to continue progress toward an Engineering Report.
- Initiate community outreach, including the following:
    - Publishing public-facing website.
    - Sending flyers to property owners in the vicinity of the MDCSO to notify them the work is starting, and they may see staff in the field conducting low-impact studies such as testing groundwater levels.
    - Hosting community drop-in sessions.
- Continue to coordinate with SPU throughout the MDCSO project-specific planning and design.

CD/CSO Report Project Status

Elliott West Wet Weather Treatment Station

CSO(s): DSN 027b (Elliot West CSO Treatment Facility)

Project Description:

The Elliott West Wet Weather Treatment Station (EWWTS) pumps, screens, and disinfects wet weather flows that exceed the storage capacity of the Mercer and Denny CSO tunnels. The primary objective of the project is to bring the facility into full permit compliance with the West Point NPDES permit.

The EWWTS Project consists of new and upgraded treatment facilities to treat CSOs prior to discharge through the existing outfall in Elliott Bay. The project will replace and upgrade the screening facility, complete pump modifications, add ballasted sedimentation technology for solids removal, replace the existing on-site chlorine disinfection system with a new ultraviolet (UV) light disinfection system, complete electrical upgrades, and complete modifications to the operation of the Mercer Street Tunnel for additional equalization.

For more information, see:

https://kingcounty.gov/en/dept/dnrp/waste-services/wastewater-treatment/capital-projects/elliott-west-upgrade

2023 Accomplishments:

- Completed an alternatives evaluation process with the goal of defining the best apparent alternative to bring the facility into full permit compliance with the West Point NPDES permit.
- Performed geotechnical investigation at the project site.
- Developed the preferred alternative to conceptual 15 percent design. Prepared for a 15 percent design review in Q1 2024.
- Continued development of the draft Engineering Report.
- Prepared for community outreach to begin in 2024, including developing a public-facing website and conducting an initial survey to introduce the EWWTS Project to the community and obtain general feedback.
- Prepared and submitted a General Contractor/Construction Manager (GC/CM) Project Application to the Capital Projects Advisory Review Board (CPARB) Project Review Committee (PRC) to use GC/CM collaborative delivery.
- Conducted initial outreach to potential GC/CM contractors to generate interest in the GC/CM procurement to be conducted in 2024.
- Continued coordination with Sound Transit, specifically related to the proposed Ballard Link Extension to address potential conflicts and mitigate risks.

2023 Challenges and Corrections:

- No major challenges were experienced in 2023.

2024 Activities in Progress or Expected:

- Conducted 15 percent design review.
- Development and submittal of the 30 percent design package.
- Submittal of the draft Engineering Report in accordance with the NPDES compliance schedule.
- Received approval from the CPARB PRC to use GC/CM delivery method.
- Procurement of the GC/CM contractor and notice to proceed for the GC/CM preconstruction services contract.
- Coordination with permitting agencies, as required, specifically the Seattle Department of Construction and Inspections (SDCI) pre-application site visit.
- Continuing community outreach efforts, including development of the Public Involvement Plan, conducting community group briefings, and updating the project website, as necessary.

4.1 Supplemental Compliance Plan Summaries

Supplemental Compliance Plans are documents that describe remedial measures King County will take to achieve CSO control for completed CSO control projects required by the CD. According to the 2013 CD, Supplemental Compliance Plans are required when

- CSO control projects are not constructed in accordance with design criteria set forth in the CD,
- King County is not complying with all requirements of its NPDES permit pertaining to CSOs, or
- the CSO control project does not result in meeting the CSO control performance standard of no more than one overflow event per year on a 20-year moving average.

To date, King County has only developed supplemental compliance plans for CSO control projects that did not result in meeting the CSO control performance standard. Table 5 presents a summary of King County Supplemental Compliance Plans. A status page for each project under a Supplemental Compliance Plan follows and provides updates for each of King County's Supplemental Compliance Plans.

A Supplemental Compliance Plan was submitted for the Dexter and Harbor CSO outfalls in 2013. An amendment to the Harbor Supplemental Compliance Plan was submitted in 2016 with additional remedial actions. Those plans are complete, and Dexter and Harbor are now in control.

Projects with active Supplemental Compliance Plans include the following:

- Barton Street Pump Station
- Denny Way Regulator
- Hanford #1
- South Magnolia Wet Weather Storage and Pipeline

Table 5. Summary of King County Supplemental Compliance Plans

CSO Name (Project Name)	DSN	Supplemental Compliance Plan Background	Outfall Status
Barton Street Pump Station (Barton Street Roadside Raingardens and Barton St. PS Upgrades)	057	Supplemental Compliance Plan submitted to Ecology April 23, 2018. An amendment to the Supplemental Compliance Plan was submitted on August 30, 2022. Ongoing conversations took place with Ecology through 2023, and a revised amendment to the Supplemental Compliance Plan was submitted on December 21,	Additional remedial actions are underway; performance of the outfall will continue to be monitored.

CSO Name (Project Name)	DSN	Supplemental Compliance Plan Background	Outfall Status
		2023. Control status to be reported in Annual Reports.	
South Magnolia (South Magnolia Wet Weather Storage Project)	006	Supplemental Compliance Plan was submitted to Ecology January 30, 2017. Addendum submitted on April 24, 2018. An amendment to the Supplemental Compliance Plan was submitted on August 30, 2022. Ongoing conversations took place with Ecology through 2023 and a revised amendment to the Supplemental Compliance Plan was submitted on March 3, 2024. Control status to be reported in Annual Reports.	Additional remedial actions are underway; performance of the outfall will continue to be monitored.
Dexter Ave. Regulator (Dexter Ave. Supplemental Compliance Plan)	009	Supplemental Compliance Plan submitted August 2013; control status to be reported in Annual Reports.	Outfall controlled in 2016.
Denny Way Regulator (Denny Way Supplemental Compliance Plan)	027a	Supplemental Compliance Plan submitted to Ecology August 2, 2013. Revised Supplemental Compliance Plan submitted August 31, 2016; An amendment to the Supplemental Compliance Plan was submitted on August 30, 2022. This amendment was approved in 2023.	Additional remedial actions are underway; performance of the outfall will continue to be monitored.
Hanford #1 (Rainier Valley Wet Weather Storage)	031	Supplemental Compliance Plan submitted to Ecology August 28, 2020. Work detailed in the Supplemental Compliance Plan is continuing. An amendment to the Supplemental Compliance Plan is expected to be submitted in 2024.	Initial remedial actions are underway; performance of the outfall will continue to be monitored.
Harbor Ave. Regulator (Harbor Ave. Supplemental Compliance Plan)	037	Supplemental Compliance Plan submitted to Ecology July 3, 2013. Revised Plan submitted August 31, 2016; an amendment to the Supplemental Compliance Plan was submitted on August 30, 2022, and control status to be reported in Annual Reports.	Outfall controlled in 2022.

CD/CSO Report Supplemental Compliance Plan

Barton Street Pump Station

CSO(s): DSN 057 (Barton Street Pump Station)

Project Description: Since submitting the original Supplemental Compliance Plan for Barton St. PS in 2018, WTD has completed a number of actions to better understand the facility and to improve its CSO control performance, including a study on GSI efficacy, force main inspection, as well as investigating different pump station control strategies to optimize the performance of the pump station. The pumps are still not operating per design, and WTD is investigating different aspects of pump operation that could increase pump capacity and control Barton. Additional remedial actions have been developed, and an updated Supplemental Compliance Plan amendment was submitted in December 2023 and approved in February 2024.

WTD will complete a planning-level options analysis in 2024 to identify a solution to control Barton St PS. The planning-level study will look at options that use pump upgrades, gray storage, and additional GSI to control the Barton St. PS outfall to meet the performance standard (an average of one uncontrolled CSO event per year on a 20-year moving average).

2023 Accomplishments:

- Reopened the Barton RainWise basin to allow additional installations.
- Submitted an amendment to the Supplemental Compliance Plan detailing additional remedial actions.

2023 Challenges and Corrections:

- The pumps at the Barton St. PS are underperforming and peak pumping capacity continues to be diminished.

2024 Activities in Progress or Expected:

- Received EPA and Ecology approval of the amendment to the Supplemental Compliance Plan.
- Complete a planning-level options analysis and evaluate capital projects to control Barton St. PS.

CD/CSO Report Supplemental Compliance Plan Status

Denny Way Regulator

CSO(s): DSN 027a (Denny Way Regulator)

Project Description: Adjust facilities built in 2005 to achieve final control per the Supplemental Compliance Plan included in the 2011 TM (Technical Memorandum) 970 and updated to Ecology and EPA in 2012. Investigation suggested that two of the inputs—Denny Local and Denny Lake Union—were overflowing more than intended. The investigation recommended removal of the lower Denny local weir and modification of the Elliott West pump ramp-up strategy to drop the lead pump start set point by 2.25 ft and improve flow into the Elliott West facility. The weir modifications were completed in July 2011 and pumping strategy modifications were completed on November 17, 2011. Additional work on the pumping strategy was completed in the fall of 2015.

Monitoring in 2016 still showed control issues with Denny Way, and additional adjustments to pumping strategy were made in December 2016 and monitored over two wet seasons. Model updates were completed in 2019. After additional monitoring, it has been determined that the outfall is not yet in compliance. Additional remedial actions have been developed, and an updated Supplemental Compliance Plan was submitted in August 2022 and approved in 2023.

2023 Activities:

- Received approval from EPA and Ecology on the amendment to the Supplemental Compliance Plan.
- Investigated raising Interbay weir crest height through modeling to determine feasibility.

2023 Challenges and Corrections:

- The outfall has an event frequency of 1.2 overflows per year and will likely need additional remedial actions to reach control.

2024 Activities in Progress or Expected:

- Continue monitoring for achievement of the performance standard.
- Perform analysis to determine the feasibility of incorporating a way to control the Denny RS through the upcoming EWWTS capital project and Mouth of the Duwamish Wet Weather Facilities capital project.

CD/CSO Report Supplemental Compliance Plan Status

Hanford #1

CSO(s): DSN 031 (Hanford #1 Overflow - Hanford @ Rainier Overflow, Bayview North Overflow, and Bayview South Overflow)

Project Description: The project achieved substantial completion in 2018.To date, the project has not achieved the performance standard and has an event frequency of 2.5 overflows per year. WTD submitted a Supplemental Compliance Plan in August 2020.

For more information, see:
https://kingcounty.gov/~/media/depts/dnrp/wtd/capital-projects/COMPLETED/PDF/Rainier-valley-wet-weather-storage-2018.ashx

2023 Accomplishments:

- Additional flow data were collected from the 2022 to 2023 wet season.
- Additional modeling of the basin was completed.

2023 Challenges and Corrections:

- The outfall will likely need additional remedial actions to reach control

2024 Activities in Progress or Expected:

- An update to the Hanford #1 Supplemental Compliance Plan is being developed and will be submitted to Ecology and EPA in Q3 2024.

CD/CSO Report Supplemental Compliance Plan Status

South Magnolia Wet Weather Storage and Pipeline

CSO(s): DSN 006 (South Magnolia)

Project Description: A Supplemental Compliance Plan was submitted for South Magnolia Wet Weather Storage (S. Magnolia WWS) in January 2017 to comply with the CD deadline for notifications. King County completed all commitments in the Revised Supplemental Compliance Plan. After additional monitoring, it has been determined that the outfall is not yet in compliance. Additional remedial actions have been developed, and an updated Supplemental Compliance Plan amendment was submitted in March 2024 and approved in April 2024.

WTD will complete an investigation and planning-level options analysis in 2024 to 2025 to identify the cause of overflows and a solution to control S. Magnolia WWS. The planning-level study will look at options including conveyance improvements, GSI improvements, and sewer and stormwater separation to control the S. Magnolia outfall to meet the performance standard (an average of one uncontrolled CSO event per year on a 20-year moving average).

2023 Accomplishments:

- Submitted an amendment to the Supplemental Compliance Plan detailing additional remedial actions.

2023 Challenges and Corrections:

- Data continue to indicate the storage facility is not being fully used during wet weather events.

2024 Activities in Progress or Expected:

- Received EPA and Ecology approval of the amendment to the Supplemental Compliance Plan.
- Begin a planning-level options analysis to determine the cause of overflows and evaluate capital projects to control S. Magnolia outfall.

4.2 Corrective Action for Previously Controlled Outfalls

Corrective Actions require King County to take remedial measures to achieve CSO control for completed CSO control projects required by the CD that have trended out of control due to operational changes and climate change.

4.2.1 Belvoir and 63rd

In December 2017, King County submitted a CSO compliance actions letter to Ecology acknowledging that the Belvoir PS outfall does not meet the CSO control performance standards as specified in the NPDES permit and CD. Belvoir PS Overflow, which is within King County's CSO system, has historically been reported as controlled. However, updated modeling indicated that the CSO frequency has increased due to hydraulic and hydrologic changes upstream of the pump station. As of the 2016 Annual CSO and CD Report, Belvoir PS Overflow (No. 012) does not meet the CSO control performance standard. WTD is committed to working closely with SPU to support completion of operational and capital improvements underway. All necessary steps needed to bring Belvoir PS into compliance will be completed by the end of the CD.

WTD and SPU recognize that hydraulic and hydrologic changes have affected compliance at the Belvoir PS Overflow. WTD is committed to coordinating and developing mutually beneficial solutions with SPU. This includes working with SPU to meet the approach and schedule included in SPU's approved Windermere Basins 13 and 15 Supplemental Compliance Plans, dated December 7, 2016, and April 18, 2018, respectively. In addition, SPU and King County are working together to develop strategies for controlling Belvoir as part of WTD's LTCP planning. SPU is a member of WTD's LTCP planning team.

Additionally, beginning in 2024, WTD and SPU will be launching a Coordinated Optimization Evaluation to explore optimization opportunities in three priority planning areas (Montlake, University, and Henderson) in advance of upcoming planning efforts relating to CSO control. Belvoir will be included as part of the University planning area. The goal is to develop a preferred strategy and implementation schedule as part of WTD's next LTCP Update. WTD is working closely with SPU to bring this outfall into compliance by the end of the CD.

In a letter submitted to Ecology in May 2018, WTD outlined the control status of the 63rd Ave. SW PS Outfall. The 63rd Ave. SW PS Outfall, which is within King County's CSO system, has historically been reported as controlled. However, in 2017, monitoring data indicated that the CSO frequency increased because of hydraulic changes. As of 2017, the 63rd Ave. SW PS Outfall (No. 054) does not meet the CSO control performance standard.

Actions to improve compliance include optimization of the West Seattle portion of the CSO system, which includes operating the Alki WWTS more frequently. Improvements have also been made to the 63rd Ave. SW PS, including changing two constant speed

pumps to variable speed pumps as well as electrical and control upgrades. These upgrades increase operating flexibility and improve performance of the 63rd Ave. SW PS and the Alki WWTS. A comprehensive computer model of the West Seattle System was completed in 2018, and it is being used to optimize operations. A flap gate was also installed on the 63rd Ave. SW PS outfall to prevent saltwater intrusion. The majority of the flap gate installation work was completed in 2018, and the final outstanding item was completed in 2020. A new project was started at Alki WWTS in 2021, which is still ongoing, to determine options for increasing the capacity at Alki WWTS to further improve performance at the 63rd Ave. SW PS.

4.2.2 North Beach and 30th Avenue Northeast

This is the second year that 30th Ave. Northeast Overflow and North Beach Pump Station Wet Well Overflow have exceeded the one event per year on a 20-year moving average after previously being controlled. The County is initiating Tier I corrective actions for these outfalls per the West Point NPDES permit. These corrective actions include reviewing monitoring practices to verify that the data for North Beach Pump Station Wet Well and 30th Ave Northeast are accurate. Additionally, maintenance practices are being reviewed at both of these locations to verify proper operation of the system.

4.3 Program Plan Summaries

The CD required development and implementation of two plans: the SSOP and the JOSOP with the City of Seattle.

4.3.1 Sewer System Operations Plan

WTD submitted the SSOP on September 27, 2013. Ecology and EPA approved the SSOP on May 29, 2014, and July 29, 2014, respectively. The SSOP is an electronic, interactive document with embedded links to the most current base documents such as O&M manuals, plant manuals, safety plans, and maps. King County staff typically access the SSOP from the County's intranet and SharePoint sites. Representatives from WTD Operations, Off-Site, and CSO control planning continue to review the plan regularly to ensure the electronic links still work and base documents are being updated as needed.

4.3.2 Joint Operations and System Optimization Plan

The City of Seattle's and King County's CDs direct both agencies to work together to develop a JOSOP and to review it every three years and update it as necessary. In developing the original JOSOP (submitted to EPA and Ecology in February 2016), DNRP and SPU staff focused on areas in the system that have the greatest potential for operational optimization and developed a set of multi-basin joint commitments. These commitments were reviewed, updated, and approved by SPU's Drainage and

Wastewater Line of Business Branch Executive and DNRP's WTD Director, and included in the JOSOP Update submitted to EPA and Ecology in January 2019. The second update of the JOSOP was submitted to EPA and Ecology on February 28, 2022.

The following list describes each commitment and the progress made in 2023:

- The Joint System Event Debrief Committee commitment includes preparing for the wet season and debriefing after major storm events to exchange information, reviewing and updating emergency communication protocols between the agencies, discussing meteorological data, evaluating CSO performance, and assessing operational decision impacts on the combined system. To coordinate for the 2023/2024 wet season, a meeting was held in October 2023 to discuss preseason maintenance activities, system changes, meteorological information, and emergency communication protocols.
- The Data Sharing commitment includes supporting a Joint Operations Information Sharing Team (JOIST), implementing a pilot project for sharing real-time SCADA data, developing data sharing protocols, and improving the regional ability to forecast storms and rainfall intensities.
    - JOIST held two meetings (May and September 2023) during which SPU and DNRP staff shared information on the operation of existing facilities, progress of capital projects, and coordination of Joint Plan commitments.
    - SPU and DNRP held three workshops in 2023, one in August and the other two in September, as part of the annual process to review flow monitoring data collected by each agency and provide recommendations for future monitoring.
- The Joint Modeling Coordination Committee commitment includes sharing modeling tools and increasing understanding of modeling analyses and system operations while developing stronger working relationships between DNRP and SPU modeling staff and improving efficiencies through better coordination efforts. Members of the Joint Modeling Coordination Committee held meetings in 2021 to review modeling results and coordinate model developments between each agency.
    - In 2021, DNRP completed hydraulic evaluation of the proposed Ship Canal Water Quality Project 3rd Ave. W diversion design. The North Interceptor/Ship Canal model was updated per the 90 percent drawings for TEPS and Ballard and per the 100 percent drawings for Wallingford. The model was updated with the proposed controls for TEPS, as described in the project process control descriptions. SPU and DNRP finalized the Ship Canal Water Quality Project Modeling and Monitoring Plan in September 2023.
    - In 2022, SPU and DNRP shared modeling results from the Henderson CSO basin. In 2024, SPU plans to update the Henderson North CSO

model to represent the recent facility improvements, and DNRP is in the process of evaluating potential impacts from proposed SPU retrofits in the South Henderson CSO basins.
    - The DNRP System Model was updated to include the recent SPU Central Waterfront project, the Georgetown WWTS, and an improved Interbay PS control algorithm. In addition, these models are being transitioned to the latest versions of the modeling software. In 2023, model conversion continued, which included installing the most recent software version and preparing for the January 2024 training. Modeling work and collaboration continued, including, but not limited to: Ship Canal Integrated Tunnel Model, Henderson, Magnolia, and North Union Bay.
    - DNRP launched a SharePoint site to share information between agencies, and it is being used and tested.
    - The joint modeling work plan, initially developed in 2018, is updated every six months to reflect current and future work. This plan will continue to provide a framework for coordination, standardization, and communication for upcoming modeling work.
- The Coordination during Startup and Commissioning of CSO Control Facilities commitment includes conducting document review, attending commissioning meetings, and implementing data sharing for SPU and DNRP CSO control facilities. In 2023, SPU commissioned Dawson Street CSO Facility and provided an overview to DNRP during a JOIST meeting.
- The Real Time CSO Notification commitment includes revising both agencies' on-site signs and website information to improve notification of CSO events and communication with customers (see Section 3.1.8 of this report).
- The Reduce Saltwater Intrusion commitment involves continuing to work together on studies, data, and solutions for reducing intrusion. In 2023, SPU and DNRP continued to discuss strategies for reducing saltwater intrusion.
- In 2023, DNRP and SPU kicked off the Coordinated Optimization Evaluation effort. The Coordinated Optimization Evaluation chartering was completed in Q1 2024, identifying the three priority planning areas: Montlake, University, and Henderson.

4.3.3 WTD and SPU Coordination on CSO Control Projects

WTD and SPU have been working together for many years to identify collaborative project and operational opportunities to improve each agency's efforts and to better protect public health and the environment. The two agencies have agreed to guiding principles to ensure that neither agency will adversely impact the compliance of the other. Given that SPU's combined sewers are upstream of King County's system, new or improved SPU CSO control facilities have the potential to affect flows in King County's regional system. For this reason, SPU and WTD coordinate before and after construction of capital projects. Below is a list of projects constructed by SPU in recent years:

- Delridge Basin 99 CSO Sewer System Improvement Project – SPU commissioned the project in 2019 and provided an overview to DNRP during a JOIST meeting.
- Central Waterfront Project (SPU basins 70, 71, and 72) – Following removal of the Alaskan Way Viaduct, SPU is eliminating two CSO locations and providing conveyance and storage to control two other CSO outfalls. Construction is underway and substantial completion is expected in early 2024. More flows will be conveyed to WTD's Elliott Bay Interceptor as a result of the project. Monitoring is in place to confirm expected flow changes, and WTD continued modeling the changes and impacts to the downstream system in 2023.
- SPU Pump Station 22 (SPU Basin 60) was upgraded from 0.86 MGD to 4 MGD in 2020.
- SPU Pump Station 20 in Portage Bay was upgraded from 1.1 MGD to 1.5 MGD in 2020.
- SPU Pump Station 13 in East Montlake (SPU Basin 20) was upgraded from 0.9 MGD to 2.8 MGD in 2021.

WTD and SPU have flow monitoring in place for those Seattle projects with the potential to impact flows in the regional system. Flow data are collected and reviewed annually to determine if flow monitoring adjustments need to occur. WTD will continue working with SPU on control and operational strategies as SPU starts up any new facilities and continues operating its existing facilities.

SPU and WTD continue to work together to ensure GSI projects in the City of Seattle use a consistent approach, per the GSI Memorandum of Agreement signed by the two agencies in 2013. The term "GSI" describes a variety of measures that manage urban runoff by using nature-based processes to slow, detain, or retain stormwater. The goals of King County's GSI work are to reduce polluted runoff entering the CSO system and/or nearby waterways while also delivering a range of risk reduction and community co-benefits. GSI bioretention facilities in the right-of-way also are referred to as "natural drainage systems." GSI can also be a component of low-impact development.

Collaborative work between WTD and SPU in 2023 included the following:

- Developing design standards for weirs.
- Developing design guidance for use of structural soil cells in bioretention facilities.
- Developing design guidance for underdrain design.
- Reviewing current inlet designs in practice and providing updates to design guidance.
- Coordination with SPU on a re-evaluation of control options for King County's Mouth of Duwamish outfalls as well as opportunities to perform joint planning and project delivery to address nearby SPU outfalls.

In 2024, planned collaborative work includes the following:

- Continuing work on 2023 items listed above.
- Updating GSI Guidance Manuals for Design, Options Analysis, Constructions, and Operations and Maintenance.
- Continued coordination with SPU for King County's Mouth of Duwamish outfalls as well as opportunities to perform joint project delivery to address nearby SPU outfalls.
- Ongoing coordination wherever close system relationships present the opportunity, including current projects in design (such as West Duwamish) and future projects still in planning (such as University and Montlake CSO control).
- SPU and WTD are working closely on the Ship Canal Water Quality Project, a joint project that will control WTD's 11th Ave. NW and 3rd Ave. W CSOs and SPU Basins 147, 150/151, 152, and 174. Coordination for this project is ongoing, and its status is described in Section 4 of this report.
- Launching Coordinated Optimization Evaluation with SPU to explore optimization opportunities in three priority planning areas (Montlake, University, and Henderson) in advance of upcoming planning efforts relating to CSO control.

5 Summary of Rainfall and CSO Events

King County measures rainfall in the Seattle area at many of its regulator stations, pump stations, overflow locations, and at West Point. It also monitors the frequencies and volumes of both untreated and treated CSOs at all of its permitted CSO locations.

This section describes rainfall data and reports on unpermitted overflows and summarizes frequency and volume for all untreated and treated CSO discharges in 2023. Additional information can be found in the appendices of this report.

5.1 Annual Rainfall

Rainfall data are reported for each CSO event as measured by the nearest King County-owned rain gauge. Appendices A and B include rainfall data for 2023. The annual rainfall for 2023, as an average over local rain gauges, was 32.91 in. The annual rainfall at SeaTac International Airport was 34.97 in., which is below the 20-year SeaTac annual average of 40.03 in., according to National Oceanic and Atmospheric Administration data collected at the time of report writing. WTD funded work by the University of Washington Climate Impacts Group to prepare a model run to analyze impacts on precipitation over the next century to inform long-term planning efforts. The last climate model was completed in 2021.

5.2 Unpermitted Overflows

Overflows can occur from CSO structures and outfalls, broken pipelines, and maintenance holes. The County characterizes three types of unpermitted overflows: dry weather overflows (DWOs), exacerbated CSOs (eCSOs), or sanitary sewer overflows (SSOs).

Any overflow in the combined system from a designated CSO outfall that occurs beyond 24 hours after rainfall has ceased is called a DWO. In King County's system, when DWOs occur, they are typically a result of mechanical failures, power outages, or human error. Per EPA's Nine Minimum Controls and the West Point NPDES permit, DWOs are prohibited. Overflows in controlled or uncontrolled basins from CSO outfalls that are increased or extended in duration as a result of mechanical failures, power outages, or human error are referred to as "eCSOs."

The release of sanitary or combined flows at any location in the conveyance system other than the designated CSO outfalls, regardless of the basin's "control" status, presence/absence of precipitation or existing high flow events, or causes due to mechanical failures, power outages, or human error, are referred to as "SSOs" by the County. Additionally, the CD defines a "sewer overflow" as "any overflow, spill, diversion, or release of wastewater from or caused by the Sanitary Sewer System or the Combined Sewer System upstream of a County's CSO Outfall" and including discharges to water bodies or discharges to land (i.e., public or private property). The County responds to sewer backups in buildings to determine if they are caused by

failures of equipment or operations, or if they are associated with private property circumstances. WTD strives to avoid and alleviate conditions that may result in backups and assists property owners when backups occur as a result of conditions in the County's system.

Table 6 shows unpermitted overflows that occurred in 2023 as a result of any incident in the County's CSO system. In 2023, there was one power-related interruption and CSO overflow (Barton Pump Station), and overflows occurred at two CSO locations (Ballard Regulator Station and 11th Avenue NW [East Ballard]) as a result of a programmable controller issue at the Ballard Regulator Station.

Table 6. Summary of Unpermitted Overflows in 2023

Date of Event	Facility	Description of Violation(s)
2/13/23	Barton Street Pump Station	CSO system overflow: power disruptions caused two instances of faults with the variable frequency drive (VFD) units for both pumps. While VFDs were offline, the wet well level rose, resulting in overflow to Puget Sound. Staff responded immediately and reset the drives.
9/20/23	Ballard Regulator Station	CSO system overflow: incident occurred during heavy rain when a storm gate for the large siphon designed to carry high flows failed to open. Operation's staff noticed the overflow and investigated and found that a recently installed control logic program to open the gate used the wrong data points for control.
9/20/23	11th Avenue NW (East Ballard)	CSO system overflow: modeling indicated that the incident at the Ballard Regulator Station could have caused the overflow at the 11th Ave. NW outfall but were unable to determine the specific amount due to the heavy localized rainfall that occurred.

In coordination with SPU, WTD continued efforts in 2023 to reduce backups in the South Park area upstream from the County's 8th Ave. S Regulator Station that have occurred in past years during larger storm events, including completing installation of grinder pumps for 25 properties with SPU.

The County also continued work with SPU in response to landowners and the community affected by a major flooding event from December 25 to 27, 2022, when the Duwamish River overtopped its banks due to a combination of king tides, pre-spring snowmelt, a low barometric pressure system, strong onshore westerly winds, and stormwater runoff. The potential for extreme conditions such as king tides are monitored, and the County participates in the activation of incident response teams with SPU and other agencies as the system conditions evolve during extreme weather events. In the longer term, the WTD Conveyance System Improvement Program

continued planning and project formulation work in 2023 to adapt and manage the wastewater system in the South Park area to the anticipated increased variability with climate change.

5.3 Annual Untreated CSO Events

West Point's SCADA system monitors the volume and frequency of CSOs at regulator and pump stations. Portable flow meters are deployed at 12 CSO locations not currently monitored by SCADA or to supplement SCADA monitoring: 11th Ave. NW Overflow; 3rd Ave. W and Ewing Street Overflow; 30th Ave. NE Overflow; Southwest Alaska Street Overflow (SW Alaska St. Overflow); Hanford #1 (Bayview North Overflow, Bayview South Overflow, Hanford @ Rainier Overflow); East Duwamish Pump Station Overflow (E Duwamish PS Overflow); W Duwamish Overflow; S Magnolia Overflow; North Beach PS Inlet Overflow; and Terminal 115 Overflow.

In 2023, there were 29 storm events resulting in untreated CSO discharges. Some storm events spanned multiple days, and, at times, there were multiple discharges on the same day. Conditions in 2023 resulted in 95 untreated CSO events discharging about 645 MG. Rainfall in 2023 was lower than normal, resulting in a total discharge volume that was lower than predicted in an average year. The highest precipitation occurred in December (8.48 in.) and resulted in 39 untreated events totaling 477 MG. The second highest precipitation occurred in November (5.78 in.), resulting in 21 untreated events and an overflow volume of 78 MG.

Appendix A lists the untreated events from County CSOs during 2023. These data are also provided to Ecology in electronic form alongside this report.

5.4 CSO Treatment

King County provides CSO treatment, defined in Chapter 173-245 WAC as "equivalent to primary" treatment and disinfection, at West Point for flows above its secondary capacity of 300 MGD and at five CSO treatment plants (WWTSs): Alki, Carkeek, Elliott West, Henderson/MLK Jr. Way, and Georgetown. The following sections summarize performance and compliance at each facility during 2023. Appendix B of this report provides more details on volumes and events. Appendices C through F contain the annual reports for each WWTS.

5.4.1 West Point Treatment Plant CSO-Related Events

In addition to secondary treatment of up to 300 MGD of base wastewater flows (defined as 2.25 times the average wet weather flow of 133 MGD), West Point provides primary treatment plus disinfection/dechlorination for flows above 300 MGD and up to a designed instantaneous peak of 440 MGD. Where captured flows into King County's conveyance system cannot be conveyed to regional treatment plants because of

conveyance system limitations, flows are conveyed to WWTSs or are discharged untreated. West Point flows in excess of 300 MGD and up to 440 MGD receive primary treatment and are blended with full secondary treated flows (up to 300 MGD), followed by disinfection, dechlorination, and discharge of the final effluent from the deep marine outfall. The resulting effluent must meet secondary effluent quality limits, with a small reduction (i.e., 80 percent instead of 85 percent in the monthly removal requirements of TSS) during the typical wet season months of November through April. This practice is accepted by Ecology, provides a high level of treatment to wet weather flows, and reduces program costs and impacts to local water bodies. West Point had 12 wet weather treatment events during 2023, where peak flows received primary treatment prior to blending with secondary treated flows, disinfection, dechlorination, and discharge. The total volume of flows that exceeded 300 MGD and received primary treatment only was 129.2 MG. All occurrences are listed in Appendix B.

There were no CSO nor dry weather events due to power or equipment failures in 2023. There was a planned annual preventive maintenance activity to test and exercise the two West Point CSO gates where the gates were opened as part of the preventive maintenance work. The maintenance work occurred during dry weather and low plant flow. The gates were open for 1.2 hours and the resulting volume was 2.0 MG, which was returned, disinfected, and dechlorinated. No permit exceedances occurred during the gate testing.

5.4.2 Alki Wet Weather Treatment Station

The transfer of Alki area base flows to West Point was completed in 1998, and conversion of the Alki Treatment Plant from a continuously operating primary plant to a WWTS was completed in 2001. In 2023, there were seven filling events and one discharge event. The Alki WWTS received 41.5 MG of influent flow and discharged 38.4 MG.

Overall, TSS removal was 31 percent for 2023, which did not meet the annual average 50 percent TSS removal limit. Alki was compliant with all permit conditions in 2023 except for the annual TSS removal and daily minimum pH less than 6.0 on one occasion. The annual average settleable solids (SS) was 0.10 milliliter per liter per hour (ml/L/hr), which met the SS limit of 0.3 ml/L/hr. The Alki WWTS complied with the instantaneous maximum pH of over 9.0. In addition, Alki's effluent met the daily maximum average total residual chlorine (TRC) permit limit of 234 micrograms per liter (µg/L) on all discharge days. Alki WWTS met the monthly fecal coliform geomean permit limit of 400 counts per 100 mL. Appendix C contains more details on the Alki WWTS.

5.4.3 Carkeek Wet Weather Treatment Station

The transfer of Carkeek area base flows to West Point and the conversion of the Carkeek Treatment Plant from a continuously operating primary plant to a WWTS was completed in 1994. In 2023, Carkeek WWTS had three filling events and two discharge events. The Carkeek WWTS received 9.4 MG and discharged 8.3 MG.

Overall, TSS percent removal was 59 percent in 2023, thereby meeting the NPDES permit limit of 50 percent for annual average removal. Carkeek WWTS did not meet its annual average SS limit, with the average measuring 1.80. ml/L/hr (with the NPDES permit limit being 0.3 ml/L/hr).

Carkeek WWTS met the instantaneous minimum pH of 6.0 and maximum pH limit of 9.0 for all discharge days. The daily maximum average TRC met the permitted level of 490 µg/L on all discharge days. The facility also experienced a disinfection failure during the December event. Additionally, the effluent fecal coliform geomean was greater than 400 colony-forming units (cfu)/100 ml in November, with a maximum value of 160,000 cfu/100 mL. All remaining NPDES permit limits were met at Carkeek WWTS. Appendix D contains more details on the Carkeek WWTS.

5.4.4 Elliott West Wet Weather Treatment Station

The Elliott West WWTS was brought online in May 2005 as a joint project with Seattle's East Lake Union CSO control projects. In 2023, there were 33 inflow events totaling 236.3 MG and six discharge events totaling 96.4 MG that were treated and discharged through the Elliott West Outfall at the Denny Way RS.

Overall, TSS removal averaged 61 percent for the year, thereby meeting the NPDES 50 percent annual average TSS removal limit. EWWTS did not meet the SS annual event average limit, with the average measured as 1.5 ml/L/hr and the NPDES permit limit being 0.3 ml/L/hr. Daily average TRC exceeded the permitted level of 109 µg/L on 3 of 7 discharge days; it reached as high as 485 µg/L. Effluent pH dropped below the permitted minimum limit of pH 6.0 on 2 of the 7 discharge days; it reached as low as pH 5.8. The facility experienced one disinfection failure during an event in November. Elliott West WWTS met the monthly fecal coliform geomean permit limit of 400 counts per 100 mL. All required samples were collected, and all required measurements were completed in 2023. Appendix E contains more details on EWWTS.

5.4.5 Henderson/MLK Jr. Way Wet Weather Treatment Station

The Henderson/MLK Jr. Way WWTS was brought online in May 2005. In 2023, there were three events where the facility stored flow, one of which resulted in a discharge. The treatment facility received 10.58 MG of combined sewer wastewater and discharged 6.75 MG of treated water to the Duwamish Waterway. The Henderson/MLK

Jr. Way WWTS complied with all permit effluent and performance limits in 2023. Appendix F contains more details on the Henderson/MLK Jr. Way WWTS.

5.4.6 Georgetown Wet Weather Treatment Station

Georgetown WWTS is the latest wet weather treatment facility for WTD. Commissioning and startup (i.e., substantial completion under the CD) of the facility began on November 22, 2022, and the Georgetown WWTS was online for the first storm events that occurred in December 2022. Operational adjustments are ongoing. Georgetown WWTS represents a high-rate treatment process based on the ballasted sedimentation technology using Veolia Krueger's ActiFlo® treatment design. Disinfection of the treated flows is accomplished by UV disinfection. The final effluent is discharged to the outfall located at the lower Duwamish River.

In 2023, there were a total of 32.23 in. of rainfall at the Georgetown WWTS as measured by the rain gauge located at the station. This compares to the annual rainfall of 34.97 in. reported at Seattle-Tacoma International Airport. Georgetown WWTS had four separate inflow events leading to three treatment and discharge events across three months in 2023. The facility had a total of 26.1 MG of inflow volume in 2023, of which 24.8 MG were treated and discharged.

6 Summary of Consent Decree and NPDES Violations in 2023

Section VIII. 43 of the CD requires a listing of any violations of the CD in the annual report. Table 7 identifies CD violations in 2023 and related exceedances of NPDES wet weather permit requirements for the CSO system. Appendices C through F contain details on the causes and corrective actions taken. All notifications to Ecology were made in a timely manner.

Table 7. Summary of Effluent Limitation* and Consent Decree Violations in 2023

Date of Event	Facility	Description of Violation(s) *
November 2023	Carkeek WWTS	Fecal coliform
12/4/23	Alki WWTS	pH
12/4-5/23	Carkeek WWTS	Disinfection failure
12/4-5/23	Elliott West WWTS	Total chlorine residual (x2), pH (x1)
12/7/23	Elliott West WWTS	Total chlorine residual, and pH
2023 annual	Alki WWTS	Annual average Total Suspended Solids (TSS) removal
2023 annual	Elliott West WWTS	Annual average Settleable Solids
2023 annual	Carkeek WWTS	Annual average Settleable Solids

* Exceedances of pH effluent limits and temporary disinfection failure incidents are specified in the NPDES permit along with monitoring and reporting special conditions but are not specified as violations subject to stipulated penalties under the CD.

(#) Parenthetical numbers refer to the exceedances of the limit over the duration of a multi-day CSO event.

7 Post-Construction Monitoring

King County's PCMP was approved by Ecology on September 28, 2012. Monitoring volume and frequency of overflows at the controlled untreated discharge locations listed above in Table 7 is ongoing, reported monthly to Ecology, and summarized in each CSO Annual Report (Appendix A). Volume, frequency, and NPDES permit effluent monitoring and effluent compliance for the WWTSs are reported monthly and summarized in Appendix B.

King County's ongoing ambient monitoring program provides data for post-construction monitoring as described in the PCMP. Additional details can be found in the PCMP's Appendix D ("Receiving Water Characterization Study Sampling and Analysis Plan and Quality Assurance Project Plan"), Appendix E ("Major Lakes Sampling and Analysis Plan"), and Appendix F ("Freshwater Swimming Beach Monitoring Sampling and Quality Assurance Project Plan").

Sediment monitoring for controlled sites is being performed as described in the PCMP. Details can be found in the PCMP's Appendix C ("Sampling and Analyses Plan") as revised in 2022 (King County 2022). All monitoring is currently up to date. No post-construction sediment monitoring was required in 2023.

A post-construction monitoring report required under NPDES permit condition S11.F(d) was submitted to Ecology on November 26, 2019. The report demonstrates how CSO outfalls that were controlled prior to permit issuance, as well as CSOs brought under control during the permit term, achieve performance requirements and comply with the state's water quality and Sediment Management Standards (SMS). For outfalls with SMS exceedances associated with CSO discharges, the report describes cleanup activities in the vicinity, including cleanup actions planned or that have been performed, targeted chemicals, any available pre- and post-cleanup monitoring results, cleanup project schedule, post-project monitoring schedule, and a list of parties involved.

Appendices

Appendix A: Untreated CSO Events, January–December 2023

Appendix B: Treated CSO Events, January–December 2023

Appendix C: Alki Wet Weather Treatment Station 2023 Annual Report

Appendix D: Carkeek Wet Weather Treatment Station 2023 Annual Report

Appendix E: Elliott West Wet Weather Treatment Station 2023 Annual Report

Appendix F: Henderson/MLK Jr. Way Wet Weather Treatment Station 2023 Annual Report

Appendix A
Untreated CSO Events

January–December 2023

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
003	Ballard Siphon Regulator via Seattle Storm Drain	Lake Washington Ship Canal	9/20/2023 1:34	9/20/2023 2:09	0.58	575,243	0.27	3.23
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	1/9/23 2:44 PM	1/9/23 10:23 PM	7.65	198,557	1.18	97.48
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	2/21/23 7:25 PM	2/21/23 7:35 PM	0.17	450	0.29	1.53
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	3/24/2023 18:25:00	3/24/2023 18:40:00	0.25	2,929	0.17	0.67
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	9/20/23 1:44 AM	9/20/23 2:03 AM	0.32	22,626	0.27	3.23
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	9/25/23 6:30 PM	9/27/23 8:47 PM	50.28	1,476,799	1.81	101
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	10/10/23 9:22 PM	10/10/23 10:05 PM	0.72	181,022	0.42	16.32
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	10/16/23 9:19 AM	10/16/23 9:42 AM	0.38	40,310	0.26	18

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	11/2/2023 2:07	11/2/2023 4:51	2.73	27,990	0.71	9.8
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	11/4/2023 8:02	11/4/2023 11:36	3.57	2,896,115	1.28	13.73
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	11/6/2023 15:22	11/6/2023 17:31	2.15	450,791	0.81	23.83
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	12/4/23 19:27	12/5/23 21:38	26.18	9,618,499	3.78	62.8
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	12/7/23 2:14	12/7/23 9:22	7.13	94,540	2.35	98.6
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	12/22/23 8:30	12/22/23 9:37	1.12	421,847	0.52	5.67
004	East Ballard (AKA 11th Ave NW)	Lake Washington Ship Canal	12/25/23 23:22	12/26/23 0:03	0.68	91,760	0.73	14.97
006	Magnolia Overflow	Elliot Bay/Puget Sound	12/5/23 4:00 AM	12/5/23 8:55 PM	16.92	505,129	3.07	37.08
008	3rd Ave W and Ewing St	Lake Washington Ship Canal	1/9/23 10:29 PM	1/9/23 11:32 PM	1.05	171,416	1.54	98.4
008	3rd Ave W and Ewing St	Lake Washington Ship Canal	9/27/23 9:42 AM	9/27/23 11:16 AM	1.57	776,834	2.64	90.82
008	3rd Ave W and Ewing St	Lake Washington Ship Canal	11/4/23 11:06 AM	11/4/23 12:20 PM	1.23	496,712	1.28	13.73

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
008	3rd Ave W and Ewing St	Lake Washington Ship Canal	12/4/23 20:32	12/5/23 22:17	25.75	10,344,652	3.78	63.27
012	Belvoir Pump Station Emergency Overflow	Lake Washington	11/4/23 11:22 AM	11/4/23 11:28 AM	0.10	214	0.78	13.22
012	Belvoir Pump Station Emergency Overflow	Lake Washington	12/4/23 23:42	12/5/23 12:23	12.68	582,959	2.77	47.03
014	Montlake Overflow	Lake Washington Ship Canal	10/10/23 9:28 PM	10/10/23 9:44 PM	0.27	309,919	0.51	29.75
014	Montlake Overflow	Lake Washington Ship Canal	11/2/23 2:13 AM	11/2/23 8:05 AM	5.87	652,666	0.76	13.87
014	Montlake Overflow	Lake Washington Ship Canal	11/4/23 11:02 AM	11/4/23 11:44 AM	0.70	1,737,711	0.78	13.22
014	Montlake Overflow	Lake Washington Ship Canal	12/4/23 21:22	12/5/23 21:34	24.20	16,837	2.5	62.95
014	Montlake Overflow	Lake Washington Ship Canal	12/7/23 9:14	12/7/23 14:00	4.77	624,703	3.31	103.45
014	Montlake Overflow	Lake Washington Ship Canal	12/22/23 9:02	12/22/23 9:58	0.93	1,099,578	0.21	5.05
015	University Regulator	Lake Washington Ship Canal	9/27/2023 9:35:00	9/27/2023 10:34:00	0.98	894,308	2.08	65.83
015	University Regulator	Lake Washington Ship Canal	12/4/23 20:12	12/5/23 22:17	26.08	84,629,305	3.21	125.03

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
015	University Regulator	Lake Washington Ship Canal	12/22/23 9:01	12/22/23 11:50	2.82	3,012,084	0.71	7.6
028	King Street Regulator	Elliott Bay	9/25/23 6:28 PM	9/25/23 10:18 PM	3.83	656,865	1.46	29.82
028	King Street Regulator	Elliott Bay	9/27/23 8:26 AM	9/27/23 9:47 AM	1.35	442,588	2.61	66.45
028	King Street Regulator	Elliott Bay	10/10/23 9:03 PM	10/10/23 9:13 PM	0.17	48,594	0.38	28.62
028	King Street Regulator	Elliott Bay	10/16/23 3:54 PM	10/16/23 4:00 PM	0.10	17,027	0.42	24.77
028	King Street Regulator	Elliott Bay	11/2/23 2:00 AM	11/2/23 3:14 AM	1.23	325,827	0.58	10.47
028	King Street Regulator	Elliott Bay	11/4/23 10:47 AM	11/4/23 10:59 AM	0.20	104,104	1.12	14.35
028	King Street Regulator	Elliott Bay	12/5/23 6:39	12/5/23 6:43	0.07	7,438	2.32	48.38
028	King Street Regulator	Elliott Bay	12/22/23 8:56	12/22/23 9:06	0.17	33,336	0.4	5.20
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	11/2/23 2:07 AM	11/2/23 10:53 AM	8.77	2,997,576	0.8	16.38
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	12/2/23 2:57	12/2/23 5:27	2.50	649,126	0.61	36.93
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	12/4/23 20:58	12/7/23 16:03	67.08	20,032,586	3.88	79.25
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	12/9/23 14:32	12/9/23 16:00	1.47	478,789	4.27	128.48

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
029	Connecticut St. Regulator (AKA Kingdome)	Elliott Bay	12/22/23 9:50	12/22/23 15:01	5.18	2,095,720	0.78	10.13
030	Lander St. Regulator	Duwamish River - East Waterway	1/8/23 2:00 PM	1/8/23 2:13 PM	0.22	16,891	0.80	25.95
030	Lander St. Regulator	Duwamish River - East Waterway	1/9/23 9:43 PM	1/9/23 11:50 PM	2.12	3,493,701	1.21	78.72
030	Lander St. Regulator	Duwamish River - East Waterway	1/12/2023 2:24:00	1/13/2023 1:58:00	23.57	8,259,912	1.13	55.52
030	Lander St. Regulator	Duwamish River - East Waterway	3/4/2023 10:42:00	3/4/2023 11:04:00	0.37	44,068	0.57	19.32
030	Lander St. Regulator	Duwamish River – East Waterway	3/13/2023 8:50:00	3/13/2023 10:03:00	1.22	1,945,256	0.33	16.5
030	Lander St. Regulator	Duwamish River - East Waterway	4/10/23 10:13 PM	4/11/23 12:24 AM	2.18	7,232,336	1.2	59.55
030	Lander St. Regulator	Duwamish River - East Waterway	9/24/23 11:51 PM	9/27/23 12:08 PM	60.28	45,416,672	0.85	52.92
030	Lander St. Regulator	Duwamish River - East Waterway	10/10/23 10:45 PM	10/10/23 11:12 PM	0.45	66,903	0.85	26.58
030	Lander St. Regulator	Duwamish River - East Waterway	10/24/23 9:25 PM	10/24/23 11:31 PM	2.10	2,238,226	0.56	25.72
030	Lander St. Regulator	Duwamish River - East Waterway	11/2/23 2:23 AM	11/2/23 12:27 PM	10.07	27,250,953	0.87	15.82

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
030	Lander St. Regulator	Duwamish River - East Waterway	11/4/23 2:39 AM	11/4/23 3:01 PM	12.37	28,207,678	1.13	14.53
030	Lander St. Regulator	Duwamish River - East Waterway	12/2/23 3:05	12/2/23 8:23	5.30	5,295,778	1.04	37.15
030	Lander St. Regulator	Duwamish River - East Waterway	12/4/23 12:16	12/7/23 16:03	75.78	106,110,637	4.12	79.22
030	Lander St. Regulator	Duwamish River - East Waterway	12/9/23 14:30	12/9/23 16:00	1.50	2,171,941	0.4	4.57
030	Lander St. Regulator	Duwamish River - East Waterway	12/22/23 10:07	12/22/23 15:25	5.30	23,154,035	0.73	10.33
030	Lander St. Regulator	Duwamish River - East Waterway	12/25/23 16:46	12/26/23 1:03	8.28	1,454,679	0.71	15.13
031	Hanford #1	Duwamish River via Diagonal Storm Drain	9/25/23 8:24 PM	9/25/23 9:32 PM	1.13	4,721,332	1.64	29
031	Hanford #1	Duwamish River via Diagonal Storm Drain	11/4/23 10:55 AM	11/4/23 12:13 PM	1.30	2,277,700	1.14	14.53
031	Hanford #1	Duwamish River via Diagonal Storm Drain	12/4/23 10:32 PM	12/6/23 1:13 AM	26.68	18,368,521	3.53	66.98
031a[1]	Hanford #1 (Hanford @ Rainier)	Duwamish River via Diagonal Storm Drain	9/25/23 8:24 PM	9/25/23 9:32 PM	1.13	4,721,332	1.64	29

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
031a[1]	Hanford #1 (Hanford @ Rainier)	Duwamish River via Diagonal Storm Drain	11/4/23 10:55 AM	11/4/23 12:13 PM	1.30	1,816,129	1.14	14.53
031a[1]	Hanford #1 (Hanford @ Rainier)	Duwamish River via Diagonal Storm Drain	12/4/23 10:32 PM	12/6/23 1:13 AM	26.68	18,368,521	3.53	66.98
031b[1]	Hanford #1 (Bayview S.)	Duwamish River via Diagonal Storm Drain	11/4/23 11:00 AM	11/4/23 11:15 AM	0.25	167,166	1.14	14.53
031c[1]	Hanford #1 (Bayview N.)	Duwamish River via Diagonal Storm Drain	11/4/23 10:55 AM	11/4/23 11:10 AM	0.25	294,405	1.14	14.53
032	Hanford #2 Regulator	Duwamish River - East Waterway	1/8/2023 14:03:00	1/8/2023 14:39:00	0.60	350,234	0.80	44.30
032	Hanford #2 Regulator	Duwamish River - East Waterway	1/9/2023 21:52:00	1/9/2023 23:56:00	2.07	2,483,937	1.54	78.72
032	Hanford #2 Regulator	Duwamish River - East Waterway	1/12/2023 13:21:00	1/13/2023 16:13:00	26.87	3,140,296	1.14	56.55
032	Hanford #2 Regulator	Duwamish River - East Waterway	3/4/2023 10:44:00	3/4/2023 11:35:00	0.85	207,826	0.11	19.32
032	Hanford #2 Regulator	Duwamish River - East Waterway	3/13/2023 9:19:00	3/13/2023 10:28:00	1.15	121,470	0.38	27.55
032	Hanford #2 Regulator	Duwamish River - East Waterway	4/11/2023 0:08:00	4/11/2023 0:32:00	0.40	1,502,951	0.35	59.02

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
032	Hanford #2 Regulator	Duwamish River - East Waterway	10/10/23 10:52 PM	10/10/23 11:41 PM	0.82	100,813	0.86	26.58
032	Hanford #2 Regulator	Duwamish River - East Waterway	10/24/23 9:34 PM	10/25/23 12:13 AM	2.65	2,344,877	0.55	7.12
032	Hanford #2 Regulator	Duwamish River - East Waterway	11/2/23 2:30 AM	11/2/23 8:59 AM	6.48	5,356,275	1.17	15.03
032	Hanford #2 Regulator	Duwamish River - East Waterway	11/4/23 3:02 AM	11/4/23 3:57 PM	12.92	5,049,800	1.14	14.53
032	Hanford #2 Regulator	Duwamish River - East Waterway	12/2/23 3:12	12/2/23 6:33	3.35	2,769,672	1.04	37.15
032	Hanford #2 Regulator	Duwamish River - East Waterway	12/4/23 12:30	12/7/23 18:19	77.82	75,840,413	4.25	79.22
032	Hanford #2 Regulator	Duwamish River - East Waterway	12/9/23 14:34	12/9/23 17:54	3.33	3,028,149	0.43	5.8
032	Hanford #2 Regulator	Duwamish River - East Waterway	12/22/23 10:12	12/22/23 16:05	5.88	2,947,655	0.71	10.33
032	Hanford #2 Regulator	Duwamish River - East Waterway	12/25/23 16:46	12/26/23 2:00	9.23	2,063,292	0.71	15.13
036	Chelan Ave. Regulator	West Waterway of Duwamish River	9/25/23 9:04 PM	9/25/23 10:03 PM	0.98	50,353	1.64	29
036	Chelan Ave. Regulator	West Waterway of Duwamish River	11/4/23 11:08 AM	11/4/23 12:53 PM	1.75	164,402	1.14	14.53

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
036	Chelan Ave. Regulator	West Waterway of Duwamish River	12/4/23 21:47	12/6/23 1:17	27.50	3,456,256	3.35	41.33
036	Chelan Ave. Regulator	West Waterway of Duwamish River	12/7/23 15:08	12/7/23 15:14	0.10	9	4.25	79.22
038	Terminal 115 Overflow	Duwamish River	12/4/23 11:15 PM	12/5/23 11:05 PM	23.83	16,392,198	3.65	39.23
040	8th Ave. South Regulator (AKA W. Marginal Way Pump Station)	Duwamish River	12/5/23 0:33	12/5/23 10:41	10.13	123,069	2.72	27.05
041	Brandon Street Regulator	Duwamish River	11/4/23 10:54 AM	11/4/23 11:11 AM	0.28	80,001	1.14	14.53
041	Brandon Street Regulator	Duwamish River	12/4/23 23:52	12/5/23 0:54	1.03	259,734	2.59	100.37
042	West Michigan (AKA SW Michigan St regulator)	Duwamish River	11/4/23 10:51 AM	11/4/23 11:13 AM	0.37	7,739	1.38	14.55
042	West Michigan (AKA SW Michigan St regulator)	Duwamish River	12/4/23 11:37 PM	12/5/23 12:57 AM	1.33	20,123	2.99	113.98
044a	Norfolk local drainage	Duwamish River	12/5/23 0:32	12/5/23 0:40	0.13	7,545,331	1.56	17.25
048b[2]	North Beach Pump Station (inlet structure)	Puget Sound	12/5/23 3:55 AM	12/5/23 4:40 AM	0.75	23,498	1	46.28

Outfall #	CSO Name	Receiving Water	Event Starting Date/Time	Event Ending Date/Time	Duration (hours)	Volume (gallons)	Precipitation (inches)	Storm Duration (hours)
049	30th Avenue NE Pump Station	Lake Washington	12/4/23 22:50	12/5/23 17:00	18.17	61,152	2.42	58.52
054	63rd Avenue SW Pump Station	Puget Sound	12/5/23 0:12	12/5/23 16:48	16.60	71,340,930	3.64	59.1
057	Barton Street Pump Station	Puget Sound	2/13/23 19:36	2/13/23 20:30	0.90	101,100	0.28	4.6
057	Barton Street Pump Station	Puget Sound	10/10/23 8:49 PM	10/10/23 9:04 PM	0.25	17,610	0.68	30.1
057	Barton Street Pump Station	Puget Sound	11/4/23 10:45 AM	11/4/23 11:05 AM	0.33	180,196	1.35	14.65
Total Volume						644,702,661	Gallons	

Notes:
[1] This event is reported under DSN 031 and is not counted separately in overall event count but is reflected separately in this table for consistency.
[2]Per 2024 NPDES permit, North Beach Pump Station (inlet structure) DSN 048b will no longer be reported as a separate outfall from DSN 048a but is reflected separately in this table for consistency.

Appendix B
Treated CSO Events

January–December 2023

Outfall #	CSO Name	Facility Name	Receiving Water	Event Ending Date/Time	Event Starting Date/Time	Duration (hours)	Volume (million gallons)	Storm Precipitation (inches)	Storm Duration (hours)
051b	Alki CSO Treatment Facility Outfall	Metropolitan King County - West Point	Puget Sound	12/6/23 2:32 AM	12/4/23 11:36 PM	26.20	38.40	3.69	42.30
046b	Carkeek CSO Treatment Facility Outfall	Metropolitan King County - West Point	Puget Sound	11/4/23 3:25 PM	11/4/23 11:11 AM	2.43	0.13	1.40	17.63
046b	Carkeek CSO Treatment Facility Outfall	Metropolitan King County - West Point	Puget Sound	12/6/23 3:31 AM	12/5/23 12:02 AM	26.60	8.20	4.12	68.36
027b	Elliott West CSO Treatment Facility	Metropolitan King County - West Point	Puget Sound	9/25/23 11:51 PM	9/25/23 9:19 PM	2.53	2.35	1.50	32.67
027b	Elliott West CSO Treatment Facility	Metropolitan King County - West Point	Puget Sound	11/2/23 10:56 AM	11/2/23 7:11 AM	3.77	4.54	1.19	16.80

Outfall #	CSO Name	Facility Name	Receiving Water	Event Ending Date/Time	Event Starting Date/Time	Duration (hours)	Volume (million gallons)	Storm Precipitation (inches)	Storm Duration (hours)
027b	**Elliott West CSO Treatment Facility**	Metropolitan King County - West Point	Puget Sound	11/4/23 1:41 PM	11/4/23 11:33 AM	2.13	3.84	1.15	14.35
027b	**Elliott West CSO Treatment Facility**	Metropolitan King County - West Point	Puget Sound	12/5/23 11:21 AM	12/4/23 10:34 AM	23.72	83.15	3.36	65.02
027b	**Elliott West CSO Treatment Facility**	Metropolitan King County - West Point	Puget Sound	12/7/23 4:34 PM	12/7/23 1:30 PM	3.07	1.89	0.79	31.65
027b	**Elliott West CSO Treatment Facility**	Metropolitan King County - West Point	Puget Sound	12/22/23 3:49 PM	12/22/23 2:34 PM	1.25	0.64	0.83	10.18
044b	**MLK/ Henderson CSO Treatment Facility Outfall**	Metropolitan King County - West Point	Duwamish River	12/6/23 1:21 AM	12/5/23 9:16 AM	16.10	6.75	3.75	41.40
1	**West Point Wastewater Treatment Plant**[1,2]	Metropolitan King County - West Point	Puget Sound	1/10/23 1:26 AM	1/9/23 9:57 PM	3.50	5.16	0.76	99.78

Outfall #	CSO Name	Facility Name	Receiving Water	Event Ending Date/Time	Event Starting Date/Time	Duration (hours)	Volume (million gallons)	Storm Precipitation (inches)	Storm Duration (hours)
1	**West Point Wastewater Treatment Plant**[1,3]	Metropolitan King County - West Point	Puget Sound	1/12/23 3:45 PM	1/12/23 1:55 PM	1.73	0.44	0.18	162.57
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	9/25/23 11:15 PM	9/25/23 12:46 AM	3.70	2.30	0.96	28.38
1	**West Point Wastewater Treatment Plant**[1,4]	Metropolitan King County - West Point	Puget Sound	9/27/23 12:15 PM	9/27/23 9:34 AM	3.12	5.96	0.75	42.37
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	11/2/23 10:31 AM	11/2/23 2:58 AM	6.08	3.50	0.97	13.82
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	11/4/23 2:14 PM	11/4/23 9:02 AM	5.15	7.22	1.28	3.82
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	11/6/23 6:54 PM	11/6/23 4:42 PM	2.15	1.46	0.38	23.83
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	12/2/23 4:52 AM	12/2/23 3:38 AM	1.22	0.20	0.50	37.55

Outfall #	CSO Name	Facility Name	Receiving Water	Event Ending Date/Time	Event Starting Date/Time	Duration (hours)	Volume (million gallons)	Storm Precipitation (inches)	Storm Duration (hours)
1	**West Point Wastewater Treatment Plant**[1,5]	Metropolitan King County - West Point	Puget Sound	12/7/23 11:51 PM	12/4/23 8:06 PM	32.40	85.80	2.47	107.28
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	12/9/23 5:19 PM	12/9/23 2:23 PM	2.93	3.46	0.58	5.40
1	**West Point Wastewater Treatment Plant**[1]	Metropolitan King County - West Point	Puget Sound	12/22/23 4:16 PM	12/22/23 9:34 AM	6.70	12.71	0.67	10.00
1	**West Point Wastewater Treatment Plant**[1,6]	Metropolitan King County - West Point	Puget Sound	12/26/23 2:02 AM	12/25/23 5:01 PM	2.97	1.03	0.68	15.25
Total Volume							**279.13 MG**		

Notes:

[1] Flow at West Point exceeded 300 MGD.
[2] Event spans two days.
[3] This event was a result of a long storm duration.
[4] The storm event includes the previous storm event.
[5] Event spans four days.
[6] Event spans two days.

Appendix C
Alki Wet Weather Treatment Station
Annual Report

January–December 2023

Executive Summary

This 2023 annual report summarizes the performance of King County's Alki Wet Weather Treatment Station (Alki WWTS). The Alki WWTS came online for combined sewer overflow (CSO) treatment in 1998; it operates under the National Pollutant Discharge Elimination System (NPDES) permit for the West Point Treatment Plant (West Point) (WA-0029181).

The year 2023 was slightly drier than normal, producing seven filling events and one discharge event at Alki WWTS. The seven discharge events occurred over six reporting days and four months. The Alki WWTS received a total of 41.5 million gallons (MG) and discharged 38.4 MG. A total of 35.0 inches (in.) of rain fell in 2023, as measured at the rain gauge at the Murray Avenue Pump Station. King County switched to the rain gauge in late 2019 to report Alki WWTS rainfall data. The annual rainfall for 2023 at SeaTac International Airport was 34.97 in.; the 20-year average of annual total rainfall at SeaTac is 40.03 in.

Table C-1 summarizes the performance of Alki WWTS in 2023. This station was compliant with all permit conditions except the annual total suspended solids (TSS) removal and the daily minimum pH on one occasion. The annual TSS removal for 2023 was 30.5 percent, which did not meet the annual 50 percent TSS removal limit. Effluent settleable solids (SS) averaged 0.1. milliliters/liter/hour (ml/L/hr), which met the annual permit limit of 0.3 ml/L/hr. The effluent total residual chlorine (TRC) averaged no greater than 10 µg/L on any discharge day. The effluent fecal coliform geomeans were no greater than 2 counts per 100 ml during the one discharge month. The effluent pH exceeded the minimum on one discharge day in 2023. There was no permit exceedance for maximum pH greater than 9.0 throughout the reporting year.

Table C-1. Alki WWTS Permit Performance in 2023

Parameter	Performance	Permit Conditions
Discharge events (number)[a]	**1**	**29**
Discharge volume million gallons (MG)[a]	**38.4**	**108**
Annual average SS (ml/L/hr)	**0.1**	**0.3**

Annual average TSS removal – including all discharge events (%)	**30.5**	**50**
Instantaneous minimum effluent pH, frequency of discharge days with pH < 6.0	**1 out of 2 discharge days**	**≥ 6.0**
Instantaneous maximum effluent pH, frequency of discharge days with pH > 9.0	**0 out of 2 discharge days**	**≤ 9.0**
TRC, maximum of daily averages (µg/L), frequency of discharge days with TRC >234 µg/L	**0 out of 2 discharge days**	**≤ 234 µg/L**
Monthly fecal coliform geomean, frequency of months with monthly geomean >400/100mL	**0 out of 1 discharge months**	**400/ 100 mL**

Notes:

[a]Compliance assessed over a five-year average.
Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

Total suspended solids (TSS) removal averaged 30.5 percent in 2023, which includes all discharge events. This did not meet the annual average TSS removal permit level of 50 percent. The annual event average SS was 0.1 ml/L/hr, and thus met the annual average NPDES permit level of 0.3 ml/L/hr.

Historically, complying with the annual 50 percent TSS removal limit at the Alki WWTS has been a challenge. Past operational changes were made to improve TSS removal with little success.

These changes included changes in the filling operation of the sedimentation tanks, periodic cleaning of the effluent channel of accumulated solids and adding variable frequency drives (VFD) to raw sewage pumps at the 63rd Ave. Pump Station to smooth the influent pumping swings at Alki WWTS. A new project was started in 2021 to determine the solids mass balance, which is still ongoing, and lamella plates and cloth filters are being evaluated for use in the sedimentation tanks to improve the solids removal at Alki WWTS. During 2024, additional online solids monitoring equipment will be installed at Alki WWTS to inform how solids are distributed throughout Alki WWTS for better understanding of the overall system.

Fecal Coliform Bacteria

The fecal coliform monthly geomean limit of 400 counts per 100 ml was met during the one discharge month in 2023; the result was 2 counts per 100 ml in December 2023. All fecal coliform samples collected were valid.

Total Residual Chlorine

Both discharge days at the Alki WWTS met the daily average TRC permit limit of 234 µg/L. The 2023 annual effluent TRC average was 7 µg/L, with the maximum daily average of 11 µg/L occurring during the December 4, 2023, discharge event.

Instantaneous Minimum and Maximum Effluent pH

There was one discharge day that resulted in the discharge effluent exceeding the minimum pH permit of 6.0 at Alki WWTS. The December 4 to 5, 2023, event had a minimum pH of 3.8 on the first day of the two-day discharge event. The permit violation occurred at the beginning of the discharge event, and the pH steadily increased and stabilized to a pH above 6.0 after only a few minutes. This would suggest that the low pH was not representative of the effluent. Data indicates that there was septic water in the sample line prior to the events, and the increase in pH was due to fresh effluent entering the sample intake line.

Operation and Maintenance

Major upgrades to the Alki WWTS were completed in recent years; staff evaluated and adjusted, as needed, in 2023. The following are highlights of operations and maintenance (O&M) activities during 2023:

- Conducted annual CSO refresher training for the operators.
- Quarterly/monthly testing of hypochlorite and bisulfite solution strength; set point changes made to chemical feed pumps based on solution strength; shipments of full- strength solutions ordered as necessary.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Periodic cleaning of the effluent channel of accumulated solids and debris to improve treatment including solids removal.
- Ongoing, routine preventive maintenance practice to exercise the chemical feed pumps on a monthly basis.
- Completed work on the final effluent sampling pump stilling well to improve effluent flow through the stilling well and to prevent low pH exceedances.
- Continue preventive maintenance by Off-Site Instrumentation and Electrical staff of online chlorine and pH analyzers, including weekly calibration and replacement of probes and other instrumentation components, as necessary.

Alki Improvement Solids/TSS Removal Project

A project was started in early 2021 to evaluate if the abandoned digester tanks could be used as solids holding tanks during discharge events. This project has included a structural inspection and evaluation of the digester tanks, and evaluation of potential treatment process changes to improve the solids removal at Alki. The preliminary findings indicate that the digester tanks are structurally sound for holding solids; however, additional modifications in pumping, piping, and odor control would be needed, requiring a substantial capital cost. As a follow-up to this project of converting the digesters into solids storage, further evaluations of treatment performance were also recommended. The recommendations included the installation of online solids monitoring and additional sampling to perform more robust solids mass balances, and the installation of lamella plates in the sedimentation tanks to increase the solids removal performance. The follow-up phase would be data analysis and recommendations, if any, for potential treatment process changes. The installation of online solids monitoring equipment is ongoing.

Near Future Operation

As with all wet weather treatment stations, opportunities to operate and then to optimize are very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. WTD staff will continue to investigate issues and make any necessary adjustments in the O&M. In addition, WTD staff responding to Alki WWTS will:

- Continue with the evaluation and make necessary adjustments to the new hypochlorite feed system.
- Continue to evaluate the TSS removal performance and support the solids removal improvement project.
- Continue to evaluate and make necessary improvements to inline pH measurements to prevent low pH excursions from nonrepresentative sample flows.

Table C-2. Alki WWTS 2023 Annual Event Data Summary

Month	Day	Alki Inflow Event Number	Alki Inflow Volume (MG)	Alki Discharge Event Number	Alki Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ Alki + WP (lb)	% removal	Alki Effl. Daily Settl Solids (ml/l/hr)	Alki Effl. Settl Solids Event Avg (ml/l/hr)	Alki Effl. Fecal Coliforms (#/100 ml)	Alki Effl. Residual Chlorine Daily Average (µg/l)	Daily Min/Max pH
January	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/Geo Mean	0	0.0	0	0.0	-	-	-			ND		
February	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/Geo Mean	0	0.0	0	0.0	-	-	-			ND		
March	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/Geo Mean	0	0.0	0	0.0	-	-	-			ND		
April	No Inflow/No Disch.												

	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
June	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		
August	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**0**	**0.0**	**0**	**0.0**	**-**	**-**	**-**			**ND**		

September	25	1	0.21	ND	ND	NS**	NS**						
	27	2	0.09	ND	ND	98	12						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**2**	**0.3**	**ND**	**ND**	**98**	**12**	**87.7%**			**ND**		
October	10	1	0.28	ND	ND	579	16						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**1**	**0.3**	**ND**	**ND**	**579**	**16**	**97.3%**			**ND**		
November	4	1	0.51	ND	ND	1,523	258						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/Geo Mean	**2**	**0.51**	**ND**	**ND**	**1,523**	**258**	**83.1%**			**ND**		
December	4	1	14.84	1	13.22	3,342	3,411		<0.1		20/1	10	3.8/6.7
	5	1	25.58	1	25.22	9,814	6,981		0.1	0.1	1/1	4	6.6/6.8
	Instant. Min/Max pH												**3.8/6.8**
	Event/Daily Max									**0.10**		**10**	
	Monthly Total/Avg/Geo Mean	**2**	**40.4**	**1**	**38.4**	**13,156**	**10,392**	**21.0%**			**2**		
Total		**7**	**41.5**	**1**	**38.4**	**15,355**	**10,677**						
Inst. pH Min/Max													3.8/6.8
Max (GEM, SS, TRC)											**2**	**ND**	
Annual Average							by mass:	**30.5%**		**0.10**	**2**	**7**	

Notes:
ND = No discharge.
Red = NPDES permit exceedance.
%NS = No sample collected.
^ED = End of discharge; fecal coliform samples were collected before next grab sample was required.

Appendix D
Carkeek Wet Weather Treatment Station
Annual Report

January–December 2023

Executive Summary

This 2023 report summarizes the performance of Carkeek Wet Weather Treatment Station (Carkeek WWTS). The Carkeek WWTS began to operate as a CSO treatment facility on November 1, 1994. The Carkeek WWTS operates under the National Pollutant Discharge Elimination System (NPDES) permit for the West Point Treatment Plant, Washington State Department of Ecology permit number WA-0029181.

The year 2023 was slightly dryer than normal for the region, producing three filling events and two discharge events at Carkeek WWTS. The two discharge events occurred over 3 reporting days and two months. Carkeek WWTS received a total of 9.4 million gallons (MG) and discharged 8.3 MG. Rainfall at the Ballard Station rain gauge—the gauge used for Carkeek WWTS reporting—totaled 33.3 inches (in.) in 2023. By comparison, 2023 annual rainfall at SeaTac was 34.97 in.; the 20-year average of annual total rainfall at SeaTac is 40.03 in.

Table D-1 summarizes the performance of Carkeek WWTS in 2023. This station was compliant with all permit conditions except the annual average settleable solids (SS) removal and the fecal coliform monthly geomean, during one discharge month. The effluent fecal coliform geomean during the month of November was 160,000 counts per 100 ml, which exceeded the permit limit of 400 counts per 100 mL. Effluent SS averaged 1.8. milliliters/liter/hour (ml/L/hr) for 2023, which exceeded the annual permit limit of 0.3 ml/L/hr. The annual TSS removal for 2023 was 59 percent, which met the annual 50 percent TSS removal limit. The effluent total residual chlorine (TRC) averaged no greater than 5 µg/L on any discharge day. Carkeek WWTS effluent pH never exceeded the minimum permit limit of pH 6.0 or the maximum permit limit of pH 9.0.

Carkeek WWTS had one disinfection failure in 2023, which occurred from December 4 to December 5. This event is further discussed below in the fecal coliform bacteria section.

Table D-1. Carkeek WWTS Permit Performance in 2023

Parameter	Performance	Permit Conditions
Discharge events (number)[a]	**2**	**10**
Discharge volume (MG)[a]	**8.3**	**46**
Annual average SS (ml/L/hr)	**1.80**	**0.3**
Annual average TSS removal – including all discharge events (%)	**59**	**50**
Instantaneous minimum effluent pH, frequency of discharge days with pH <6.0	**0 out of 2 discharge days**	**≥ 6.0**
Instantaneous maximum effluent pH, frequency of discharge days with pH >9.0	**0 out of 2 discharge days**	**≤ 9.0**
TRC, maximum of daily averages (µg/L), frequency of discharge days with TRC >490 µg/L	**0 out of 2 discharge days**	**≤ 490 µg/L**
Monthly fecal coliform geomean, frequency of months with monthly geomean >400/100mL	**1 out of 2 discharge months**	**400/100 mL**

Notes:

[a] Compliance assessed over a five-year average. Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

Total suspended solids (TSS) removal averaged 59 percent, thereby meeting the annual TSS removal NPDES permit limit of 50 percent. The annual SS for the year averaged 1.80 ml/L/hr, exceeding the NPDES permit limit annual average of 0.3 ml/L/hr. Carkeek WWTS has typically met the annual percent TSS removal and SS annual average. The 2023 average SS was driven by the unusually high effluent SS value of 3.0 ml/L/hr on November 4, 2023, and of 0.4 and 0.8 ml/L/hr on December 4 and 5, 2023, respectively. However, it is unclear at this time why the SS values were so high. One possible reason for the high SS values in November is that the November 4 storm was the first discharge in 10 months, with only one very small filling event in the interim. The December event had a high inflow volume and high flow rates (with peak flows reaching 22 MGD), which likely contributed to the high SS values. The rated surface

overflow rate (SOR) as gallons per day per square foot (gpd/ft^2) of the Carkeek sedimentation tanks is 5,500 gpd/ft^2. The SOR of the sedimentation tanks during both storms was higher than the rated specifications and, during the December 4 to 5 event, the SOR was approximately 2 times that of the rated SOR (12,300 and 8,000 vs. 5,500 gpd/ft^2). These results support the suggestion that the December storm event resulted in washing out of solids, including SS, resulting in the high SS value for the event.

Fecal Coliform Bacteria

Carkeek did not meet the fecal coliform monthly geomean permit limit of 400 counts per 100 ml one month out of the two discharge months in 2023. The annual average of the monthly geomeans was 80,101 counts/100 ml. The cause of high measured fecal coliform concentrations during the November discharge, the discharge month not meeting the monthly geomean limit, was the result of the C2 carrier water system being out of service due to delays in obtaining replacement parts. All fecal coliform samples collected during these months were valid.

There was one disinfection failure at Carkeek in 2023. The disinfection failure occurred on December 4. The failure resulted from the disruption of the hypochlorite feed when the metering pumps failed to feed hypochlorite due to a faulty pressure relief valve (PRV). The hypochlorite pump was operating but was not pumping, and staff reestablished hypochlorite flow before the event ended. In response to the disinfection failure, the faulty PRV and a cracked coupling upstream of the hypochlorite pumps was replaced. Furthermore, a preventive maintenance work order was created to replace the PRV annually prior to each wet season.

Instantaneous Minimum/Maximum pH

The instantaneous minimum and maximum pH during the 2023 reporting period were 6.4 and 8.3, respectively, thereby meeting the NPDES permit limits of a minimum pH of 6.0 and maximum pH of 9.0.

Total Residual Chlorine

Carkeek WWTS did meet the daily maximum average TRC all discharge days during 2023. The maximum daily average effluent TRC during the 2023 reporting year was 5 µg/L, thereby meeting the NPDES permit limit of 490 µg/L.

There is a project underway to improve the sodium bisulfite (SBS) storage and feed system. The project includes improved heated chemical storage, SBS recirculation within the storage tanks during non-event periods, and new peristaltic metering pumps. The purpose of this project is to address chemical feed and dechlorination issues to avoid violating the permitted TRC limit. Construction of the new SBS system is expected to start by spring 2024.

Operations and Maintenance

The following are highlights of operations and maintenance (O&M) activities during 2023:

- Conducted annual CSO refresher training for operators.
- Received shipments of both sodium hypochlorite and SBS treatment chemicals.
- Continued to conduct debriefings with O&M staff after each discharge event to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Conducted periodic cleaning out of the sedimentation tanks and effluent channel of accumulated solids and debris to improve solids removal.
- Continued monthly testing of the treatment chemicals' concentrations (sodium hypochlorite and SBS solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued a preventive maintenance practice to exercise the chemical feed pumps monthly.
- Continued preventive maintenance by Off-Site Instrumentation and Electrical staff of online chlorine and pH analyzers, including weekly calibration and replacement of probes and other instrumentation components, as necessary.
- Continued ongoing Carkeek Pump Station evaluation and adjustments of the variable frequency drive.
- Supported the telemetry upgrade (third-party telecommunication company).
- Retrieved instrumentation technician data from data logger for continuous data collection during instances of telemetry loss.
- Installed new updated telecommunication equipment in Q2 2023.

Dechlorination Improvement Project

In late 2019, a new capital project was initiated to improve the reliability of the dechlorination system at Carkeek WWTS. This project entails upgrading the storage of SBS chemical solution from a single, 1,000-gallon tank to two 500-gallon tanks, upgrading the HVAC system, new chemical feed pumps, and upgraded amperometric chlorine analyzers. The project will also locate the sampling and instrumentation equipment in a dedicated room, separated from SBS chemical storage, to provide a safer workspace for staff during monitoring and maintenance. The project team has set a potential start of construction for spring 2024, with potential commissioning by summer 2024.

Near Future Operation

As with all wet weather treatment stations, opportunities to operate and then to optimize are very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to

test the improvements would likely occur in the following wet season. Given the "normal" challenges of an intermittently operated facility, WTD has essentially had to make improvements continuously. The following improvements have been identified to be addressed during subsequent dry seasons:

- Continue to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Continue monthly or quarterly testing of the treatment chemicals' concentrations (sodium hypochlorite and SBS solutions) and make necessary changes to the feed programs or ordered fresh chemicals.
- Continue a preventive maintenance practice to exercise the chemical feed pumps' monthly and weekly calibration and preventive maintenance of online instrumentation.
- Continue to monitor and evaluate the completed flow measurement improvements.
- Support the Dechlorination Improvement capital project to upgrade the SBS chemical storage and feed system.
- Install replacement C2 system parts as soon as possible once they are received.

Table D-2. Carkeek WWTS 2023 Annual Event Data Summary

Month	Day	Carkeek Inflow Event Number	Carkeek Inflow Volume (MG)	Carkeek Discharge Event Number	Carkeek Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ Carkeek + WP (lb)	% removal	Carkeek Effl. Daily Settl Solids (ml/l/hr)	Carkeek Effl. Settl Solids Event avg (ml/l/hr)	Carkeek Avg daily Effl. Fecal Coliforms (#/100 ml)	Carkeek Effl. Residual Chlorine Daily Average (µg/l)	Daily Min/Max pH
January	9	1	0.04	ND	ND	448	26						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.04**	**ND**	**ND**	**448**	**26**	**94.1%**			**ND**		
February	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
March	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
April	No Inflow/No Disch.												

	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	0.00	-	-	-			ND		
May	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	0.00	-	-	-			ND		
June	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	0.00	-	-	-			ND		
July	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	0.00	-	-	-			ND		
August	No Inflow/No Disch.												
	Instant. Min/Max pH												ND
	Event/Daily Max									ND		ND	
	Monthly Total/Avg/GeoMean	0	0.00	ND	0.00	-	-	-			ND		
September	No Inflow/No Disch.												

	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
October	No Inflow/No Disch.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**0.00**	**-**	**-**	**-**			**ND**		
November	4	1	0.37	1	0.13	1027	219.55		3.00	3.00	160000	5	6.8/7.9
	Instant. Min/Max pH												**6.8/7.9**
	Event/Daily Max									**3.0**		**5**	
	Monthly Total/Avg/GeoMean	**1**	**0.37**	**1**	**0.13**	**1,027**	**220**	**78.6%**			**160000**		
December	4	1	3.88	1	3.23	1909	928	**DF**	0.40		45/1	0	6.4/8.3
	5	1	5.08	1	4.98	1949	1010	**DF**	0.80	0.60	230/160,000	0	7.6/7.9
	Instant. Min/Max pH												**6.4/8.3**
	Event/Daily Max									**0.6**		**0**	
	Monthly Total/Avg/GeoMean	**1**	**8.96**	**1**	**8.21**	**3858**	**1938**	**49.8%**			**202**		
Total		**3**	**9.37**	**2**	**8.34**	**5,333**	**2,184**						
Inst. pH Min/Max													**6.4/8.3**
Max (GEM, SS, TRC)											**160000**	**5**	
Annual Average								**59%**		**1.80**	**80101**	**2**	

Notes:
ND = No discharge.
Red = NPDES permit exceedance.
%NS = No sample collected.
^ED = End of discharge; fecal coliform samples were collected, discharge ended before next grab sample was required.
DF=Disinfection Failure

Appendix E
Elliott West Wet Weather Treatment Station
Annual Report

January–December 2023

Executive Summary

This 2023 annual report summarizes the performance of the Elliott West Wet Weather Treatment Station (EWWTS). EWWTS began operating in July 2005. The facility operates under the permit for the West Point Treatment Plant (West Point), Washington State Department of Ecology permit number WA-0029181.

The year 2023 was slightly drier than what was reported at SeaTac International Airport, resulting in 33 inflow events and six discharge events at EWWTS. The six discharge events occurred over seven reporting days and three reporting months. EWWTS influent totaled 236.3 million gallons (MG) and 96.4 MG were discharged in 2023. Total rainfall in 2023 was 31.8 inches (in.) as measured at the Denny Way rain gauge (3165 Alaskan Way in Seattle). The annual total at Denny Way is considerably lower than the 2023 annual rainfall total of 34.97 in. at SeaTac. The 20-year average of annual rainfall at SeaTac International Airport is 40.03 in.

Table E-1 summarizes the performance of EWWTS in 2023. EWWTS did not comply with seven out of a possible 26 permit conditions in 2023. EWWTS did comply with the instantaneous effluent maximum pH of 9.0, but it did not meet the minimum pH of 6.0. EWWTS had permit violations for fecal coliform monthly geomean and maximum daily average total residual chlorine (TRC) of 109 µg/L. EWWTS did meet the permit limits for annual total suspended solids (TSS) removal of 50 percent. TSS removal averaged 61 percent over the year, which accounts for all inflow and discharge events.

EWWTS met the fecal coliform monthly geomean permit limit of 400 counts per 100 ml during all discharge months. The station did not comply with the annual average settleable solids (SS) limit of 0.3 milliliters/liter/hour (ml/L/hr.); effluent SS averaged 1.3 ml/L/hr in 2023. Daily average TRC exceeded the permitted level of 109 µg/L on three of seven discharge days; it reached as high as 485 µg/L. Effluent pH dropped below the permitted minimum limit of pH 6.0 on two of the seven discharge days; it reached as low as pH 5.8 during an event.

All required samples were collected, and all required measurements were completed in 2023.

Table E-1. Elliott West Wet Weather Treatment Station Permit Performance in 2023

Parameter	Performance	Permit Conditions
Discharge events (number)	**7**	**NA**
Discharge volume (MG)	**96.4**	**NA**
Annual average SS (ml/L/hr)	**1.3**	**0.3**
Annual average TSS removal – including all discharge events (%)	**61**	**50**
Instantaneous minimum effluent pH, frequency of discharge days with pH <6.0	**2 out of 7 discharge days**	**≥ 6.0**
Instantaneous maximum effluent pH, frequency of discharge days with pH >9.0	**0 out of 7 discharge days**	**≤ 9.0**
TRC, maximum of daily averages (µg/L), frequency of discharge days with TRC >109 µg/L	**3 out of 7 discharge days**	**109 µg/L**
Monthly fecal coliform geomean, frequency of months with monthly geomean >400/100 ml	**0 out of 3 discharge months**	**400/100 mL**

Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

In 2023, EWWTS met the permit annual TSS removal limit of 50 percent, with an average of 61 percent. EWWTS did not meet the permit annual SS average limit of 0.3 ml/L/hr. The annual SS concentration for 2022 averaged 1.33 ml/L/hr, with a maximum event SS value of 4.5 ml/L/hr on November 4, 2023. In August 2022, King County hired a contractor to clean out the EWWTS wet well of accumulated solids. The expectation was that removing the accumulated solids from the wet well would reduce the potential for resuspension of solids including the settleable solids during subsequent inflow and discharge events by the main discharge pumps. It is suspected that resuspension of

accumulated solids contributes to the high SS concentrations in the final effluent flow, resulting in noncompliance of SS permit limits.

The contractor was able to remove approximately 32 tons of material from the wet well. Unfortunately, the wet well clean-out in August 2022 did not improve the settleable solids removal in 2023. Staff will continue to monitor the effectiveness of the wet well clean out in reducing the SS concentration in the pumped flows including discharge flows. Discussions are ongoing to decide if wet well clean-out should be a reoccurring activity.

With the ongoing challenges of meeting the NPDES permit limits at EWWTS, King County is underway with a project of combined sewer overflow (CSO) treatment improvements for EWWTS to achieve compliance. Until a new treatment facility is in operation, there are interim upgrades planned to start the 2024 dry season. These interim improvements include upgrading the chlorination and dechlorination system by installing new hypochlorite and bisulfite feed pumps along with improved feed controls, and improvements to the compliance sampling system.

Fecal Coliform Bacteria

In 2023, Elliott West WWTS did meet the fecal coliform NPDES permit limit of 400 counts per 100-ml monthly geomean during all of the discharge months. The maximum monthly geomean for fecal coliform bacteria was calculated as 89 counts per 100 ml and occurred in the month of December. The annual average of the monthly geomeans was 51 counts per 100 ml.

Total Residual Chlorine

In 2023, there were three out of seven discharge days when the effluent daily average TRC exceeded the NPDES permit level of 109 µg/L. (Refer to Table E-2 for the discharge events that exceeded the TRC limits.) The annual average of all daily TRC values was 195 µg/L. The maximum daily average TRC of 485 µg/L occurred on December 4, 2023. This discharge event spanned two days, December 4 to 5, and exceptionally heavy rain contributed to the overflows that occurred on those days. During this storm event, EWWTS exceeded its daily TRC permit limit of 109 µg/L on both days, averaging 485 µg/L on December 4 and 184 µg/L on December 5. A high TRC is typically due to inadequate sodium bisulfite (SBS), the dechlorination chemical, dose. During this event, the SBS feed pumps did not start in auto due to a stuck float switch. After several attempts to start the SBS feed in manual mode, the operator was able to establish SBS flow and reduced the effluent TRC. As a result of the event, the float switch was relocated to prevent future hangups, the SBS run permissive is under evaluation, and a proposal to replace the float switch with a level sensor is currently under review.

The interim SBS improvement project will include evaluating the SBS metering pumps' capacities and level of turn-down. Additional past actions include feeding a diluted SBS

solution to aid in dispersion, increased C2 water capacity for reliable SBS carrier water, the use of an in-pipe SBS diffuser (in place of flash mixers), and the use of the "semi-auto" mode for SBS feed control during times of questionable pre-dechlorination analyzer output. King County staff will continue to monitor and adjust the hypochlorite and SBS dosing and further investigate areas to improve the chemical feed control.

Instantaneous Minimum and Maximum Effluent pH

Instantaneous minimum effluent pH in 2023 exceeded the minimum permit limit of pH 6.0 on two out of seven total discharge days. The instantaneous maximum pH limit of 9.0 was met for each of the discharge days in 2023.

The effluent pH reached as low as pH 5.8 on December 7, 2023; this was the lowest effluent pH of the year. The December 7 event was preceded by a different storm event in which the effluent pH dropped below 6.0. The December 4 to December 7 discharge events were the result of several inches of rain across five days. The event on December 7 had a short duration and low rate, which limited the time operators had to dial in the chemical system. The effluent pH dropped below 6.0 for 10 minutes during the 3.1 hours of discharge, likely due to low alkalinity CSO flows along with potential for overdosing SBS during high pre-dechlorinated TRC values. Part of the challenge is that the inflow can drop so low in alkalinity (e.g., as low as 12 to 40 milligrams per liter [mg/L] as CaCO3). By comparison, the influent alkalinity at West Point tends to be near 200 to 225 mg/L CaCO3 on dry weather days.

Some of the projects and actions to address dechlorination and TRC exceedances, as described in the previous section on final effluent TRC permit performance, will also be beneficial in meeting the minimum pH permit limits of the effluents.

Operations and Maintenance

The following are highlights of operations and maintenance (O&M) activities at EWWTS during 2023:

- Conducted annual CSO refresher training for the operators in 2023.
- Provided remote monitoring support team in anticipation of a treatment and discharge event, and during the event.
- Received shipments of both sodium hypochlorite and SBS treatment chemicals, as needed.
- Continued monthly testing of the treatment chemicals' concentrations (sodium hypochlorite and SBS solutions) and made necessary changes to the feed programs or ordered fresh chemicals.
- Continued the automated Mercer Tunnel flushing program at the East Portal flushing gate as an attempt to flush and capture the solids that settled in the Mercer Tunnel.

- Continued to monitor the effectiveness of the automated Mercer Tunnel flushing by taking samples from the return flows and running laboratory solids analyses on those samples.
- Continued to run the dewatering pumps during discharges to remove additional solids, which takes advantage of the turbulence and resuspension of solids in the wet well caused by the larger main pumps and increases the solids in the return flows to West Point.
- Continued to conduct debriefings with O&M staff after discharge events to review and discuss the discharge and treatment performance and make any needed operational adjustments for subsequent events.
- Continued with additional procedures to the post-discharge event routines, including equipment testing and cleaning and de-ragging within the dechlor and final effluent vaults/structures (equipment includes both pre-dechlor and final effluent sample pumps and sample line).
- Continued to exercise the hypochlorite chemical feed pumps on a monthly basis as a preventive maintenance measure.
- Operated a post-inline SBS dilution system (installed in summer 2018) to dilute the 38 percent SBS to 20 percent solution.

Improvement Projects at Elliott West Wet Weather Treatment Station

King County has assembled a consultant team to plan and design a new treatment facility at EWWTS. The project will be built on the current Elliott West location. The alternatives analysis completed in 2021 indicated that various high-rate treatment technologies would fit in the limited footprint of the site. King County is underway with planning and design on the various elements of this long-term project that will consist of ballasted sedimentation and replacement of the chlorine disinfection with an ultraviolet light system. Until the new facility is built and operating, the County is committed to addressing some of the current challenges in meeting permit compliance. These interim improvements include upgrades to the chlorination and dechlorination systems with new sets of feed pumps to better match the necessary feed ranges, along with improved chemical feed controls. Interim improvements also include addressing the compliance and control point sampling reliability issues. Construction on some of these interim improvements will start during the next dry season in 2024.

Near Future Operation

During its 19 years of operation, opportunities to operate and then to optimize EWWTS have been very limited. Challenges may be identified during an event in the wet season, but any major projects to address the challenge would likely have to occur during the following dry season. Then, after the completion of these projects, the opportunities to test the improvements would likely occur in the following wet season. Given the

complexity of EWWTS's design and operation and the “normal” challenges of an intermittently operated facility, WTD has essentially had to make improvements continuously, and a number of improvements have been identified to be addressed during subsequent dry seasons. WTD staff will continue to fine-tune the chlorination–dechlorination controls and assess and improve the facility performance using these additional tools.

The EWWTS CSO effluent drop structure drain gate (aka wet well drain gate) and the corroded frame were repaired and replaced during summer 2023. Currently, the gate is operated manually after each event. The gate is opened once the wet well level is low enough for the hydraulic grade line to allow the remaining treated CSO in the final effluent pipe to drain back to the wet well, where it is pumped back to West Point via the Elliott Bay Interceptor. Review of the program is currently underway to understand why the newly replaced gate is failing to operate as expected while in auto mode.

In addition, WTD staff will do the following:

- Continue to investigate and, if possible, correct the cause(s) of the instantaneous minimum pH exceedances.
- Continue to implement the remote monitoring response team to EWWTS as the wet well fills and in anticipation of a discharge.
- Continue evaluation and fine-tuning of the chlorination and dechlorination controls.
- Continue to sample and monitor copper and dissolved oxygen of EWWTS flow per the NPDES permit requirement.
- Continue with laboratory solids analyses on all flows sampled at EWWTS as part of the monitoring of the automated Mercer Tunnel flushing program.
- Continue fine-tuning the SBS post-dilution system that was implemented in summer 2018, as necessary.
- Continue evaluation and fine-tuning of changes in the main pump control program.
- Continue discussions to periodically schedule a contractor to clean out the wet well as preventive maintenance.

Table E-2. Elliott West Wet Weather Treatment Station 2023 Annual Event Data Summary

Month	Day	EWCSO Inflow Event Number	EWCSO Inflow Volume (MG)	EWCSO Discharge Event Number	EWCSO Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ EW + WP (lb)	% removal	EWCSO Effl. Daily Settl Solids (ml/l/hr)	EWCSO Effl. Settl Solids Event Average (ml/l/hr)	EWCSO Effl. Fecal coliforms (#/100 ml)	EWCSO Effl. Residual Chlorine Daily Average (µg/l)	Daily Min/Max pH
January	8	1	1.5	ND	ND	741	42						
	9	1	6.2	ND	ND	1506	88						
	10	1	1.3	ND	ND	810	50						
	11	1	0.3	ND	ND	934	28						
	12	1	2.1	ND	ND	1599	102						
	15	2	1.0	ND	ND	NS**	NS**						
	18	3	0.6	ND	ND	3683	115						
	21	4	0.9	ND	ND	810	75						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**4**	**13.89**	**ND**	**ND**	**10,081**	**499**	**95.0%**			**ND**		
February	13	1	0.7	ND	ND	414	14						
	17	2	0.6	ND	ND	290	14						
	21	3	0.9	ND	ND	341	16						
	23	3	0.3	ND	ND	196	6						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**3**	**2.44**	**ND**	**ND**	**1,241**	**49**	**96.0%**			**ND**		
March	2	1	1.3	ND	ND	564	20						
	3	1	0.6	ND	ND	284	7						

	4	1	1.4	ND	ND	306	18						
	5	1	1.7	ND	ND	3,588	196						
	6	1	0.6	ND	ND	651	32						
	12	2	1.4	ND	ND	1,448	68						
	13	2	1.9	ND	ND	1,441	99						
	24	3	1.9	ND	ND	347	9						
	25	3	0.9	ND	ND	494	22						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**3**	**11.73**	**ND**	**ND**	**9,123**	**470**	**94.9%**			**ND**		
April	1	1	0.4	ND	ND	4,753	184						
	6	2	0.9	ND	ND	375	17						
	9	3	0.3	ND	ND	2786	172						
	10	3	2.0	ND	ND	550	28						
	11	3	0.3	ND	ND	184	9						
	16	4	0.6	ND	ND	751	33						
	20	5	1.4	ND	ND	479	16						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**5**	**5.80**	**ND**	**ND**	**9,879**	**459**	**95.4%**			**ND**		
May	5	1	2.2	ND	ND	603	24						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**2.19**	**ND**	**ND**	**603**	**24**	**96.0%**			**ND**		
June	6	1	0.9	ND	ND	816	36						
	19	2	1.0	ND	ND	3841	106						

	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**2**	**1.87**	**ND**	**ND**	**4,657**	**142**	**97.0%**			**ND**		
July	No Inflow/No DisDh.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**ND**	**-**	**-**	**-**			**ND**		
August	No Inflow/No DisDh.												
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**0**	**0.00**	**ND**	**ND**	**-**	**-**	**-**			**ND**		
September	19	1	0.7	ND	ND	466	22						
	20	1	0.8	ND	ND	244	16						
	24	2	0.7	ND	ND	265	10						
	25	2	11.8	1	2.35	11,526	5,820			0.9	1	59.00	6.22/8.00
	26	2	4.4	ND	ND	1,477	97						
	27	2	6.6	ND	ND	2,127	263						
	28	2	1.5	ND	ND	390	18						
	Instant. Min/Max pH												**6.22/8.00**
	Event/Daily Max									**0.9**		**59.00**	
	Monthly Total/Avg/GeoMean	**2**	**26.55**	**1**	**2.35**	**16,496**	**6,245**	**62.1%**			**1**		
October	2	1	0.5	ND	ND	563	41						
	10	2	3.0	ND	ND	7262	197						
	11	2	1.7	ND	ND	664	36						

	16	3	3.0	ND	ND	1651	81						
	24	4	1.8	ND	ND	589	26						
	25	4	0.9	ND	ND	1233	93						
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**4**	**10.88**	**ND**	**ND**	**11,963**	**473**	**96.0%**			**ND**		
November	1	1	0.8	ND	ND	310	8						
	2	1	11.4	1	4.5	9832	4651		0.6	0.60	170/1	53.00	6.0/7.3
	3	1	2.1	ND	ND	652	24						
	4	1	9.7	2	3.84	10180	8188		4.5	4.50	18	4.00	6.0/7.4
	5	1	2.1	ND	ND	6141	169						
	6	1	1.5	ND	ND	325	13						
	11	2	0.4	ND	ND	1319	45						
	12	2	0.3	ND	ND	3656	102						
	18	3	0.7	ND	ND	3154	48						
	21	4	0.6	ND	ND	331	4						
	Instant. Min/Max pH												**6.0/7.4**
	Event/Daily Max									**2.6**		**53.00**	
	Monthly Total/Avg/GeoMean	**4**	**29.47**	**2**	**8.38**	**35,900**	**13,252**	**63.1%**			**13**		
December	1	1	1.6	ND	ND	2743	100						
	2	1	4.3	ND	ND	4087	188						
	4	2	51.4	1	48	17591	17002		<0.1		3500/230	485	5.9/8.1
	5	2	38.1	1	35	24683	24186		2.50	1.3	1	184	6.1/7.6
	6	2	6.4	ND	ND	1327	59						
	7	2	8.6	2	1.9	1701	429		<0.1	0.1	1	112	5.8/7.5
	8	2	2.4	ND	ND	2131	103						
	9	2	3.0	ND	ND	895	44						
	10	2	1.8	ND	ND	492	32						
	19	3	0.6	ND	ND	551	20						

	22	4	7.7	3	0.6	3031	501		<0.1	0.1	78	0	6.1/7.7
	23	4	1.7	ND	ND	2142	129						
	25	5	3.0	ND	ND	4623	359						
	26	5	1.0	ND	ND	326	19						
	Instant. Min/Max pH												**5.8**/**8.1**
	Event/Daily Max									**0.5**		**485**	
	Monthly Total/Avg/GeoMean	**5**	**131.51**	**3**	**85.68**	**66,323**	**43,171**	**34.9%**			**89.0**		
Total		**33**	**236.33**	**6**	**96.41**	**166,267**	**64,785**						
Inst. pH Min/Max													**5.8**/**8.1**
Max (GEM, SS, TRC)										**4.5**	**89**	**485**	
Annual Average							by mass:	**61%**		**1.3**	**34**	**195**	

Notes:
ND = No discharge.
Red = NPDES permit exceedance.
%NS = No sample collected.
^ED = End of discharge; fecal coliform samples were collected, discharge ended before next grab sample was required.

Appendix F
Henderson/MLK Jr. Way Wet Weather Treatment Station Annual Report

January–December 2023

Executive Summary

This 2023 annual report summarizes the performance of King County's Henderson/Martin Luther King Junior Way Wet Weather Treatment Station (Henderson/MLK Jr. Way WWTS). The Henderson/MLK Jr. Way WWTS came online in 2005 and operates under the National Pollutant Discharge Elimination System (NPDES) permit for the West Point Treatment Plant (WA0029181).

The year 2023 had 34.97-inches (in.) of rainfall measured at SeaTac International Airport, which is less than the 40.03-in. annual average for the past 20 years. There were two events in 2023 during which the Henderson/MLK Jr. Way WWTS stored flow, one of which resulted in a discharge. The treatment facility received 10.58 million gallons (MG) of combined sewer wastewater and discharged 6.75 MG of treated water to the Duwamish Waterway. The Henderson/MLK Jr. Way WWTS complied with all permit effluent and performance limits in 2023.

The discharge event was the result of 3.75-in. of rain that fell on December 5 and 6 (as measured by the SeaTac International Airport rain gauge). Total inflow was 10.43 MG and 6.75 MG of treated water was discharged to the Duwamish Waterway.

Table F-1 summarizes NPDES permit performance in 2023. Henderson/MLK Jr. Way WWTS complied with all effluent and performance limits in 2023.

Table F-1. Henderson/MLK Jr. Way WWTS Permit Performance in 2023

Parameter	Performance	Permit Conditions
Annual average effluent settleable solids (ml/L/hr)	0.1	≤ 0.3
Annual average total suspended solids removal (%) – all events	73%	≥ 50
Instantaneous minimum effluent pH: number of days with pH <6.0	0 out of 1 discharge days	≥ 6.0
Instantaneous maximum effluent pH: number of days with pH >9.0	0 out of 1 discharge days	≤ 9.0

Daily average TRC (µg/L): number of days with TRC >39 µg/L	0 out of 1 discharge days	≤ 39
Monthly geomean fecal coliform (cfu/100 ml): number of months with >400 cfu/100 mL	0 out of 1 discharge months	≤ 400

Numbers in red indicate a permit exceedance.

Suspended and Settleable Solids

The 2023 annual average total suspended solids (TSS) removal was 73 percent; the minimum permit limit is 50 percent. The annual average effluent settleable solids of <0.1 milliliters/liter/hour (ml/L/hr) met the annual maximum permit limit of 0.3 ml/L/hr.

Fecal Coliform Bacteria

There were no exceptions to the maximum monthly fecal coliform geomean limit of 400 colony-forming units (cfu)/100 ml. The maximum monthly effluent fecal coliform concentration in 2023 was 15 cfu/100 ml.

Total Residual Chlorine

There were no exceptions to the total residual chlorine (TRC) limit in 2023. The highest daily average effluent TRC in 2023 was 3 µg/L.

Instantaneous Minimum and Maximum Effluent pH

There were no exceptions to the minimum and maximum pH limits. The lowest and highest effluent pH measured in 2023 was pH 6.4 and pH 7.1, respectively.

Operations and Maintenance

Routine operations and maintenance (O&M) activities included weekly operator inspections, checklists, equipment and sampler testing, alarm checks, weekly analyzer preventive maintenance and calibrations, quarterly lubrication and preventive maintenance of mechanical equipment, annual training and preparation for winter wet weather operation, post-event cleaning of the CSO facilities, and post-event debriefs and corrective work orders, as appropriate. Preventive maintenance was performed routinely.

Henderson/MLK Jr. Way WWTS Improvements

Major equipment modifications and improvements were made to Henderson/MLK Jr. Way WWTS from 2017 through 2019 to address challenges with consistently meeting NPDES permit requirements for disinfection and dechlorination. These are as follows:

2017 Improvements

- Levelled the existing inlet and outlet rectangular weirs.
- Installed new fine-range bubbler sensors at the tunnel's inlet and outlet weirs.

- Installed flow meters on the hypochlorite and sodium bisulfite (SBS) chemical dosing lines.
- Improved venting of the chemical supply lines' 2019 improvements.

2019 Improvements

- Installed new hypochlorite chemical feed pumps.
- Installed new SBS chemical feed pumps.
- Installed a pre-dechlorination TRC monitoring system.
- Installed a strainer on the SBS metering pump suction lines.
- Improved exhaust ventilation in the SBS chemical room.

2021 Improvements

- Improved local data logging and additional data available remotely.

2022 Improvements

- Added security features to chemical pumps to prevent inadvertent rescaling.

Planned Improvements

As with all wet weather treatment stations, and especially the Henderson/MLK Jr. Way WWTS, opportunities to optimize operations are limited because of the infrequent number of events; there were only two events in 2023. Given the complexity and "normal" challenges of an intermittently operated wet weather treatment station facility, King County Wastewater Treatment Division staff will continue to monitor, evaluate, and make necessary adjustments in the station's O&M. Similarly, equipment improvements will follow a design-construct-operate-monitor-adjust cycle.

Additional improvements will be made, as necessary. One identified future improvement is an adjustment to the SBS control strategy that would establish a minimum pump speed and ensure flow does not completely stop when a low dose is require

Table F-2. Henderson/MLK Jr. Way WWTS Annual Plant Performance 2023

Month	Day	Inflow Event Number	Inflow Volume (MG)	Discharge Event Number	Discharge Volume (MG)	Total Influent TSS (lb)	Total Effluent TSS Discharged @ MLK + WP (lb)	% removal	Effl. Daily Settl Solids (ml/l/hr)	Effl. Settl Solids Event Avg (ml/l/hr)	Effl. Fecal Coliforms (#/100 ml)	Effl. Residual Chlorine Daily Average (µg/l)	Daily Min/Max pH
January -- October	No Inflow/No Disch.												
November	4	1	0.15	0	0	599	101	83%	**ND**	**ND**	**ND**	**ND**	**ND**
	Instant. Min/Max pH												**ND**
	Event/Daily Max									**ND**		**ND**	
	Monthly Total/Avg/GeoMean	**1**	**0.15**	**0**	**0**	**599**	**101**	**83%**			**ND**		
December	4	1	2.50	0	0	917	79	91%	**ND**	**ND**	**ND**	**ND**	**ND**
	5	1	7.93	1	6.75	2,579	948	63%	**0.1**	**0.1**	**15**	**3**	**6.4/7.1**
	Instant. Min/Max pH												**6.4/7.1**
	Event/Daily Max									**0.1**		**3**	
	Monthly Total/Avg/GeoMean	**1**	**10.43**	**1**	**6.75**	**3,497**	**1,027**	71%			**15**		
Total		**2**	**10.58**	**1**	**6.75**	**4,096**	**1,128**						
Inst. pH Min/Max													**6.4/7.1**
Max (GEM,											**15**	**3**	

SS, TRC)													
Annual Average							by mass:	**73%**		**0.1**	**15**	**3**	

Notes:
ND = No discharge.
Red = NPDES permit exceedance.
%NS = No sample collected.
^ED = End of discharge; fecal coliform samples were collected, discharge ended before next grab sample was required.