Seattle Public Utilities

Protecting Seattle's Waterways

Wastewater Collection System: 2023 Annual Report

March 31, 2024

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List of Abbreviations

Term	Definition
BIPOC	Black, Indigenous, and People of Color
BMP	Best Management Practice
CMOM	Capacity, Management, Operations, and Maintenance
COE	Coordinated Optimization Evaluation
CSO	Combined Sewer Overflow
DOJ	U.S. Department of Justice
DNRP	King County Department of Natural Resources and Parks
DWO	Dry Weather Overflow
Ecology	Washington State Department of Ecology
EBI	King County Elliott Bay Interceptor
EPA	U.S. Environmental Protection Agency
FSE	Food Service Establishment
GSI	Green Stormwater Infrastructure (see also NDS, LID)
LID	Low Impact Development (see also NDS, GSI)
LTCP	Long-Term Control Plan
MG	million gallons
MGD	million gallons per day
NDS	Natural Drainage Systems (see also GSI, LID)
NPDES	National Pollutant Discharge Elimination System
PACP	Pipeline Assessment and Certification Program
Public Health	Public Health - Seattle & King County
RCM	Reliability Centered Maintenance
SCADA	Supervisory Control and Data Acquisition
SDOT	Seattle Department of Transportation
SOP	Standard Operating Procedure
SPU	Seattle Public Utilities
SSO	Sewer Overflow
TSS	Total Suspended Solids
WWPS	Wastewater Pump Station

SECTION 1

Introduction

This annual report was prepared to share information with the public on activities Seattle Public Utilities (SPU) is undertaking to improve its wastewater collection system and to meet state and federal regulatory requirements. The report includes updates on the Combined Sewer Overflow (CSO) Reduction Program and the Capacity, Management, Operations and Maintenance (CMOM) Program. The report is organized as follows:

- Section 1: Introduction
- Section 2: Planning Activities
- Section 3: Operation and Maintenance Activities
- Section 4: Capital Activities
- Section 5: Monitoring Programs and Results

Additional information is available at www.seattle.gov/cso.

1.1 The Wastewater Collection System

The City of Seattle's (City's) wastewater collection system is one of the largest in Washington State. It includes sanitary, combined, and partially separated combined sewers, as shown in Figure 1-1. In areas of the City served by sanitary sewers, stormwater runoff flows to a storm drainage system, and sewage is conveyed through City sewers to larger pipelines and treatment facilities owned and operated predominantly by King County Department of Natural Resources and Parks (DNRP). In areas of the City with combined sewers, stormwater runoff and sewage flow into the sewers and are conveyed to DNRP facilities. In areas of the City served by partially separated combined sewers, storm drain separation projects were built during the 1960s and 1970s to divert street runoff to the storm drainage system; rooftop and other private property stormwater runoff and sewage continue to flow into the combined sewers.

During storm events, the amount of stormwater in the combined sewers sometimes exceeds the collection system's capacity. When this happens, the collection system overflows through structures designed for this purpose. These wet weather overflows are called Combined Sewer Overflows (CSOs), and the structures where these overflows can occur are called CSO outfalls. There are currently 82 CSO outfalls in SPU's wastewater collection system. As shown in Figure 1-2, the combined sewer basins they serve are located along Lake Washington, the Ship Canal, Puget Sound, Elliott Bay, the Duwamish River, and Longfellow Creek. The goal of SPU's CSO Reduction Program is to reduce the number of CSOs from these outfalls to an average of no more than one overflow per outfall per year based on a 20-year moving average. DNRP owns and operates an additional 38 CSO outfalls in the City of Seattle and has a similar program to reduce CSOs.

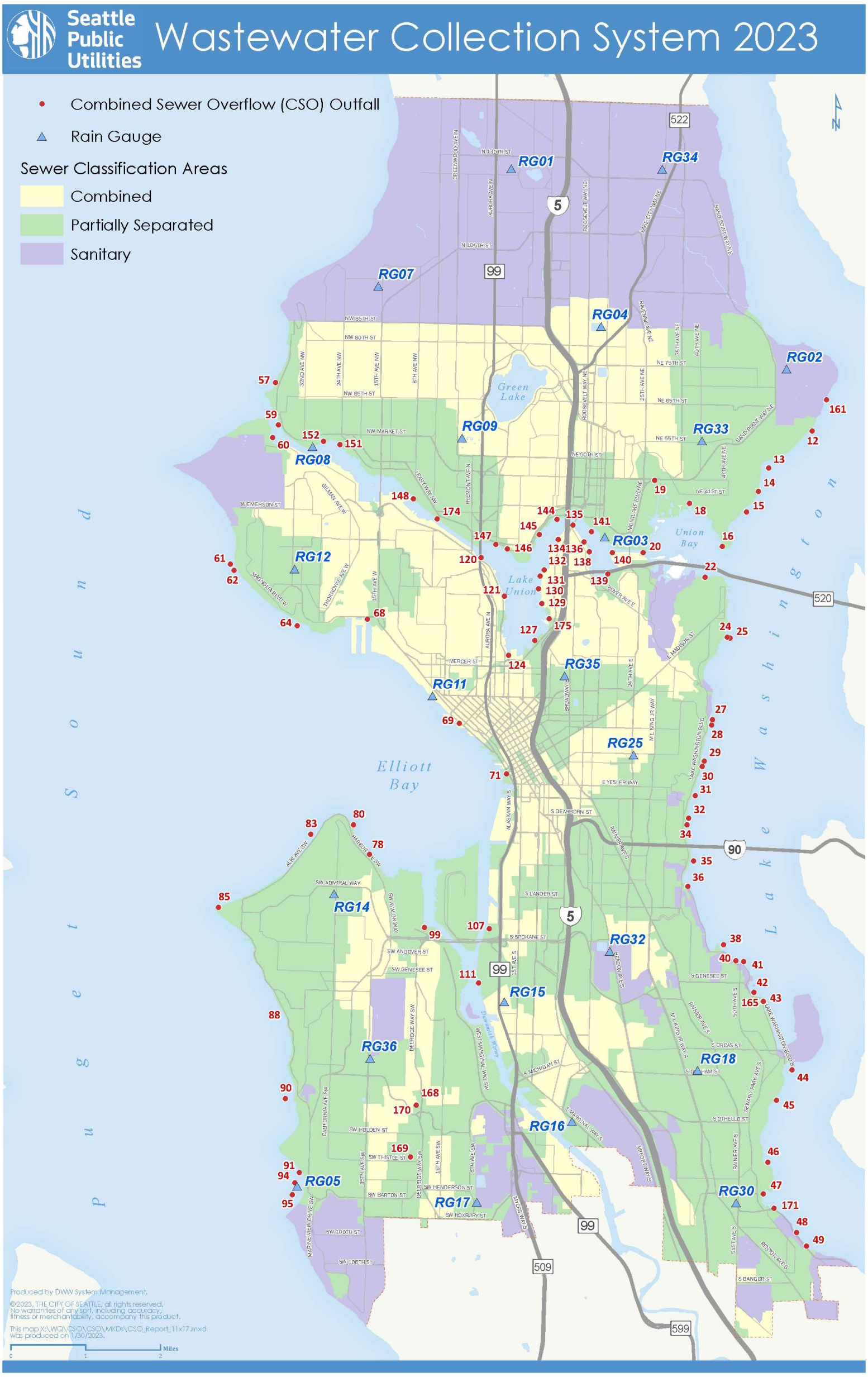


Figure 1-1. City of Seattle Sewer Classification Areas

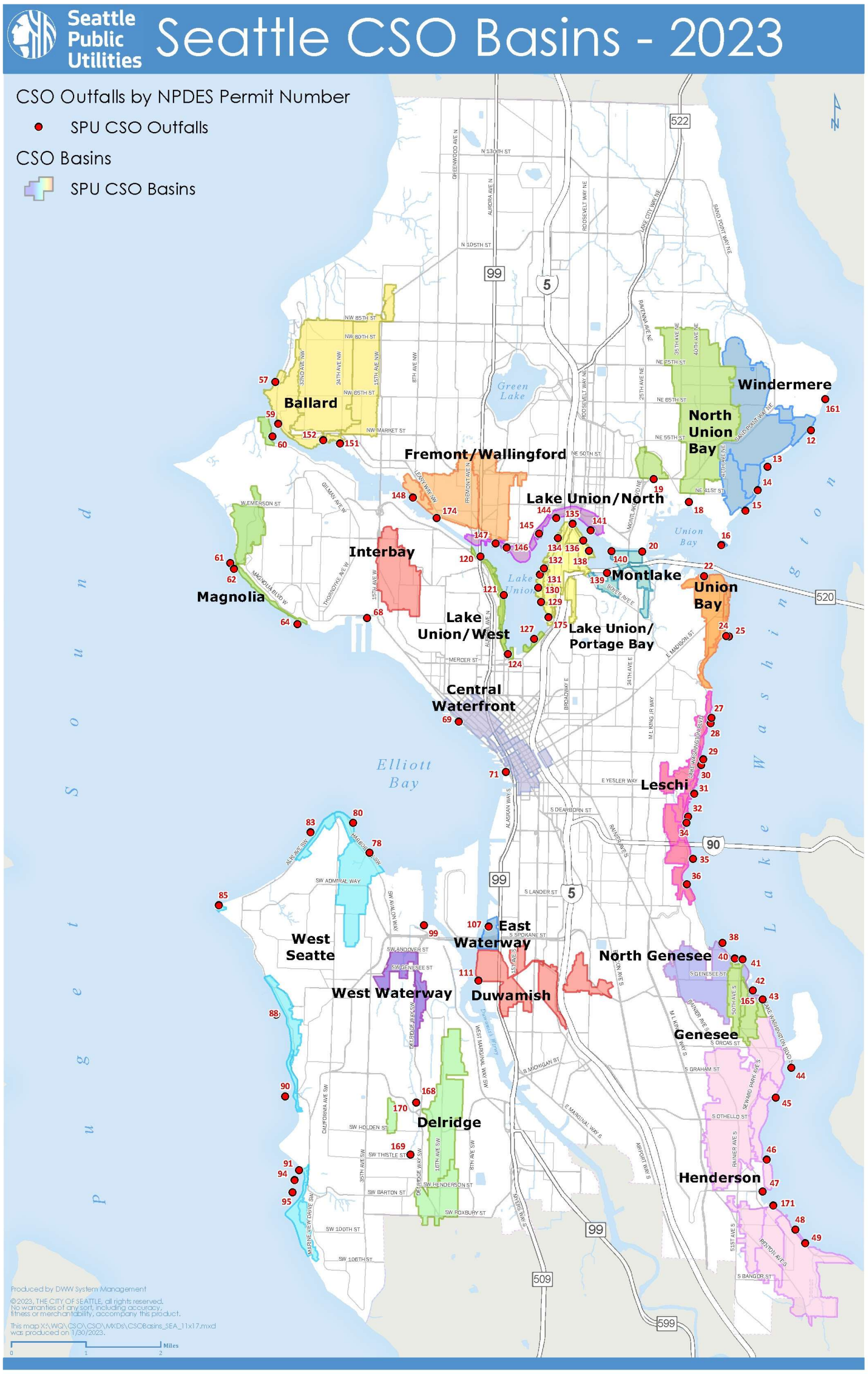


Figure 1-2. City of Seattle Combined Sewer Basins

1.2 Collection System NPDES Permit

The City's wastewater collection system is regulated by the Washington State Department of Ecology (Ecology), through a National Pollutant Discharge Elimination System (NPDES) Permit. Ecology first issued the City an NPDES Permit for CSO discharges in 1975. The permit has been reissued periodically (generally every 5 years), most recently as NPDES Permit WA0031682 issued on March 30, 2016, with an effective date of May 1, 2016. The permit was modified on September 28, 2017, and SPU applied for permit renewal on August 31, 2020. Ecology reviewed the application and accepted it as complete on December 29, 2020, and administratively extended the permit until a new one is issued.

The NPDES Permit:

- Authorizes CSOs at the 82 outfalls shown in Figures 1-1 and 1-2.
    - Note: Outfall 33, which formerly served the Leschi area and is not shown on these figures, was removed from CSO service on July 22, 2016. Outfalls 150 and 151, which formerly served the Ballard area, were replaced with a single rehabilitated Outfall 151 effective February 27, 2019. Outfall 150 is not shown on these figures. Outfalls 70 and 72, which formerly served the Central Waterfront area and are not shown on these figures, were removed from CSO service on April 24, 2020, and May 26, 2020, respectively.
- Requires that SPU limit the number of CSOs from each controlled outfall to an average of no more than one overflow per outfall per year, based on a 20-year moving average.
- Includes a compliance schedule for CSO control projects and other activities that must be completed by the permit expiration date.
- Prohibits overflows from the CSO outfalls during dry weather. Regardless of their cause (mechanical failure, blockage, power outage, and/or human error), such overflows are called dry weather overflows (DWOs). Based on guidance from Ecology, if the volume of a wet weather overflow is increased because of a mechanical failure, blockage, power outage, and/or human error, the event is called an exacerbated CSO.
- Requires SPU to report DWOs and overflows that occur elsewhere in the collection system (called sewer overflows, abbreviated SSOs, and including basement backups and overflows from maintenance holes and other collection system structures) within specific timeframes.
- Required SPU to apply for permit renewal by October 30, 2020.

1.3 Collection System Consent Decree

The City also must meet the requirements of a Consent Decree with the United States Department of Justice (DOJ), United States Environmental Protection Agency (EPA), and Ecology (Civil Action No. 2:13-cv-678; July 3, 2013). The Consent Decree achieves the following:

- Resolved EPA's and Ecology's complaints that the City had violated the Clean Water Act and its collection system NPDES Permit.
- Sets a schedule for the City to come into compliance with state and federal requirements for controlling CSOs.
- Requires the City to implement a performance based adaptive management approach to system operation and maintenance (O&M), to prevent DWOs and reduce the number of SSOs and exacerbated CSOs.
- Requires the City to work with King County to jointly develop and implement a Joint Operations and System Optimization Plan.
- Requires the City to report annually on Consent Decree required activities.
- Establishes penalties for non-compliance.

On August 6, 2019, SPU submitted a letter to DOJ, EPA, and Ecology describing its interest in renegotiating the terms of the Consent Decree. King County also has a Consent Decree with DOJ, EPA, and Ecology (Civil Action No. 2:13-cv-677; July 3, 2013), and the County submitted a similar letter to EPA and Ecology on October 28, 2019. Confidential negotiations involving DOJ, EPA, Ecology, SPU and DNRP were initiated in January 2020 and are ongoing. On March 26, 2021, SPU submitted a letter to Ecology and EPA notifying the agencies of anticipated Consent Decree milestone violations.

1.4 Collection System Reporting Requirements

SPU's NPDES Permit requires submittal of the following types of reports:

- Monthly discharge monitoring reports. These document the volume, duration, precipitation, and storm duration for each CSO event and are due by the 28th of the following month.
- Reports of SSOs and DWOs. SPU must report any DWOs and certain types of SSOs (those that reach surface waters, the municipal storm system, or other areas with public access) immediately, by phone, to Ecology and Public Health – Seattle & King County (Public Health). Other SSOs must be reported to Ecology online or by phone within 24 hours. SPU must also file a written follow-up report within five days of each DWO or SSO, except those SSOs that are contained within buildings. SSOs that are contained within buildings are summarized quarterly in a spreadsheet.
- Engineering reports, plans, specifications, construction quality assurance plans, and post-construction monitoring plan reports. These are required for specific CSO reduction projects. Many of the due dates are specified in the permit.

Each of the 2023 monthly discharge monitoring reports was completed and submitted on time. All required engineering reports, plans, specifications, and construction quality assurance plans were submitted by their respective deadlines. All DWOs and almost all SSOs were reported by their respective deadlines, and all of the written follow-up reports were submitted on time.

In addition, both the NPDES Permit and the Consent Decree include annual reporting requirements. This report meets these annual reporting requirements. Table 1-1 lists the requirements and identifies where the information is provided.

Table 1-1. 2023 Annual Reporting Requirements		
Source	**Requirement**	**Report Location**
NPDES Permit		
S4.B	Detail the past year's frequency and volume of combined sewage discharged from each CSO outfall	Table 5-4
S4.B	For each CSO outfall, indicate whether the number and volume of overflows has increased over the baseline condition and, if so, propose a project and schedule to reduce the number and volume of overflows to baseline or below	Table 5-5, Section 5.3
S4.B	Explain the previous year's CSO reduction accomplishments	Section 4
S4.B	List the CSO reduction projects planned for the next year	Table 4-1, Section 4
S4.B	Document compliance with the Nine Minimum Controls	Section 3.1
S4.B	Include a summary of the number and volume of untreated discharge events per outfall	Table 5-6
S4.B	Determine and list which outfalls are controlled (no more than one overflow per year on average), using up to 20 years of past and present data, modeling, and/or other reasonable methods	Table 5-8
S4.B	Summarize all event-based reporting for all CSO discharges for the year	Tables 5-4, 5-6, 5-7
Consent Decree		
V.C.26	Report the metrics regarding sewer overflow (SSO) performance included in Appendix D, Paragraph E (1-7): a. SSO performance; b. Number of miles of sewer that were cleaned, inspected, and repaired/replaced/rehabilitated; c. Number of pump station inspections and the capacity of each pump station; d. Number of maintenance holes and force mains inspected and repaired/replaced/rehabilitated; e. Number and type of CSO regulators inspected; f. Summaries of inspections and cleanings of each CSO control structure; and g. Summaries of Fats Oil and Grease (FOG) inspections and enforcement actions taken the preceding year.	 a. Tables 3-3, 3-4, A-1 b. Table 3-1 c. Tables 3-1, A-2, A-3 d. Table 3-1 e. Table 3-1 f. Section 3.1.1 g. Section 3.3
V.D.28	Submit summaries of FOG inspections and enforcement actions taken during the previous year.	Section 3.3
VII.43.a.i	Describe the status of any work plan or report development	Section 2
VII.43.a.ii	Describe the status of any design and construction activities	Section 4

Table 1-1. 2023 Annual Reporting Requirements		
VII.43.a.iii	Describe the status of all Consent Decree compliance measures and specific reporting requirements for each program plan, including: a. The CSO control measures for the Early Action CSO Control Program (Henderson Basins 44, 45, 46, and 47/171); b. The Long-Term Control Plan; c. The Post-Construction Monitoring Program Plan; d. The CMOM Performance Program Plan; e. The FOG Control Program Plan; and f. The Joint Operations and System Optimization Plan between the City of Seattle and King County	a. Section 4.6.3 b. Section 2.3 c. Sections 5.4 and 5.5 d. Section 3.2 e. Section 3.3 f. Section 2.1
VII.43.a.iv	Provide the project costs incurred during the reporting period	Table 4-1
VII.43.a.v	Describe any problems anticipated or encountered, along with the proposed or implemented solutions	Sections 3.1.5, 4.2, 4.5, and 5.3
VII.43.a.vi	Describe the status of any wastewater collection system permit applications	Section 1.2
VII.43.a.vii	Describe any wastewater collection system reports submitted to state or local agencies	Section 1.4
VII.43.a.viii	Describe any anticipated or ongoing collection system O&M activities	Section 3
VII.43.a.ix	Describe any remedial activities that will be performed in the upcoming year to comply with the Consent Decree	Sections 4.7 and 5.3
VII.43.b	Describe any non-compliance with the requirements of the Consent Decree and include an explanation of the likely cause, the duration of the violation, and any remedial steps taken (or to be taken) to prevent or minimize the violation	Sections 4.3, 4.5, 4.7 and 5.3
Appendix D, Paragraph E	Include the listed CMOM performance metrics.	Tables 3-1, 3-3, 3-4, A-1, A-2, and A-3, and Sections 3.1 and 3.3

SECTION 2

Planning Activities

In 2023, SPU continued planning efforts to help ensure SPU meets Clean Water Act, NPDES Permit, and consent decree requirements in a way that is cost-effective, community centered, and provides the most value to our customers.

2.1 Joint City of Seattle/King County Operations and System Optimization Plan

The City of Seattle's and King County's Consent Decrees direct both agencies to work together to develop a Joint Operations and System Optimization Plan (Joint Plan) and to review the Joint Plan every three years and update it as necessary. In developing the original Joint Plan (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, approved by SPU's Drainage and Wastewater Line of Business Branch Executive and DNRP's Wastewater Treatment Division Director, and included in the Joint Plan Update submitted to EPA and Ecology in January 2019. The second update of the Joint Plan was submitted to EPA and Ecology on February 28, 2022.

The following 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 pre-season 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, 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 (SCWQP) 3rd Ave W diversion design. The North Interceptor/Ship Canal model was updated per the 90% drawings for Tunnel Effluent Pump Station (TEPS) and Ballard and per the 100% 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 Wet Weather Treatment Station, and an improved Interbay Pump Station 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' onsite signs and website information to improve notification of CSO events and communication with customers. See section 3.1.8.
- 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 Coordinate Optimization Evaluation effort. The Coordinated Optimization Evaluation chartering was completed in December 2023, identifying the three priority planning areas: Montlake, University, and Henderson.

2.2 Coordinated Optimization Evaluation

The Coordinated Optimization Evaluation (COE) is an effort in which SPU and DNRP will identify and evaluate optimization opportunities that reduce CSOs by taking advantage of potential capacities through improving system-wide or basin specific controls and/or by installing new minor system components.

"Optimization" shall mean the application of adjustable controls, operational improvements, or capacity modifications to achieve improved flow management with limited capital modifications to the system. Examples include but are not limited to installing or adjusting controls for gates or pump stations; using additional monitoring locations to refine control settings; modifying weir elevations; and adding conveyance capacity to resolve a localized capacity limitation. The primary objective is to maximize the use of available storage and conveyance capacities more rapidly and effectively than typical capital projects.

SPU and DNRP recognize that optimization of existing capacities in our respective interconnected systems could reduce the size and cost of future CSO control investments. The evaluation will identify opportunities for selection and prioritization by subsequent decision-making bodies and processes, including but not limited to capital portfolio management and the Long Term Control Plan (LTCP) update planning efforts.

In 2023, SPU and DNRP worked together to develop a charter for the COE and identified the initial planning areas to focus efforts on. SPU and DNRP are committed to exploring optimization opportunities to benefit CSO control objectives in three priority planning areas: Montlake, University, and Henderson in advance of upcoming planning efforts relating to CSO control.

The goals of the COE are to:

- Identify opportunities to optimize wastewater system capacity to maximize use of collection system transport, storage, and treatment infrastructure for wastewater flows, including wet weather flows.
- Evaluate operation of both agencies combined systems, including potential use of real time controls that can react and/or anticipate wet weather conditions. Explore whether operational changes and minor system improvements can increase system capacity to reduce the scale of other anticipated investments, improve climate adaptability, or otherwise improve system efficiencies.
- Document a collaboratively developed understanding of present and future opportunities for system optimization in the planning areas.
- Provide optimization concepts with sufficient detail for potential inclusion in long-term control planning activities and other capital program decision-making bodies at the respective agencies, based on a common understanding of the opportunities and characteristics of each recommended concept.

SPU and DNRP plan to submit a COE summary report for the three priority planning areas (Montlake, University, and Henderson) to EPA and Ecology by March 2027.

2.3 Shape Our Water Plan

SPU's Drainage and Wastewater (DWW) Line of Business is developing Shape Our Water, a 50-year plan for Seattle's water resilience. The purpose of Shape Our Water is to plan future investments that improve water quality while providing the greatest community value. The effort is integrating planning across drainage and wastewater systems, emphasizing engagement, and focusing on leveraging effective partnerships to meet Seattle's infrastructure and receiving water body challenges. Additional information on this planning process is included at www.shapeourwater.org.

The Shape Our Water Plan is made up of four interrelated stages, described below and shown graphically in Figure 2-1:

- ***Analysis:*** In the data collection and analysis stage, we identified drainage and wastewater system and receiving water body challenges and opportunities and prioritizing the challenges based on risk. Three major comprehensive analysis projects were included in this stage: the Wastewater System Analysis, which was completed in 2019; the Drainage System Analysis, which was completed in 2020; and a drainage and wastewater system Seismic Risk Assessment, which was completed in 2022 (final reports from the analysis stage are available on https://www.seattle.gov/utilities/about/reports/drainage-and-wastewater/shape-our-water) .
- ***Visioning:*** In the visioning stage, we set the vision and goals for the Shape Our Water plan. The vision was developed through collaboration with our community, City departments, and partner agencies and organizations. In early 2020, SPU implemented our engagement approach, which was responsive to COVID-19 related restrictions and shifts in community priorities. Engagement was launched in late 2020 and completed in 2021 (the final Community Vision document is available on www.shapeourwater.org).
- ***Planning:*** The planning stage is identifying and sequencing near- and long-term investment in the partnerships, programs, and projects that will improve receiving water quality and the performance and resilience of our drainage and wastewater systems while optimizing social and environmental benefits for the City. SPU launched the planning stage in 2022 and anticipates substantial completion at the end of 2025.
- ***Implementation:*** The implementation stage will begin in 2026 when the plan is complete. To stay accountable to stakeholders, SPU will monitor and adaptively manage implementation, tracking against identified measures of success. While Shape Our Water is being developed, SPU is also piloting near-term integrated projects in Seattle's neighborhoods. This is an opportunity for SPU and our partners to explore innovative approaches and learn as we develop the plan.

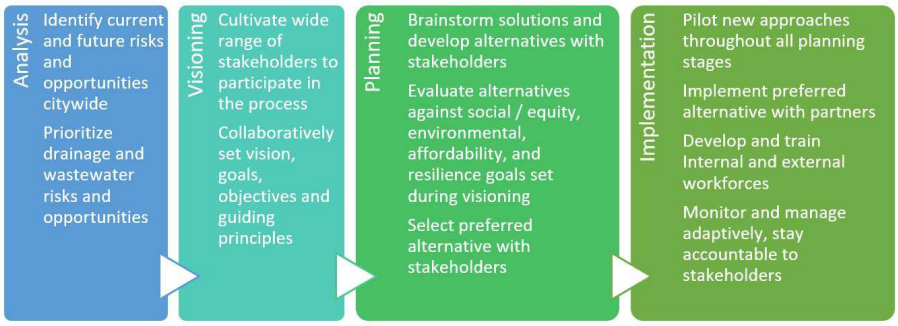


Figure 2-1. Shape Our Water Planning Process

2.4 Long Term Control Plan Update

SPU developed the 2015 Long-Term Control Plan (LTCP) and Integrated Plan (together the "Plan to Protect Seattle's Waterways") in compliance with the CSO reduction planning requirements of the Consent Decree.

In 2022, SPU initiated an LTCP Update process that will include joint CSO planning with DNRP and development of detailed area plans in specific CSO basins. Area plans will reduce CSOs and address short- and long-term drainage and wastewater needs, such as infrastructure capacity upgrades and rehabilitation, flooding, and climate resilience. Through these efforts, SPU will work to help ensure that future CSO investments achieve the Community Vision for Shape Our Water. The LTCP Update is an important opportunity for SPU to partner with other City departments and agencies to deliver community benefits, including mobility, open space, and livability improvements.

Work completed in 2023 to support the LTCP Update included project chartering and preparation necessary to begin area planning. Progress will continue in 2024 and includes updating data and tools to support planning, providing citywide project communications, and launching area planning and engagement. Completion of the LTCP Update is anticipated in 2026.

SECTION 3

Operation & Maintenance Activities

This section describes the operation and maintenance (O&M) activities SPU undertakes to reduce the number and volume of sewer overflows, dry weather overflows (DWOs), and combined sewer overflows (CSOs).

3.1 Nine Minimum Control Activities

The Federal CSO Control Policy requires municipalities with combined sewer systems to implement nine measures that help reduce the number and volume of sewage overflows without extensive engineering studies or significant construction costs. The following paragraphs describe the work that was performed in 2023 on each of these nine control measures.

3.1.1 Control 1: Provide System Operations & Maintenance (O&M)

Reduce the magnitude, frequency, and duration of CSOs through proper operation and maintenance (O&M) of the combined sewer system.

Each year SPU performs extensive system O&M activities to reduce the frequency and volume of preventable overflows. Routine maintenance activities include sewer inspections, cleaning, and non-emergency point repairs; catch basin inspection, cleaning, and repairs; control structure and storage structure cleaning; valve and flap gate inspection, cleaning, lubricating, and servicing; and pump station electrical, mechanical, and facilities inspection and servicing. 2023 O&M accomplishments are summarized in Table 3-1. Notably, in 2023, SPU inspected approximately 18% of total mainline pipe (by length) and cleaned approximately 14%.

SPU uses the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) defect coding system to identify and prioritize pipes to be scheduled for maintenance or rehabilitation. Once a sewer has been identified as having a maintenance-related problem, the sewer is placed on a routine cleaning schedule to prevent future overflows. The initial cleaning frequency is based on the cause of the initial overflow, and the cleaning frequency is increased or decreased over time as appropriate. Corrective activities include:

- Jetting, for light to medium debris;
- Hydrocutting, for roots and/or grease;
- Rodding, for pipes with an active blockage; and
- Chemical root treatment when roots are present with no grease.

SPU's preventive sewer maintenance frequencies range from once a month to once every ten years. The challenge for sewer utilities is to clean sewers as frequently as necessary to maintain system capacity but no more than necessary, as cleaning sewers shortens the sewer's functional life span.

SPU inspects each of its 93 CSO control structures upstream of its 82 CSO outfalls. The control structures are inspected one to four times per year. During these inspections, crews make observations about flow, water level, sediment, debris, signs of infiltration, structural integrity, and whether the structure is operating as intended. Those observations lead to recommendations for cleaning, repair, and rehabilitation. The crews also perform any needed cleaning and make any necessary repairs. The 2023 inspections showed that the structures were generally in good working condition and did not require any extensive repair.

Pump station electrical and mechanical components are replaced as necessary during pump station maintenance. Since 2008 SPU has used Reliability Centered Maintenance (RCM) at its wastewater pump stations. The objective of RCM is to help ensure the right maintenance is performed at the right intervals, which in turn optimizes life cycle costs while increasing system reliability. In addition, RCM helps ensure the right data is collected and evaluated, adding discipline to decision-making around operations, spare parts inventory, maintenance strategies, and data collection. SPU continues to use, evaluate, and adjust its RCM-based strategies.

3.1.2 Control 2: Maximize Storage of Flows

Maximize the use of the collection system for wastewater storage, in order to reduce the magnitude, frequency, and duration of CSOs.

SPU maximizes storage in its collection system through a multi-faceted approach that includes:

- Regular collection system maintenance, so that existing capacity is available during storm events;
- Ongoing monitoring and evaluation of storage use during storms;
- Modification of storage facilities whose existing capacity is not fully utilized;
- Increasing the height of overflow weirs, when doing so increases collection system storage capacity without creating backups; and
- Eliminating excessive inflow and infiltration.

In 2023, SPU continued to design and construct sewer system improvements to better utilize existing sewer system capacity. Work on these improvements is described in Section 4.1. SPU is also working to optimize the operation of recently constructed storage facilities, as described in Section 4.7.

Table 3-1. 2023 O&M Accomplishments	
Activity	**Quantity**
Miles of mainline pipes cleaned	199.68
Miles of wastewater mainline pipes CCTV	261.25
Miles of mainline pipe repaired/replaced/rehabilitated	3.28
Number of pump station inspections[1]	1,510
Number of maintenance holes inspected	141
Number of force mains repaired/replaced/rehabilitated	1
Number of CSO structures inspections	296
Number of CSO structures cleanings	287
Number of CSO HydroBrake inspections	202
Number of CSO HydroBrake cleanings	13
Linear ft of pipe receiving chemical treatment to inhibit root intrusion	127,994
Number of catch basins inspected	5,186
Number of catch basins cleaned	2,157
Number of catch basin repaired	8
Number of catch basin traps replaced	120

1. See Tables A-2 and A-3 for pump station capacity and inspection details.

3.1.3 Control 3: Control Nondomestic Sources

Implement selected CSO controls to minimize CSO impacts resulting from nondomestic discharges.

Two important programs are implemented to help control nondomestic discharges into the Seattle sewer system: The Fats, Oils, and Grease (FOG) Control Program and the Industrial Pretreatment Program.

SPU Wastewater Source Control administers the City's FOG Control Program. This program enforces Seattle Municipal Code requirements relating to prohibited discharge limits and the requirement to pretreat FOG-laden wastewater before discharge to the City sewer system. FOG has a deleterious effect on the sewer system when it undergoes the process of saponification. In this process, FOG chemically reacts with calcium in the wastewater to form hardened, soap-like deposits. As shown in Figure 3-1, the deposits adhere to the inside of sewers and decrease system capacity or cause blockages. These conditions can lead to sewer overflows. SPU enforces this code on commercial and institutional kitchen facilities and other nondomestic sources through a regulatory education, inspection, and enforcement program. FOG control inspection and enforcement activities conducted in 2023 and work planned in 2024 are summarized in Section 3.3.

Figure 3-1. 2023 Mainline pipe demonstrating visible FOG accumulations

The Industrial Pretreatment Program is administered by King County Wastewater Treatment Division – Industrial Wastewater Program (KCIW). KCIW issues industrial wastewater pretreatment permits that include appropriate discharge limits and conducts regular site inspections and periodic permit reviews. SPU reviews KCIW permits issued to industries as well as CCTV footage of the collection system to assess negative impacts. Industrial discharges found to have negatively impacted the collection system are referred to KCIW for potential enforcement and/or permit modification.

3.1.4 Control 4: Deliver Flows to the Treatment Plant

Operate the collection system to maximize flows to the treatment plant, within the treatment plant's capacity.

SPU maximizes flow to the treatment plant by implementing the measures described in Controls 1 and 2 and by providing ongoing system performance monitoring and analysis.

SPU's Control Center is staffed 24 hours a day and receives real-time Supervisory Control & Data Acquisition (SCADA) information. Control Center staff respond to any alarms at the pump stations that indicate a drop in performance or other problem. In addition, SPU monitors pump station, overflow structure, and outfall flow data as it is collected and uses the data to detect maintenance issues that may be affecting system performance.

In 2023, SPU completed a rehabilitation project at Wastewater Pump Station 38 (West Seattle) and a force main rehabilitation project at Wastewater Pump Station 39 (West Seattle). Each project is expected to decrease the frequency and volume of CSOs and maximize flows to the treatment plant.

Following construction completion of any facility that includes operable equipment, SPU completes a 1-year stabilization phase. Stabilization includes monitoring and analysis to help ensure the facility is functioning as intended. In 2023, SPU completed the stabilization phase for the completed sewer system improvement project at Wastewater Pump Station 118 (Northgate) and Wastewater Pump Station 17 (Beacon Hill). SPU also began the stabilization phase for Wastewater Pump Station 38 (West Seattle), which is expected to be complete in 2024.

3.1.5 Control 5: Prevent Dry Weather Overflows

Prevent dry weather overflows; they are not authorized. Report any dry weather overflows within 24 hours and take prompt corrective action.

To help prevent DWOs and exacerbated CSOs, each combined sewer system overflow location is configured with an alarm that is triggered if there is a likely overflow condition. The alarm alerts analysts and/or field crews to assess the situation and take corrective action if possible. In addition, whenever SPU experiences a DWO or exacerbated CSO, SPU investigates to identify the cause and takes action to reduce the possibility of recurrence.

There were no DWO's in 2023. There were seven exacerbated CSOs in 2023, as follows:

1. During a rain event on September 20, the CSO at Outfall 46 was exacerbated by a malfunctioning bypass pump at wastewater pump station 9. The total CSO volume was 57,186 gallons.
2. During a rain event on November 4, the CSO at Outfall 43 was exacerbated by a programing issue at the CSO 9 automated gate. The total CSO volume was 57,521 gallons.
3. During a rain event on November 4, the CSO at Outfall 44 was exacerbated by a blockage in the conveyance system. The total CSO volume was 3,651 gallons.
4. During a rain event on November 4, the CSO at Outfall 45 was exacerbated by a blockage in the conveyance system. The total CSO volume was 15,137 gallons.
5. During a rain event on November 4, the CSO at Outfall 138 was exacerbated by a failed actuator that was out of service. The total CSO volume was 21,261 gallons.
6. During a rain event on December 7, the CSO at Outfall 13 was exacerbated by a programing issue that did not allow the storage tanks to drain. The total CSO volume was 651,036 gallons.
7. During a rain event on December 5, the CSO at Outfall 138 was exacerbated by a failed actuator that was out of service. The total CSO volume was 126,005 gallons.

To reduce the recurrence of exacerbated CSOs, in 2023 SPU:

- Conducted annual refresher training for machinists, which was expanded to include tabletop exercises.
- Began conducting facility training for operations control center staff.
- Conducted weekly facility performance reviews for CSOs and pump stations.
- Implemented early warning level alarms optimization.
- Conducted pre-storm inspections and cleaning.

A summary of the DWOs, exacerbated CSOs, and exacerbated sewer overflows from 2018-2023 is included in Table 3-2.

Table 3-2. Dry Weather Overflows (DWOs) and Combined Sewer Overflows (CSOs) and Sewer Overflows Exacerbated by System Maintenance Issues 2018 – 2023

Year	DWOs[1]		CSOs and Sewer Overflows Exacerbated by System Maintenance Issues[1]	
	No. of Overflows	Volume (gallons)	No. of Overflows	Volume (gallons)
2018	0	0	4	591,114
2019	3[2]	52,205	2	197,886
2020	1	1,892	3[3]	730,808
2021	4	61,533	0	0
2022	1	91,599	2	197,204
2023	0	0	7	931,797

1. *DWOs and exacerbated CSOs are included in the table listing all 2023 overflows (Table 5-4). Exacerbated CSOs are also included in the table comparing 2023 CSOs with 2010 baseline (Table 5-5), the tables comparing 2018-2023 discharges (Tables 5-6 and 5-7). and the table assessing whether outfalls meet the CSO performance standard (Table 5-8). Exacerbated Sewer Overflows are not included in Tables 4-5 through 5-8.*
2. *One of these DWOs was caused by a non-City entity.*
3. *One of these events (approximately 250,000-500,000 gallons, conservatively listed as 500,000 gallons in Table 3-2) was an Exacerbated Sewer Overflow.*

3.1.6 Control 6: Control Solids and Floatable Materials

Implement measures to control solid and floatable materials in CSOs.

SPU implements several measures to control floatables, as summarized in the following paragraphs.

Catch basins are designed to prevent floatables from entering the system. Specifically, SPU's catch basins are designed to overflow only when the water level in the catch basin is well above the overflow pipe opening. Because floatables remain on the water surface, they are trapped in the catch basins. Catch basins are inspected and cleaned regularly to remove debris and potential floatables. Catch basin inspection, cleaning, and rehabilitation metrics are included in Table 3-1.

In 2023, SPU's consultant, Cascadia, continued the "What to Flush" outreach campaign in priority areas to encourage appropriate flushing behaviors, specifically urging residents to flush only toilet paper and human waste down the toilet. This campaign built on knowledge and materials developed in preceding years. A baseline survey was designed to assess residents' knowledge pre-outreach. Baseline surveys and postage-paid envelopes were distributed to 1,301 addresses, of which 100 surveys were returned. Residents were also given the option to complete the survey via SurveyMonkey, which was translated into four languages. In 2024, post-outreach surveys will be distributed to the same priority areas to assess the effectiveness of the outreach campaign on flushing behaviors.

Wastewater outreach was conducted at 101 multifamily properties and 418 single-family homes, various community events and activities, and during the Seattle Housing Authority's new resident onboarding. At events and presentations, the engagement team continues to use clear containers that demonstrate how toilet paper breaks down in a pipe versus wipes, shown in Figure 3-2. In addition, the team developed a toilet tossing game (Figure 3-3), where a player decides if items should be flushed or discarded and tosses them in the appropriate place, and a pipe demo as educational and interactive tools.

Figure 3-2. Containers from 2018 with wipes and toilet paper in water

Figure 3-3. Image of the Toilet Tossing Game

In 2023, SPU also provided wastewater site assessment assistance to 205 commercial businesses, including providing wastewater education materials to 167 businesses.

In addition, the City of Seattle runs several solid waste and city cleanup programs to prevent and reduce the amount of street litter, including:

- Street sweeping, including increased efforts for Fall leaf pickup,
- Spring clean,
- Storm drain stenciling,
- Event recycling,
- Public litter and recycling cans,
- Waste free holidays,
- Product bans, and
- Illegal dumping investigation and response.

3.1.7 Control 7: Prevent Pollution

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

Source Control Pollution Prevention Program

SPU has a fully developed source control program that has been in place since the early 2000's. The program is authorized by the City of Seattle Stormwater Code and Side Sewer Code. The program implements the following source control actions in the City's combined sewer basins:

- Spill Response: SPU performs spill response activities city-wide using a 24 hour per day, 7 day per week call out system. SPU Spill Responders respond to the site, assess the impact and procure resources to mitigate or clean up the spill.
- Water Quality Complaint Investigations: SPU responds to water quality complaints citywide. This program provides outreach and education on proper Best Management Practices (BMPs) to residents and businesses within the City.
- Business Inspections: SPU conducts business inspections to assess how businesses are implementing proper BMPs based on their onsite activities. SPU conducts these inspections in combined sewer basins as resources allow.
- Stormwater Facility Inspections: SPU conducts maintenance inspections of privately-owned stormwater facilities to assess how property owners are maintaining their drainage systems. SPU conducts these inspections in combined sewer basins as resources allow.

Public Education

SPU continued to implement the invigorated Adopt-a-Drain program that was re-launched in 2021. Other SPU public education programs include spring clean, green cleaning, surface water pollution report line, event recycling, and reduce, reuse, and recycle tips. Additionally, SPU works with other City

departments on Trees for Seattle, promoting residential tree planting, and with King County on promoting green stormwater infrastructure. SPU's Wastewater Education program includes side sewer maintenance, proper disposal of cooking oil, and what not to flush, described in more detail in Sections 3.1.3 and 3.1.6.

Street Sweeping

Street Sweeping continued to reduce the amount of pollutants entering the sewer system in 2023. The Seattle Department of Transportation (SDOT) performs street sweeping, including street sweeping downtown streets every night and cleaning alleys three nights per week. In 2023, SDOT street sweeping crews swept 10,200 miles in the SPU combined sewer area, removing 1,300 short dry tons of debris from the street.

Illegal Dumping

The City has made it easier for anyone to report illegal dumping and other issues via the Find It, Fix it app available for mobile phones. In 2023, SPU received 20,612 illegal dumping complaints from customers. More than 728,104 pounds of debris were removed from Seattle's public property. One hundred percent of complaints were addressed in 10 days or less.

Other Pollution Prevention Programs

- Side Sewer Assistance Program: Poorly maintained side sewers increase costs and risks to both SPU and customers. When SPU receives customer calls about side sewer backups, 9 out of 10 times it is a private side sewer issue. In response, SPU developed a Side Sewer Assistance pilot program, launched in 2022. Phase 1 provides 0% interest loans with no monthly payments due for low-income homeowners in need of urgent side sewer repairs. In 2022 – 2023, 7 homeowners received assistance from Phase 1 with an average loan amount of $16,000 per household. In 2023 a community feedback survey was conducted to collect homeowner opinions on potential program models for sewer maintenance.

  Phase 2 is in development with plans to launch in Q4 of 2024. Phase 2 will offer side sewer maintenance services for low-income homeowners in the form of inspection and cleaning. In 2024 the Phase 2 program services will be offered at no out-of-pocket cost to incentivize sewer maintenance behaviors.

  The program and side sewer education is marketed to homeowners through several community-based organizations, community liaison partnerships, presentations at senior centers, and tabling at community events.

- Clean City Program: SPU's Clean City Program invests $4 million/year into new and existing programs to clean up litter and garbage across the city. The program pulls together and expands efforts from SPU in concert with Seattle Parks and Recreation and SDOT. These departments work together to service litter collection routes; provide parks and neighborhoods maintenance and trash, debris, and needle collection; and provide trash pick-up from encampments and RVs.

- RV Wastewater Program: The RV Wastewater Program was initiated by SPU's Source Control and Pollution Prevention Division as a response to an increasing frequency and severity of spills of sewage from RVs. Begun in early 2020 as a pilot effort, the program has evolved to provide an offer of monthly wastewater disposal service to RV owners parked and living on Seattle streets. In 2023, the program provided 1,281 wastewater collection services and 3,549 outreach visits offering service. Spills of sewage from RV communities continues to decline, with 8 incidents reported in 2023 compared to 99 in 2019, prior to the program implementation.

Legal Authority and Administrative Procedures Used for Program Implementation

The following City of Seattle codes provide authority to implement the pollution prevention program in the City's combined sewer basins:

- The Side Sewer Code (SMC 21.16) regulates side sewers and, for example, prohibits discharge of certain materials; requires repair of inoperative or inadequate sewers, drains, or natural watercourses; and regulates the construction, alteration, repair, and connection of side sewers and service drains. The Side Sewer Code was last substantially amended in 2010, signed by the Mayor on December 20, 2010, and effective on January 5, 2011.
- The Stormwater Code (SMC 22.800-22.808) provides the City with the legal authority to address discharges to the combined sewer system owned and operated by Seattle Public Utilities (SMC 22.800.030.C). The Stormwater Code was revised and became effective July 1, 2021.

Appropriate BMPs

BMPs to be used at businesses and properties are described in the City of Seattle Stormwater Manual, Volume 4: Source Control. The Manual details BMPs that the Stormwater Code requires city-wide and that are appropriate pollution prevention steps in combined sewer basins. The following BMPs from the City of Seattle Directors' Rules SDCI 17-2017/DWW200, Volume 4: Source Control are appropriate for preventing pollution in combined sewer overflow basins:

- BMP1: Eliminate Illicit Connections - All properties are required to examine their systems and obtain permits and eliminate illicit connections if found.
- BMP2: Perform Routine Maintenance - All properties are required to (a) conduct annual inspections of all conveyance, catch basin, detention and treatment systems and (b) maintain the systems per thresholds described in Appendix G of the Directors' Rule. Solids and polluted water removed from these systems must be properly disposed.
- BMP 3: Dispose of Fluids and Wastes Properly - All properties must properly dispose of solid and liquid wastes and contaminated stormwater and sediment.
- BMP 4: Proper Storage of Solid Wastes - All properties are required to implement proper solid waste storage and disposal practices.
- BMP 5: Spill Prevention and Cleanup - Businesses and real properties that load, unload, store, or manage liquids or erodible materials (e.g., stockpiles) must maintain spill plans, equipment and

practices to prevent and clean spills, and must follow notification procedures for spills to the drainage and sewer systems.

- BMP 6: Provide Oversight and Training for Staff - Businesses and public entities that have activities requiring BMPs are required to have trained personnel for their implementation.
- BMP 7: 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 practices include inspections, avoidance measures (containment, covering, or locating activities away from drainage systems), and sweeping and cleaning procedures.
- BMP 8: Rooftop Dog Runs – Rooftop dog runs must be sized to minimize the volume of stormwater discharged to the sanitary sewer or combined sewer systems.

In addition to implementing BMP's 1-8 for all real property, SDCI 17-2017/DWW200, Volume 4: Source Control also includes minimum requirements for all businesses and public entities for specific activities that occur in Seattle's drainage basins. For all discharges, source controls shall be implemented to prevent prohibited discharges and prevent contaminants from coming in contact with drainage water or being discharged to the drainage system, public combined sewer, or directly into receiving waters:

- BMP 9: Fueling at dedicated stations, for new or substantially altered fueling stations.
- BMP 10: Mobile fueling of vehicles and heavy equipment.
- BMP 11: In-water and over-water fueling.
- BMP 12: Maintenance and repair of vehicles and equipment.
- BMP 13: Concrete and asphalt mixing and production.
- BMP 14: Concrete pouring, concrete/asphalt cutting, and asphalt application.
- BMP 15: Recycling, wrecking yard, and scrap yard operations.
- BMP 16: Storage of liquids in aboveground tanks.

Source controls include, but are not limited to, segregating or isolating wastes to prevent contact with drainage water; enclosing, covering, or containing the activity to prevent contact with drainage water; developing and implementing inspection and maintenance programs; sweeping; and taking management actions such as training employees on pollution prevention.

3.1.8 Control 8: Notify the Public

Implement a public notification process to inform the citizens of when and where CSOs occur.

SPU, together with Public Health - Seattle & King County, maintains a sewage overflow notification and posting program for Seattle's CSO outfalls. Signs at each outfall identify the outfall and warn of possible combined sewage overflows. The signs previously included the phone number for the CSO Hotline, staffed and managed by Public Health. Public Health also provided a website with detailed information

about CSOs, potential public health hazards, and precautions the public may take to protect themselves. In 2019 SPU and DNRP finished an updated design for signs identifying CSO outfalls. The design includes the website address to obtain CSO status, multiple languages, a larger size for visibility, and a new phone number directed to SPU's Operations Response Center, which serves as a single point of contact for both SPU and DNRP CSO outfalls located in the City of Seattle. Installation of the signs at DNRP CSO outfalls was completed in 2019. Installation of the signs at SPU's CSO outfalls has been partially completed. In 2023, SPU coordinated with DNRP on any needed updates to the signs. In 2024, SPU is planning to update the signs as needed and complete installation of the signs at the remaining CSO outfalls.

Figure 3-4. New CSO Outfall Sign

In addition, King County DNRP has hosted an overflow website since December 2007, providing a map of recent and current DNRP CSOs. In 2009, SPU and DNRP worked together to incorporate SPU information on the DNRP website. In 2015, SPU and DNRP worked together as part of their Joint Operations and System Optimization Plan activities to make the map more user-friendly and interactive and to increase the map information refresh rate. Now the community is able to access near real-time information to assist them in making choices about the use of local waters.

3.1.9 Control 9: Monitor CSOs

Monitor CSO outfalls to characterize CSOs and the effectiveness of CSO controls.

SPU monitors each of its CSO outfalls to detect sewage overflows. SPU also tracks the performance of its flow monitors to help ensure consistent, high-quality measurements. The flow, precipitation, and flow monitor performance monitoring programs and results are summarized in Section 5 of this report.

3.2 CMOM Performance Program Activities

SPU develops and implements program roadmaps that identify program work and improvements for multi-year periods. SPU completed its last plan in 2020 and developed a new 5-year plan in 2021. The plans include initiatives in the following core program areas, among others:

- Sewer cleaning
- Sewer condition assessment
- Sewer rehabilitation

3.2.1 Sewer Cleaning Initiatives

The purpose of the sewer cleaning initiatives is to improve the quality and efficiency of sewer cleaning by standardizing procedures, measuring and tracking the quality of cleaning efforts, providing feedback to crews, and using technology to help identify where changes in cleaning frequency should be considered. Work completed in 2023 and planned for 2024 includes:

- Maintenance Strategy – In 2018, SPU began reviewing planning and scheduling processes and preventive maintenance schedules to help ensure maximum efficiency of our cleaning activities. During the first review, sixty percent of the preventive maintenance schedules were validated or fine-tuned. This effort gained newfound attention in 2020 considering COVID-19 related staffing shortages and an even greater need for efficiency. In 2023, SPU started a sewer cleaning maintenance strategy to further refine decision-making around the frequency of maintenance activities. This work will continue into 2024, with an emphasis on workload prioritization based on available resources.
- High-risk Preventive Maintenance Schedule Review – In 2023, Ecology requested a comprehensive review of SPU's preventive maintenance schedules for pipe cleaning. In 2024, SPU will perform an analysis of all short-frequency cleaning schedules, identifying which are late or past-due.

3.2.2 Sewer Condition Assessment Initiatives

The purpose of the condition assessment initiatives is to reduce the risk of sewer overflows through greater understanding of the wastewater collection system condition, leading to more informed decisions about the maintenance and rehabilitation of its components. Work completed in 2023 and planned for 2024 includes:

- Condition Assessment Strategy – In 2017, SPU developed a new approach for scheduling inspection and condition assessment of the entire wastewater collection system every ten years. The system was divided into 100 Management Areas based on system hydraulics, the design and flow of the system, and discharge points to the DNRP system. SPU then developed and applied prioritization criteria and adjusted for practical implementation factors. Work was delayed in 2020 due to COVID-19 staffing shortages and was resumed in 2021. In 2023, SPU completed the first inspection of the entire wastewater collection system.

- Condition Assessment Strategy Update – In 2023, SPU completed planning for the second 10-year cycle of the Condition Assessment Strategy (2023-2033). Continuing to inspect the wastewater pipe system every ten years is critical to the Sewer Rehabilitation Strategy, as discussed in Section 3.2.3. The Rehabilitation Strategy relies on accurate and timely pipe condition information to support rehabilitation project planning and delivery. The risk-based schedule for systematically renewing the pipe system from the Rehabilitation Strategy heavily influenced the update of the Condition Assessment Strategy. Implementation of the second 10-year cycle began in 2023 and will continue, with yearly adjustments as needed, through 2033.

3.2.3 Sewer Rehabilitation Initiatives

The purpose of the rehabilitation initiatives is to prioritize and complete sewer rehabilitation in a timely, efficient, and cost-effective manner. Work completed in 2023 and planned for 2024 includes:

- Rehabilitation Strategy – In 2017, SPU began developing a comprehensive wastewater collection system Rehabilitation Strategy that documents SPU's priorities, our approach to making system rehabilitation investments, and process improvements to improve efficiency. As a part of this effort, SPU has implemented new risk management software, adopted project delivery process improvements, and completed a long-term capital investment forecast. In 2022, SPU initiated a Rehabilitation Strategy to prioritize capital projects based on risk and equity and establish a planning level capital portfolio. SPU plans to continue increasing investment in sewer renewal, spending up to $35 million per year by 2041.
- Addressing an Increase in Reactive Work – In 2022, SPU completed the first 10-year cycle of the Condition Assessment Strategy. As mentioned above, the second 10-year cycle started in 2023. With the increase of assessment across previously uninspected portions of the pipe network, SPU continues to discover pipe conditions that must be addressed as emergency projects. These higher-risk pipes are a priority for SPU's Sewer Rehabilitation Program and will continue to be for the next few years. The Program will continue to adapt to ensure a balance is struck between unplanned urgent work and the planned work of the Rehabilitation Strategy.

3.2.4 SSO Performance

There were 30 sewer overflows in 2023, and they are summarized by cause in Table 3-3. The greatest number of sewer overflows were caused by roots (11 events each). Additional information about these overflows can be found in Table A-1 in Appendix A.

Table 3-3. 2023 Sewer Overflows by Category		
Category	**Primary Cause of Sewer Overflows**	**Number of 2023 Sewer Overflows**
1	Roots	11
2	FOG	0
3	Debris	5
4	Structural Failure – Gravity	1
5	Structural Failure – Force Main	1
6	Capacity – Gravity	4
7	Pump Station – Mechanical	0
8	Pump Station - Capacity	2
9	Power Outage	0
10	Operations Error	2
11	Maintenance Error	0
12	Pressure Release	0
13	City Construction	1
14	New Facility Startup	0
15	Private Side Sewer Issue	0
16	Capacity – King County	0
17	Private Construction	0
18	Other Agency Construction	0
19	Vandalism	3
20	Extreme Weather Event (≥25year)	0
	Total for Categories 1 – 20	**30**
	Total for Categories 1 – 15	**27**

SSO performance for the years 2013 through 2023 is summarized in Table 3-4. SSO performance measures the effectiveness of SPU's CMOM Program and helps ensure SPU is focusing its efforts on activities that help prevent sewer overflows. For these reasons, the SSO performance calculation excludes sewer overflows that are beyond SPU's ability to control, including sewer overflows caused by extreme weather events (for example, rainfall with a recurrence interval of 25 years or more), other agency construction, private construction, King County capacity and vandalism. This table shows that SPU is continuing to meet the performance target of no more than 4 SSOs per 100 miles of sewer per year, based on a two-year moving average.

Table 3-4. 2013-2023 SSO Performance			
Year	Number of SSOs[1]	SSOs/100 Miles of Sewer[2]	2-Year Average SSOs/ 100 Miles of Sewer
2013	40	2.8	3.3
2014	36	2.5	2.7
2015	72	5.1	3.8
2016	38	2.7	3.8
2017	41	2.9	2.8
2018	14	1.0	1.9
2019	22	1.5	1.3
2020	44	3.1	2.3
2021	43	3.0	3.1
2022	38	2.7	2.9
2023	27	1.9	2.3

1. *Numbers in this column include only the sewer overflows included in the SSO performance calculation and exclude sewer overflows caused by extreme weather events, other agency construction, private construction, King County capacity constraints, and vandalism.*
2. *SPU has 1,420 miles of sewers.*

To remain in the high-performing utility band and continue reducing the annual number of SSOs, SPU analyzes each SSO and identifies appropriate follow-up actions, including system modifications and/or increased maintenance where appropriate. SPU also reviews SSO data on an ongoing basis, looking for any patterns or trends that can be addressed through adaptive management of the CMOM Program.

3.3 FOG Control Program Activities

In 2023, the SPU FOG team prioritized educational-based compliance visits, recognizing the sensitivity surrounding these circumstances. Our concerted efforts have resulted in a proactive engagement model that fosters understanding and cooperation, with no violations issued during the reporting period. In this section of the report, we delve into the innovative initiatives and collaborative endeavors that have propelled our mission forward amidst evolving challenges and opportunities. The ongoing shift in our work processes allowed SPU to continue to implement the FOG Management Plan. Details of the process changes SPU Wastewater Source Control carried out in response to the unstable business climate are outlined in the paragraphs below.

The purpose of the Fats, Oils, and Grease Control Program is to reduce the number of FOG-related sanitary sewer overflows by developing and implementing a FOG Control Program Plan. The four basic elements of the FOG Control Plan are:

1. Implement the FOG Management Plan
2. Implement the Food Service Establishment (FSE) Inventory Management Plan
3. Update and implement Standardized Operating Procedures (SOPs) and Engagement Plan
4. Conduct FOG Inspector Training

Work completed in 2023 and planned for 2024 is described in the following sections.

3.3.1 Implement the FOG Management Plan

Data analysis of SPU FOG hotspots indicates a nearly even distribution of impacted lines between commercial and residential sources. To mitigate these sources, the FOG Management Plan has two areas of focus, as described in the following sections.

3.3.1.1 Residential – Community Engagement

In residential areas, SPU utilizes a community engagement-based program to increase awareness of the deleterious impacts of FOG discharges from homes and change FOG disposal behaviors. SPU developed new outreach methods and utilized existing approaches and materials. Below are the highlights of SPU's residential efforts in 2023:

- Developed five variations of pipe models, based on the needs of communities, to demonstrate to residents the impacts of FOG on a home's pipes (Figure 3-5).

Figure 3-5. A pipe demo variation made for the Chinese Information Services Community Center

- Provided 190 sink strainers and can lids to grocery store shoppers during fall holiday outreach and collected and publicly displayed 93 pledges to properly dispose of FOG (Figure 3-6).

Figure 3-6. A commitments poster board to collect FOG disposal pledges

- Ran a social media campaign during the month of December, which generated 8,698 impressions and 403 engagements (Figure 3-7).

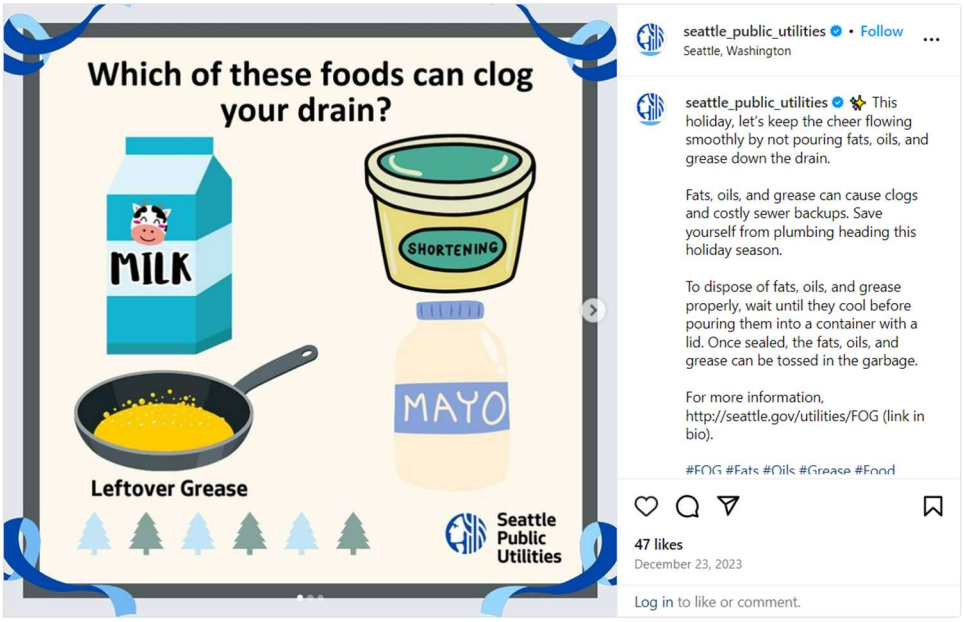


Figure 3-7. One of the social media posts shared during the holiday campaign

- Attended and distributed FOG reduction outreach materials at multiple community events including at cultural and community centers, grocery stores at eight locations near "hot spot" areas, and the TRENDS Rental Property Management conference and Tradeshow, attended by more than 900 rental property owners and managers.
- SPU's contracted engagement firm, Cascadia Consulting Group, conducted FOG specific outreach to 126 additional multifamily property managers in FOG hotspots.
- Delivered 1,285 FOG door hangers and sink strainers and grease canisters to multifamily residents.
- Delivered outreach materials and sink strainers to 418 single-family residential customers located in or near FOG "hotspot" areas.
- Through our customer service web portal and individual inquires, distributed 6,500 FOG educational flyers (primarily to multi-family property owners and managers) in nine languages including English, Amharic, Chinese, Korean, Oromo, Somali, Spanish, Tigrinya, and Vietnamese.

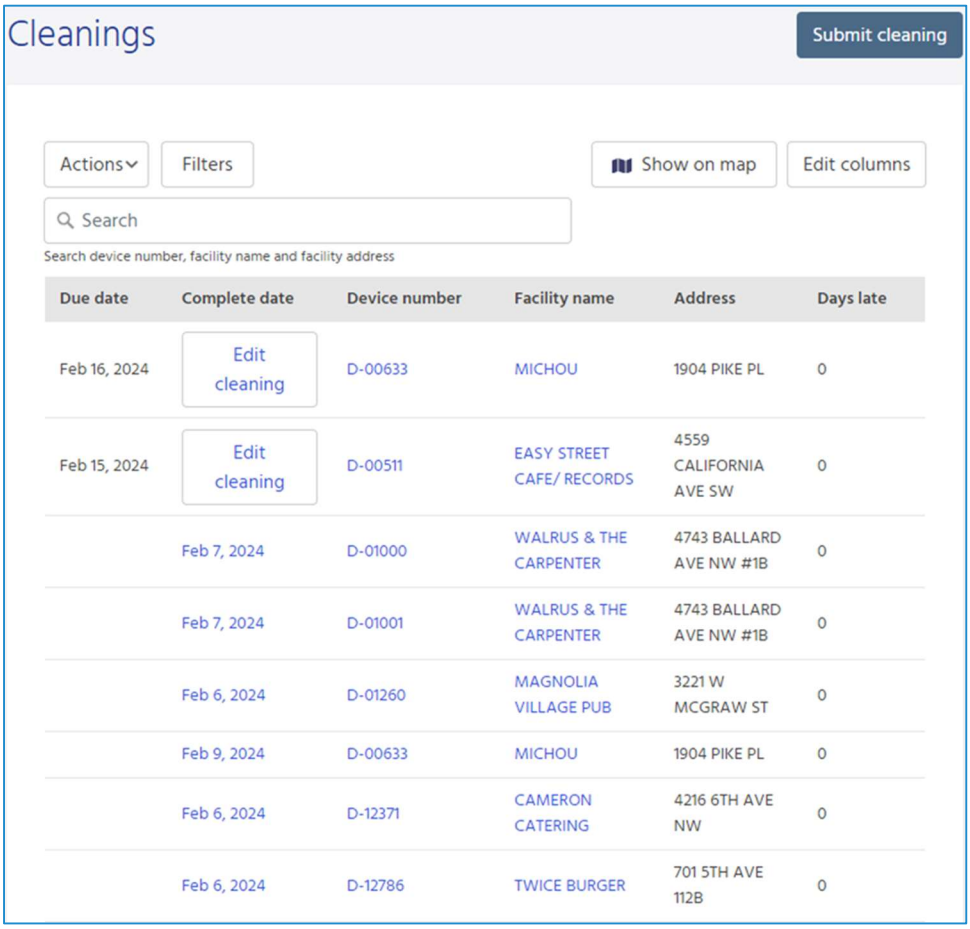
3.3.1.2 Commercial – Regulatory FOG Program

Per the Fats, Oils, and Grease Control Program Plan, SPU has focused our resources to provide the greatest impact in reducing FOG in the wastewater collection system from commercial sources. We accomplish this by utilizing a risk-based system for prioritizing inspections and enforcement. The commercial FOG program consists of restaurant engagement, site assessment, inspections, and enforcement. In 2023, economic-related obstacles remained a barrier to providing in-person, onsite assessments, and inspections at the same rate as pre-COVID years.

In 2020, SPU migrated to a new Aquatics Compliance Platform database system. In 2022, the new database platform continued to evolve by going live with the Hauler Self Reporting portal and the Facility Portal, allowing businesses to start logging their cleanings directly into the database from their computer, tablet, or smart phone. The introduction of the Hauler Portal allows grease interceptor waste haulers to report their own cleaning activities directly into the FOG database.

In 2022, SPU's Wastewater Source Control team worked with Cascadia, and began to onboard individual food service establishments in the Facility Self Reporting Portal. As part of the continuation of the pilot from last year, in 2023 the FOG software outreach coordinators on Cascadia's Green Business Team visited 102 Seattle restaurants, focused in Seattle neighborhoods Ballard and Pike Place, from May through September to onboard them in the database. This self-reporting allows SPU to gather maintenance information from businesses that typically self-clean their grease interceptors. Business owners and staff will be required to log into the portal and select which interceptor they would like to submit a cleaning for associated with their specific facility. SPU hopes that this tool will bring more awareness to their maintenance schedule and create a demand for increased education and regular grease interceptor cleanings, allowing for streamlined compliance inspections and a decrease in

impermissible discharges to the wastewater system. Cascadia will continue to provide SPU with outreach key findings and Aquatic Informatics software platform roadblocks that are encountered.



Due date	Complete date	Device number	Facility name	Address	Days late
Feb 16, 2024	Edit cleaning	D-00633	MICHOU	1904 PIKE PL	0
Feb 15, 2024	Edit cleaning	D-00511	EASY STREET CAFE/ RECORDS	4559 CALIFORNIA AVE SW	0
	Feb 7, 2024	D-01000	WALRUS & THE CARPENTER	4743 BALLARD AVE NW #1B	0
	Feb 7, 2024	D-01001	WALRUS & THE CARPENTER	4743 BALLARD AVE NW #1B	0
	Feb 6, 2024	D-01260	MAGNOLIA VILLAGE PUB	3221 W MCGRAW ST	0
	Feb 9, 2024	D-00633	MICHOU	1904 PIKE PL	0
	Feb 6, 2024	D-12371	CAMERON CATERING	4216 6TH AVE NW	0
	Feb 6, 2024	D-12786	TWICE BURGER	701 5TH AVE 112B	0

Figure 3-8. Example Cleaning Entry List from Aquatic Informatics

Additionally, in September 2023, SPU hosted a grease interceptor training program that provided training on proper hydromechanical interceptor (small, in-kitchen units) cleaning to those interesting in starting small businesses servicing interceptor equipment at Seattle foodservice businesses. The program was funded by Seattle's Seeds of Resilience grant with consultant support from Cascadia. This program was a great fit for the Seeds of Resilience grant because it met the following grant requirements:

- Promotes environmental benefit. Fats, oils, and grease discharged from Seattle foodservice businesses not maintaining their grease interceptors can clog sewer pipes and pump stations, leading to sewer overflows into the environment.
- Grows the green economy. By working with community-based organizations (CBOs) and economic development-focused city departments, we worked to help training participants organize business licenses and get their small business up and running. Many of the current grease interceptor cleaning companies are large, national businesses; the program was designed to provide more opportunities for these green jobs.

- Promotes equity. The key audience for promoting this program was current and previously employed foodservice workers. The COVID-19 pandemic had a detrimental impact on these workers, especially those who are Black, Indigenous, and People of Color (BIPOC), and this program intends to provide small business opportunities to this group. BIPOC-owned businesses are also looking for lower cost and in-language support to clean their grease interceptors based on interviews completed in the International District in 2019.

The program started by recruiting 5-10 interested individuals through partnerships with CBOs—such as the Washington Hospitality Association, Business Impact NW, Seattle Good Business Network, and Ventures—to support recruitment of foodservice workers and others who might have experience cleaning grease interceptors. Eight participants gathered for a full day of training on best practices for cleaning different types of interceptors followed by spending a morning in a food court to shadow SPU FOG inspectors for a hands-on opportunity to see what city inspectors look for and to get hands on experience doing cleanings on three commonly found under-sink interceptors. All participants were compensated for attending the shadowing and training. If participants speak a language other than English, Cascadia was available to coordinate support with in-language trainers or finding interpreters. Cascadia also continues to work with participants, connecting them to business development CBOs to support business license submission and business planning.

Figure 3-9. Grease Interceptor Training Program Advertisement

Other 2023 highlights included:

- Completed 945 FSE FOG discharge risk assessments and regulatory compliance inspections. This number includes 205 “High Priority” facility inspections. Inspections include FOG education, data collection, an evaluation of FOG discharge risk, and an assessment of compliance with Seattle Municipal Code. Due to ongoing staffing constraints, the number of inspections completed remains

below the stated annual goal of 1,200 total inspections, including 309 "High Priority" facility inspections.
- Continued collaboration with the King County Plumbing and Gas Piping Program which has led to increased plan review for FSEs and a more thorough interpretation and enforcement of the Seattle/King County Plumbing Code as it pertains to FOG pretreatment.

Cascadia completed the following commercial FOG-related engagement tasks:

- Provided FOG site assessment assistance to 422 businesses, including providing FOG maintenance logs, kitchen posters, and sink strainers.
- Delivered free spill kits to 121 facilities, including FSEs, as part of a Seattle EnviroStars Program multi-faceted conservation, pollution prevention, and recycling campaign.
- Tabled at grocery stores on various dates and areas in Seattle to provide FOG resources to customers ahead of the winter holiday cooking season.
- Provided site visits to 88 foodservice businesses to introduce them to the Aquatic Informatics platform and provide FOG BMPs and resources.

2024 goals and efforts include the following activities, pending ongoing staffing constraints (to be adjusted as conditions dictate):

- Conduct regulatory compliance inspections on a minimum of 90% of all Priority 1 and 2 facilities, as identified in the Aquatics Compliance Platform.
- Conduct regulatory compliance inspections on 90% of facilities scheduled in 2024 per the periodicity set in Aquatics Compliance Platform.
- Continue initial risk assessments for new FSEs and facilities connected to Category 3, 4, 5, and 6 mainlines.
- Conduct a reassessment of facilities that discharge to high priority sewer mainlines annotated during initial assessment as "no" or "inadequate" pretreatment and conduct Notice of Violation enforcement to achieve Code compliance.
- Continue collaboration with King County Plumbing and Gas Piping Program as well as the Plumbers and Pipe Fitters Training Center.
- Engage with business districts, neighborhood organizations, and area restaurant associations to collaborate on maintenance reporting and other FOG Program project rollouts.
- Craft a Director's Rule to support and expand existing Seattle Municipal Code (deferred from 2021).
- Complete and pilot online FSE registration and maintenance reporting project (deferred from 2022).
- Craft and implement a "Preferred Service Provider" Program for companies who install, repair, and maintain grease interceptors (deferred from 2022).

3.3.2 FSE Inventory Management Plan

The FSE Inventory Management Plan describes SPU's approach for collecting, using, and managing FSE data. SPU utilizes Aquatics Compliance Platform software to store and maintain FSE related data. In 2023, SPU updated the FSE database biannually by uploading an updated listing of FSEs permitted

through Seattle & King County Public Health. An ongoing and automated quarterly report is obtained via the Public Health database to help ensure FSE information in the FOG database remains current.

In 2023, SPU continued to work with developers for the Aquatics Compliance FOG Platform. This online database includes web access portals for SPU staff, FSE Owners/Management, and Service Providers. Direct access by FSEs and Service Providers went live in 2022. This allows SPU to obtain maintenance information, including photographs, which will greatly enhance SPU's ability to assess proper maintenance and functionality of grease interceptors outside of the compliance inspection process over the coming years.

3.3.3 Standard Operating Procedures

SPU FOG Inspectors reviewed all FOG Standard Operating Procedures (SOPs) in 2022. No updates or changes were made in 2023. In 2024, expects to complete another annual review of the FOG SOPs. The SOP review process serves the following purposes:

- Helps ensure field staff are familiar with and are utilizing SOPs.
- Helps ensure SOPs accurately reflect actual field activity processes.
- Empowers and expands the capabilities, ownership, and buy-in of field inspectors by providing them with a voice in the program process development.

SPU has developed and maintains the following SOPs relating to the FOG Management Plan:

1. FOG Regulatory Inspection SOP
2. Aquatics Compliance Platform User's Manual and Data Entry SOP (in progress)
3. FOG Enforcement SOP
4. FOG GIS & Hotspot SOP
5. FOG Violation and Enforcement SOP
6. FOG Characterization and Risk Assignment SOP
7. FOG Remote Inspector User's Manual and SOP

3.3.4 FOG Inspector Training

Continued education and training of FOG Inspectors remains a fundamental component of the SPU FOG Program. FOG Inspector training in 2023 included the following activities:

- In-house informal discussions concerning procedural changes brought about by technology improvement projects and program improvements. These sessions occur monthly during FOG Team meetings and in conjunction with software and procedural updates.
- FOG Team members actively participated in periodic online meetings of the APWA PreFOG Sub-Committee.

In 2024, SPU will continue to participate in the activities outlined above and seek out other training resources and opportunities, such as the Western States Alliance FOG Forum in April of 2024.

3.4 Annual Review of Operations and Maintenance Manuals

SPU regularly reviews its operations and maintenance manuals and updates them when necessary. They are available for O&M staff to access through a dedicated SharePoint site for wastewater facility documentation. Equipment specific operations and maintenance instructions and procedures are maintained as job plans in SPU's computer maintenance management system. New and updated O&M manuals have been submitted as follows:

- In 2015, SPU submitted O&M manuals to Ecology and EPA for the new operable CSO storage facilities at Windermere and Genesee.
- In 2016, SPU reviewed and updated the O&M Manuals for Windermere and Genesee. The updates mainly consisted of modifications to control logic made to the facilities operations during the stabilization phase.
- In 2018, SPU submitted an O&M Manual for the Henderson North CSO storage facility.
- In 2019, SPU reviewed and updated the control logic for the Windermere, Genesee, Henderson and Delridge facilities.
- In 2020, SPU submitted an O&M Manual for the Portage Bay (Basin 138) sewer system improvement project.
- In 2022, SPU completed review of the 60% Draft O&M Manual for the Ship Canal Water Quality Project.
- In 2023, SPU submitted to Ecology the draft O&M Manual for the Central Waterfront CSO Reduction Project.

SECTION 4

Capital Activities

This section describes activities SPU is undertaking to reduce the number and volume of sewage overflows and implement the Plan to Protect Seattle's Waterways. Included is a summary of progress made in 2023 and work that SPU plans to complete in 2024. During 2023, SPU continued to proactively monitor and control scope, schedule, and budget on each of its major projects. In addition, SPU applied considerable attention to applying lessons learned across capital projects. 2023 project spending is summarized in Table 4-1.

Table 4-1. 2023 Plan Implementation Spending

Project Name	Amount Spent
Ship Canal Water Quality Project	$499,549,050
Central Waterfront CSO Reduction Project (70,71,72)	$5,560,527
Delridge 168/169 CSO Control	$3,838,159
Sewer System Improvement Projects (Retrofits)	$272,914
Pump Station Rehabilitation	$54,542,226
Outfall Rehabilitation	$801,926
Sewer Renewal	$177,468,752
RainWise	$8,410,924
NDS Partnering	$985,783
South Park Water Quality Facility	$9,579,362
Expanded Street Arterial Sweeping	$2,128,914
Total	**$763,138,535**

4.1 Sewer System Improvement Projects

SPU continued to monitor performance on a variety of combined sewer system improvement projects in 2023, as summarized in the following paragraphs.

4.1.1 Delridge (Basin 99) HydroBrake Retrofit Project

Delridge Basin 99 is located at the north end of the Delridge neighborhood in West Seattle, just south of the West Seattle Bridge. In 2019, SPU replaced the Basin 99 HydroBrake flow restriction device with an automated sluice gate. This new sluice gate allows SPU to achieve a consistent discharge flowrate to the King County regional sewer system and more optimally utilize the existing offline storage tank, thereby reducing the frequency and volume of Basin 99 CSOs. Construction Completion was achieved on December 9, 2019. In 2020 and 2021, SPU monitored the facility and adjusted its performance to meet the design intent. There are two operational modes that this facility switches between during wet

weather (depending on the regional sewer system condition) and 2020 was spent optimizing the primary operational mode's settings. In 2021, SPU optimized the secondary mode. In 2022, SPU monitored the performance of the new facility and found that it was not operating optimally. Upon investigation, SPU discovered an error in the code. SPU corrected the programming and will continue to monitor the performance and make further modifications, as needed, in 2024.

Figure 4-1. New Basin 99 Sluice Gate (left) and Actuator Motor (right)

4.1.2 Magnolia (Basin 60) Pump Station 22 Rehabilitation Project

Basin 60 is located in the Lawtonwood neighborhood of Magnolia, on the west side of Seattle. The sewer system improvement for this basin includes increasing the pumping capacity of Pump Station 22 from 0.86 MGD to 4.0 MGD, rehabilitating other station assets, and replacing the aging 8-inch diameter force main with a 12-inch diameter force main and a new connection to King County's Fort Lawton Tunnel.

Construction began in September 2019 and was completed in 2020, before the regulatory construction completion milestone of December 31, 2020. The rehabilitated pump station operates using a variable frequency drive (VFD), which is a new approach to managing system flows through SPU's pump stations. In 2021 SPU monitored and adjusted the station's VFD performance throughout the year to verify that the pumps operate at the design intent. Long term simulation modeling indicates that Outfall 60 is now meeting the performance standard of 1 overflow per year on a twenty-year average. SPU monitored performance in 2023 and will continue to do so in 2024.

Figure 4-2. New Basin 60 pumps being installed (left) and New Basin 60 connection to King County trunk sewer (right)

4.1.3 East Montlake (Basin 20) Pump Station and Force Main Rehabilitation Project

East Montlake Basin 20 is located in central Seattle, just south of the Ship Canal Cut and east of Montlake Basin 140. The sewer system improvement for this basin, similar to the project in Magnolia Basin 60, includes increasing the pumping capacity of Pump Station 13 from 0.9 MGD to 2.8 MGD, rehabilitating other assets of the station, and replacing the aging 8-inch diameter force main with a 12-inch diameter force main.

Construction of this pump station rehabilitation project began in April 2020 to accommodate an eagle breeding window, as specified by the Washington Department of Fish and Wildlife construction permit. The intent was to complete the project by the regulatory construction completion milestone of December 31, 2020. However, due to COVID-19 pandemic-caused delays in the shipping of essential equipment, the need to socially distance field workers (elongating the construction schedule), and other delays caused by vendor illness, the project was delayed past the regulatory milestone. SPU notified Ecology and EPA of a potential milestone violation by letter dated November 4, 2020, and provided an update on February 1, 2021. SPU completed the sewer system improvement and sent Ecology and EPA a notification of construction completion letter on May 28, 2021. In 2022 and 2023, SPU monitored and adjusted the operation of the pump station's variable frequency drives to help ensure its performance

meets the design intent. In 2024, SPU will continue to monitor and make operational adjustments as needed.

Figure 4-3. Operational Testing of Upgraded Pump Station 13 (left) and new pumps and valving (right)

4.1.4 Portage Bay (Basin 138) HydroBrake Retrofit Project

Portage Bay Basin 138 is located on the west side of Portage Bay and is bounded by State Highway 520 to the south and Interstate 5 to the west. The sewer system improvement for this basin includes replacing the HydroBrake at the existing offline storage tank with an automated sluice gate and rehabilitating and increasing the pumping capacity of Pump Station 20 from 1.1 MGD to 1.5 MGD. The rehabilitated pump station operates using VFDs, and new automated controls will allow the sluice gate to manage flows at the pump station's new higher peak flowrate, better utilizing existing offline storage and reducing overflow volumes and frequency.

Construction began in early 2020 and was completed before the regulatory construction completion milestone of December 31, 2020. Due to the complex hydraulic components of this facility, gate settings were adjusted and monitored in 2021. In 2022 and 2023, SPU monitored the performance of the gate and improved the PID control logic to meet the design intent. In 2024, SPU will continue to monitor performance and make operational adjustments, as needed.

Figure 4-4. Installation of Basin 138 slide gate (left) and new higher capacity pumps (right)

4.2 Ship Canal Water Quality Project

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

On July 27, 2016, the City of Seattle and King County signed a Joint Project Agreement (JPA) to guide implementation, operation, and cost-sharing of the SCWQP. SPU is the lead for construction and implementation of the tunnel, and will own, operate, and maintain the tunnel and its related structures. DNRP will continue to own its two outfall structures. SPU and DNRP have also chartered both the Joint Oversight and the Project Review and Change Management Committees to provide policy guidance and senior level management oversight, support, and direction to the project.

In 2023, the project team made significant progress on project design and construction:

- Construction of the Storage Tunnel work package continued. Mining was completed on both the 2.7 mile long, 18 ft.-10 in. diameter storage tunnel and the 8 ft. diameter conveyance tunnel under the Ship Canal. Significant process 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 in order to attract more bidders for a future re-bid. Updated re-bid 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.
- Finally, SPU closed the 2019 State Revolving Fund loan for the Ship Canal Water Quality Project.

Issues encountered in 2023 include:

- 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 to 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 re-bidding 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 re-bid and its rationale was shared with EPA and Ecology.
- Slower-than-planned tunnel mining of the 2.7 mile long, 18 ft.-10 in. diameter storage tunnel caused a delay for the Wallingford Conveyance work package. The Wallingford Conveyance contractor had to delay work in 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 re-bid the TEPS/Ballard Conveyance contract, this delay did not impact the critical path of the overall program.

Figure 4-5. Construction of the 11th Ave NW Flow Diversion Structure

Highlights from SPU's 2023 community outreach for the Ship Canal Water Quality Project include:

- Delivered project briefings to SPU's Customer Review Panel (a group established to provide input and review progress on SPU's Strategic Business Plan) as well as community groups, business associations, and nonprofits.
- Delivered presentations to the Seattle Mayor's Office, Seattle City Council members, Ecology, and EPA.
- Conducted numerous stakeholder briefings with property owners and businesses along the tunnel alignment and proposed project sites, with a focus on the Wallingford Conveyance construction project.
- Delivered regular listserv updates on Storage Tunnel construction progress to over 2,000 recipients, approximately monthly.
- Participated in a forum at a national tunneling conference, representing experiences and risk management on the project.

Figure 4-6. 8 ft. MudHoney completes mining of the 18 ft-10 in diameter Storage Tunnel

In 2024, all of the SCWQP projects will be under construction. The project team anticipates the following activities and accomplishments:

- 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 re-bidding 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.

SPU's planned 2024 outreach activities include:

- Conduct outreach to contractors ahead of bid advertisement for the combined TEPS/Ballard Conveyance work package.
- Deliver project briefings to 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.

4.3 Central Waterfront CSO Reduction Project (Basins 70, 71, 72)

To control combined sewer overflows from the south end of the Central Waterfront, SPU has installed approximately 2,000 linear feet of new 24 to 36-inch diameter sewer and connecting combined sewer basins 70, 71, and 72. The project has eliminated Outfalls 70 (University Street) and 72 (Washington Street) and now limits CSOs from Outfall 71 (Madison Street) to no more than one overflow per year on average.

SPU and Seattle's Office of the Waterfront are coordinating construction of these sewer system modifications and the Waterfront Seattle Alaskan Way-Elliott Way (S King Street to Bell Street) Project, because critical portions of both City projects are located where the Alaskan Way Viaduct stood and neither of these City projects could be completed until the Alaskan Way Viaduct was demolished. Attempting to complete the CSO control project prior to demolition of the Viaduct would have resulted in significant additional cost, additional disruption to businesses and the travelling public, additional risk of failure of the then-compromised viaduct structure itself, and risk that the completed improvements would be damaged during subsequent demolition work. In addition, the Viaduct could not be demolished until the new SR-99 tunnel was complete, or there would have been major additional disruption to businesses and the travelling public. WSDOT was solely responsible for completing the new SR-99 tunnel and the Viaduct demolition; the City was not able to direct the activities of WSDOT or its tunneling or demolition contractors and therefore was not able to accelerate WSDOT's schedule for completing SR-99 and demolishing the Viaduct.

In the Plan to Protect Seattle's Waterways, SPU indicated that construction of the Basins 70, 71, 72 CSO control project would be complete by the end of 2020. This completion date was based on construction beginning in 2017, which coincided with WSDOT's original schedule for completion of SR-99 and demolition of the Viaduct. On October 22, 2015, WSDOT and STP notified the Washington State Legislature's Joint Transportation Committee that resumption of the tunneling on SR-99 was delayed until December 23, 2015. This delay in tunneling resumption, and subsequent delays in the State's work, pushed the SR-99 completion and Viaduct demolition schedules beyond the point where the City could assure that the CSO control project would be completed by 2020. Consequently, SPU submitted notification of this force majeure event the same day.

Viaduct demolition was completed in late 2019. The Waterfront Seattle Alaskan Way-Elliott Way (S King Street to Bell Street) Project, including the South-Central Waterfront (Basins 70, 71, 72) CSO control project, was bid, awarded and construction commenced in 2019, with CSO construction work starting at the end of 2019/beginning of 2020. Also in 2019, SPU completed the final measures to mitigate impacts of the completed project on our customers. In 2023, SPU completed construction of the Madison Ave

Outfall Weir Structure – the final operational system component. Substantial completion is projected to occur by early 2024.

The WSDOT-caused delay is not expected to cause or contribute to endangerment of public health, welfare, or the environment. Outfalls 70 and 72 were controlled before construction began and have since been removed from CSO service (on April 24 and May 26, 2020, respectively), and the discharge from Outfall 71 is a relatively small portion of the City's CSO volume.

Figure 4-7. Central Waterfront Construction – Pike St Control Structure Orifice Plate

4.4 Longfellow Starts Here Project (Basins 168, 169)

Longfellow Starts Here (previously known as the Longfellow Creek Water Quality Improvement Project) is a community driven, long-term project to control CSOs from Delridge Basins 168 and 169. The ultimate goal of this project is to identify the best pairing of CSO reduction and stormwater quality projects and programs that improve the water quality of Longfellow Creek while meeting the community's needs and vision, using the lens of racial equity. Longfellow Starts Here (LSH) is currently in Options Analysis, which is broken into 2 phases. Each "option" in this project is an infrastructure scenario - a suite of projects and programs that collectively meet the performance goals for the basins over time, while providing other co-benefits. The tools and frameworks needed to create infrastructure scenarios are developed in the first phase (Phase A). Infrastructure scenarios are developed and evaluated in collaboration with stakeholders in the second phase (Phase B).

In 2020, SPU delivered the majority of Phase A. The tools and frameworks developed in Phase A define the component pieces of a potential infrastructure scenario, including the cost and performance of all the major types of CSO reduction and stormwater quality projects and programs, characterization of how those projects and programs fit within an urban design context, the location of opportunities, needs, and limitations in the basins, and the opportunities for workforce development and arts-based engagement to empower communities of color within the area.

In 2021, SPU finished documenting Phase A, and worked on developing a plan for Phase B. Phase B kicked off mid-year 2022 with initiating a City family community engagement coordination group to bring together multiple departments working on efforts within the Delridge community. The intent of this group was to identify opportunities to work together and leverage each other's work so that we did not burden the community with separate City engagement processes. In 2022, work also started on developing the scope for identifying and developing inflow and infiltration (I&I) pilot programs that could be initiated relatively quickly and help to fill data gaps on I&I approaches that will help support scenarios development within LSH. The I&I pilot programs could also be applied more broadly within other CSO basins in the city. In 2023, SPU continued to work with other City departments on coordination and consultant negotiations for expanded community outreach and development of the I&I pilot programs.

In 2024, SPU will focus on further development of relationships and trust building with the community and continuing to support City family collaboration, including collectively working through a Racial Equity Toolkit for the Delridge community work. In addition, there will be a focus on identifying and developing pilot programs to test in the basin. By the end of the year, the project anticipates scoping the continued work for Phase B, which includes implementing the I&I pilot programs so that we can start to gather data on their effectiveness and developing the strategy for getting the CSO basins into compliance. This will be accomplished through focused on work on the development and evaluation of potential infrastructure scenarios with City family and external stakeholders and identifying CSO reduction approaches that best support the community's vision for southern Delridge.

4.5 Leschi (Basins 26 – 36)

The Leschi area is in east Seattle bordering Lake Washington and comprises Basins 26 through 36. Over a dozen individual sewer system improvements were implemented in this area in two phases: Phase 1, which was completed in 2015, and Phase 2, which was completed in 2016. Phase 1 improvements were described in the 2014 Annual Report. Phase 2 improvements were detailed in the 2016 Annual Report. As part of the improvements, Outfalls 26 and 33 were sealed and removed from service.

Based on flow monitoring data, it is apparent that the constructed sewer improvements changed the flow characteristics of the Leschi Area. As a result of the changed flow characteristics, together with recent changes in precipitation patterns, the constructed improvements did not reduce CSOs as much as expected. Modeling conducted in 2018, together with flow monitoring in 2019, 2020, and 2021 show that Outfalls 27, 29, 35, and 36 meet the CSO performance standard and Outfalls 28, 30, 31, 32, and 34 are not controlled to the CSO standard (see Table 5-8).

Because the Leschi area flow characteristics have changed and the location of the CSO control issue has shifted (for example, Basin 30 was not previously identified in the "if needed" Leschi CSO Control Project), SPU believes it is prudent to look again at the options for controlling the Leschi Area instead of moving forward with the originally identified off-line storage pipes. As part of this re-look, SPU will be working with DNRP to determine whether the most cost-effective and technically sound control measure involves partnering on DNRP's Montlake (DSN 014) CSO control project. This analysis will be completed as part of DNRP's future LTCP update work effort.

On June 14, 2018, SPU submitted a Notification of Potential Milestone Violation notifying Ecology and EPA of the possibility that SPU might not meet the Leschi CSO Control Project Engineering Report submittal milestones. On June 26, 2019, SPU submitted a request to EPA and Ecology for modification of the Engineering Report Milestone to have more time to develop revised control alternatives and partnership opportunities with DNRP.

4.6 Pearl Street Drainage and Wastewater Improvement Project

In 2022, SPU completed construction of the Pearl Street Drainage and Wastewater Improvement Project. The project was designed to improve the capacity of the combined sewer system to help reduce storm-related combined sewer backups and flooding. SPU spent a total of $18.8 million, including $10 million obtained in competitive loan funding through the Public Works Board loan program.

The Pearl Street project area is in the west Beacon Hill area of Seattle. This neighborhood has experienced repeated combined sewer backups onto the public right-of-way and into homes and private properties. In addition to the sewer backups, there had been significant stormwater flooding associated with the adjacent Maple Elementary School and the Maplewood Playfield (Seattle Dept. of Parks and Recreation facility), located in the upper portion of the Pearl St. basin. High groundwater in the area also contributes to sewer capacity issues.

To improve sewer system capacity, approximately 1,200 linear feet of new pipes were installed. In addition, approximately 300 linear feet of existing undersized pipes were upsized via trenchless technologies to meet wastewater capacity needs. The project also installed a 250,000-gallon underground storage tank to detain flows during large storm events and to regulate flows leaving the basin to protect the downstream system from other overflows. To protect homes against extreme storm events, the project provided reimbursement to property owners for voluntary installation of privately owned backwater valves.

Furthermore, SPU partnered with the Seattle Department of Transportation and the Washington State Department of Transportation for all work within and through those agencies' public rights-of-way. SPU made improvements to multiple public rights-of-way with new roadway infrastructure and plantings, to meet partner agency requests and to mitigate community concerns.

In 2023, SPU tested and onboarded the new facility. In 2024, SPU will monitor performance and make operational adjustments, as needed.

4.7 CSO Control Supplemental Compliance Plans

4.7.1 Windermere Supplemental Compliance Plan

In 2015 SPU completed construction of a 2.05 million-gallon (MG) storage tank near Magnuson Park on the south side of NE 65th Street to reduce the number of overflows from Outfall 13. Hydraulic modeling to assess facility performance was completed in Summer 2016. The modeling showed that, although the project significantly reduced overflows from Basin 13, the 20-year average was 1.6 CSOs/year. On October 4, 2016, SPU submitted a Supplemental Compliance Plan to Ecology and EPA outlining the steps SPU plans to take to meet the CSO standard. Ecology and EPA approved the Plan on January 5, 2017.

Per the approved Plan, in 2017 SPU evaluated operational adjustments to the recently constructed control structures and submitted a technical memorandum summarizing its findings on December 28, 2017. SPU found that the two main control gates in the Windermere Area needed to be reprogrammed and recalibrated to better respond to changes in flow. The evaluation also found that Basin 15 was barely exceeding the CSO standard (at 1.1 CSO per year based on modeling), so SPU submitted a Supplemental Compliance Plan for Basin 15 on April 17, 2018.

In 2018 SPU implemented the recommended gate programming changes. Since then SPU has continued to monitor their performance. In 2024, SPU will continue to work with DNRP to identify other short-term system operational improvements.

4.7.2 Genesee Supplemental Compliance Plan

In 2015 SPU completed the construction of a 380,000-gallon storage tank and a 120,000-gallon storage tank to reduce overflows from Outfalls 40, 41, and 43. The project was constructed in two parking lots along Lake Washington Boulevard S at 49th Avenue S and at 53rd Avenue S. Each has a facility vault, diversion sewer, and a force main with motor-operated gates to control the flow of wastewater like the Windermere storage facility.

In February 2016, SPU found significant root intrusion in the Lake Line that conveys combined sewage from the two newly constructed CSO storage tanks to Wastewater Pump Station 5. This root intrusion caused the tanks to fill prematurely during storms and drain too slowly after each storm.

These issues prevented SPU from updating the hydraulic model and completing the modeling work needed to determine whether the Genesee Area was controlled to the Consent Decree performance standard. Consequently, SPU submitted a Supplemental Compliance Plan to Ecology and EPA on March 8, 2017, requesting more time to complete flow monitoring and hydraulic modeling. Ecology and EPA approved the SCP on May 30, 2017. SPU cleaned the Lake Line and, in 2017, monitored flows in the Genesee Area.

In June of 2018, SPU submitted a Revised Supplemental Compliance Plan to Ecology, noting that the storage tanks have significantly reduced overflows in the Genesee Area but four basins are still exceeding the 1 CSO per year standard. The Basins are 40, 41, 42 and 43. Similar to the steps taken in the Windermere Area, SPU evaluated possible operational improvements in the Genesee Area, which

led to the recommendation to revise the programming of two control gates and install a new gate controller on CSO Storage Facility 9. In 2019, SPU implemented these operational improvements. SPU began to monitor those improvements in 2020 and throughout 2021, 2022, and 2023, and will continue to do so in 2024.

4.7.3 South Henderson Supplemental Compliance Plan

In 2015-2016 SPU constructed the following improvements to the combined system in the South Henderson Area:

- The 52nd Ave S Conveyance Project (Basins 47B and 171), which included a new diversion system and a pipeline to convey peak flows to DNRP's Henderson Pump Station.
- Pump Station 9 Upgrade (Basin 46), which included pumping and mechanical upgrades to SPU's pump station to better handle peak flows coming down from the sewer lake line.
- Henderson 47C Retrofit (Basin 47C), which included installing a new higher weir in the 47C control structure to optimize upstream storage and improve overflow monitoring.

In late 2016, hydraulic modeling was used to assess the performance of these improvements. The modeling showed that Basin 46 is meeting the CSO performance standard and Basins 47 and 171 are not. Prior to construction of these improvements, Basin 47 averaged 15.7 CSOs per year and Basin 171 averaged 7.4 CSOs per year. Based on 2016 modeling, the completed projects decreased the average frequency to 4.1 CSOs per year from Basin 47 and 3.3 CSOs per year from Basin 171.

Because the two basins were not yet meeting the CSO performance standard, on March 22, 2017, SPU submitted a Supplemental Compliance Plan to Ecology and EPA describing the additional steps that will be taken to control CSOs from Basins 47 and 171. Ecology and EPA approved the Plan on May 19, 2017.

In 2017, SPU evaluated these basins and identified operational adjustments to the recently constructed control structures. SPU submitted a Technical Memorandum summarizing the evaluation on September 29, 2017. The main recommendation was to remove an orifice plate in Sub-Basin 47B to achieve the desired design flowrate, and this adjustment was implemented by December 29, 2017. SPU then conducted flow monitoring and hydraulic modeling to assess the effectiveness of the orifice plate removal. In March 2019, SPU submitted a technical memorandum summarizing results. Orifice plate removal reduced Basin 47 overflows to 3.1 CSOs/year and Basin 171 overflows to 2.5 CSOs/year. However, both outfalls still exceed the one CSO per year standard. In 2020, SPU identified and modeled potential operational adjustments. In 2021 through 2023, SPU coordinated with DNRP to evaluate the impact of the operational adjustments on downstream DNRP infrastructure. In 2024, SPU will continue to coordinate with DNRP on the operational adjustments.

4.7.4 Magnolia 62 Supplemental Compliance Plan

In the 2016 Annual Report, SPU noted that the 20-year average CSO frequency at Magnolia Outfall 62 had increased in recent years to 1 per year (1997 – 2016). On March 21, 2018, SPU verbally notified Ecology and EPA that the frequency of CSOs from Outfall 62 had increased to a 20-year average of 1.1

per year (1998 – 2017) and that Outfall 62 no longer met the CSO performance standard. On April 3, 2018, SPU submitted a Supplemental Compliance Plan to Ecology and EPA, describing the remedial measures SPU will pursue to control the outfall. Following receipt of comments from Ecology and EPA on April 19, 2018, and a site visit with Ecology during Summer 2018, SPU submitted a revised Supplemental Compliance Plan on September 6, 2018.

The revised Supplemental Compliance Plan was approved on October 24, 2018. SPU committed to raise the Basin 62 CSO weir by December 31, 2018, and report on its functionality by March 31, 2019. On August 27, 2018, SPU installed a metal weir plate on the existing concrete weir wall, raising the weir 6.4 inches. SPU also evaluated how to inspect and clean (if required) the beach line (gravity conveyance from Basin 61 to Basin 64) as this line may be partially occluded with sediment. SPU submitted a technical memorandum to Ecology on June 27, 2019, summarizing the inspection and cleaning approach. However, preliminary monitoring data collected in 2018 and 2019 shows that the new weir plate is effective in reducing overflows. To determine if the weir raising was successful in keeping overflows to one or less per year, SPU submitted a revised Supplemental Compliance plan on June 27, 2019, requesting additional time to deploy flow monitors in 2019 and 2020 to be able to recalibrate the hydraulic model. In 2021, SPU recalibrated the model and performed long term simulations and found that weir raising was effective and the outfall is now meeting the performance standard. No additional work was completed in 2023 and no additional work is expected in 2024.

4.8 South Park Water Quality Facility

The South Park Water Quality Facility is one of the stormwater improvement projects included in the approved Plan to Protect Seattle's Waterways. The intent of the facility is to treat stormwater runoff from the existing 7th Avenue South drainage basin, a highly industrial basin in the City's South Park neighborhood, and discharge treated water to the Lower Duwamish Waterway. The South Park Water Quality Facility will work in conjunction with the South Park Pump Station, which completed construction in 2023, and will enable the existing stormwater collection system and outfall to function during all tidal conditions in the Lower Duwamish Waterway.

SPU originally intended to build the Water Quality Facility in conjunction with the South Park Pump Station on the 636/640 S Riverside Drive site. In 2018, SPU determined that the South Park Pump Station required full use of the two properties on S Riverside Drive and SPU began evaluating other potential properties within the industrial area of the South Park neighborhood for the Water Quality Facility.

SPU has three consultant teams to support the site cleanup, water quality facility, and community investment aspects of the project. In 2023, Ecology approved the project's remedial investigation/feasibility study work plan for remedial investigations on the identified property for purchase. In 2023, SPU continued evaluating treatment technology options for the Water Quality Facility and anticipates selecting a technology in 2024. SPU also anticipates acquiring property for the Water Quality Facility and beginning remedial investigations in 2024.

4.9 Green Stormwater Infrastructure

The term green stormwater infrastructure (GSI) describes a variety of measures that use soil to absorb stormwater or slow the rate of stormwater entering the sewer system. Green solutions control the sources of pollution by slowing, detaining, or retaining stormwater so that it does not carry runoff into nearby waterways. This reduces the volume and timing of flows into the system. GSI facilities also are referred to as natural drainage systems (NDS) and they are a type of low impact development (LID). Examples of GSI include:

- RainWise – A program that provides homeowners with rebates for installing rain gardens and cisterns on their own property.
- Roadside bioretention – Deep-rooted native plants and grasses planted in a shallow depression in the public right-of-way, such as the planting strip adjacent to homes.

SPU's general goal is to use green solutions to reduce CSOs. SPU and DNRP continue to work together to help ensure GSI projects in the City of Seattle use a consistent approach. Collaborative work in 2023 included:

- 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.

In 2024, planned collaborative work includes:

- Continuing work on 2023 items listed above.
- Updating GSI Guidance Manuals for Design, Options Analysis, Constructions, and Operations and Maintenance.

4.9.1 RainWise Program

Since 2010, RainWise has offered rebates for rain gardens and cisterns to property owners in the combined sewer areas of Seattle. Eligible property owners are alerted about the program through regular mailings, public meetings, and media events. By visiting the RainWise website at www.700milliongallons.org/rainwise, property owners can learn about green stormwater technologies and are presented with solutions appropriate for their property. Through this site, they are also able to find trained contractors.

Over 800 contractors, landscape designers, and similar professionals have been trained in the program since 2009. In 2023, the RainWise Program offered one hybrid format training for contractors, one in-person and in-language orientation for contractors with English as a second language, and built content

for an online, self-directed orientation model. In 2024, the RainWise Program plans to launch the online orientation platform.

There are currently 31 active contractors listed on the RainWise website that are available to bid and install systems for RainWise customers. Of them, eleven are multilingual. In 2023, we continued to update the list to include only those contractors that responded to our surveys and have completed installations in the last two years.

Additionally, the RainWise Program and its community partners held nine informational webinars and 13 in-person events for potential RainWise customers to learn about the program, talk with satisfied participants, and meet contractors. The RainWise team also staffed informational tables at 19 community events.

In addition to previous efforts to improve outreach, education and program delivery to potential customers and contractors, RainWise implemented recommendations from the program's racial equity toolkit, which guides program efforts related to BIPOC communities, customers and contractors. In 2023, SPU led the planning for a special assistance pilot to help low-income residents participate in RainWise to launch in the near future. Translation and transcreation of materials continued to be provided. The program also connected with a user research project called Seattle by Design to interview customers and contractors and identify opportunities for program improvements. Recommendations implemented in 2023 included a pilot offering virtual pre-consultations with interested customers and moves to further automate and digitize forms and processes.

Upon completion, installations are inspected by a RainWise inspector and property owners apply for the rebate. In 2023, RainWise increased rebate rates to reflect inflation since our last update in 2017. The rebate calculator also was adjusted to reflect changes in the stormwater code, which impact how our systems are required to perform. The program now offers up to $7 per square foot of roof area controlled for rain gardens and up to $5.33 per square foot for cisterns.

In 2023, the RainWise Program rebated 31 projects in the Ballard, Delridge, Duwamish, Fremont, Genessee, Henderson, Highland Park, Leschi, North Union Bay, Queen Anne, and Windermere basins. Since the program's inception, 1,279 installations have been rebated in combined sewer basins managed by SPU. These installations control approximately 40 acres of impervious roof area and an estimated 19.4 million gallons (MG) per year of stormwater, and they provide an estimated 352,697 gallons of CSO control volume.

The RainWise Program continues to operate under a memorandum of agreement with DNRP to make RainWise rebates available to customers whose properties are located in the City of Seattle and within CSO basins served by DNRP, in University, Green Lake, Montlake, Capitol Hill/ Central District, Highland Park, Barton and South Park.

SPU will continue to offer its RainWise Program in 2024.

Figure 4-8: RainWise cistern installation ribbon cutting event at Emerson Elementary School

4.9.2 NDS Partnering Program

In 2015, the Natural Drainage System (NDS) Partnering Program developed the methodology, budget, and schedule required to achieve the NDS Partnering Program commitments in the approved Integrated Plan portion of the Plan to Protect Seattle's Waterways. In 2018, the Program began construction of the 30th Ave NE Sidewalk and NDS Project, the first partnership project with SDOT, meeting the NDS Partnering regulatory milestone of issuing construction Notice to Proceed by July 2019. Construction was completed in early 2019. In 2020, the second partnership project with SDOT was constructed, the 12th Ave NE Sidewalk and NDS Project. Similar to the 30th Ave NE project, this project constructed sidewalk and NDS along two blocks within the Thornton Creek Basin. The NDS provides separation between the street and the new sidewalk and treats stormwater runoff from 12th Ave NE.

In 2023, SPU continued construction of the **Longfellow NDS Project.** This project includes three sites, two with a significant partnership with SDOT for pedestrian improvements. This project's construction was delayed due to poor contractor performance and a water main break over Longfellow Creek at the Kenyon site. In addition, the Sylvan site will be completed under a separate construction contract. Figure 4-9 shows the bioretention cell, and new walkway and bridge to improve pedestrian safety and access over Longfellow Creek, at the Kenyon site.

Construction of the **South Thornton NDS Project** began in Q4 2023 and will address localized flooding issues and improve pedestrian mobility through construction of bioretention cells and walkways at four project sites. This project will also include the piloting of the Bioretention Kit of Part, which are small art elements that will be incorporated into this project's right-of-way bioretention facilities.

In 2023, SPU completed 30% design on the **North Thornton NDS Project**. Work under this project included outreach and engagement with community and identifying the project blocks to move into further design. This project has had challenges in identifying project blocks due to significant areas with high groundwater, likely a result of the four tributaries to Thornton Creek running through the project

area. As a result, this project selected two sites that manage 8.5 acres of effective impervious area, a reduction from the original goal of 13 acres of effective impervious area.

Figure 4-9. Looking east from 24th Ave SW and SW Kenyon St – the new bioretention facility, walkway, and bridge

Design and community outreach for of the **Broadview NDS Project** and **Holden NDS** projects continued The Broadview NDS project, which will build bioretention along three blocks to improve water quality to Pipers Creek, completed design and started the project manual development. The Holden NDS project continued working through design issues with SDOT and engaging with community. It will construct bioretention to narrow the roadway and provide traffic calming where SDOT and the community identified a need and also treat arterial water from an adjacent street.

Finally, in 2023 the **Pipers NDS** project procured a new consultant to complete Options Analysis that had the right experience to design bioretention within the project area and address existing flooding and conveyance issues.

In 2024, the Longfellow NDS Project will complete construction of 24th Ave SW and Kenyon St sites and the South Thornton NDS Project will continue construction. North Thornton NDS will complete 60% design, begin 90% design and continue to outreach and engage with community. Design and community outreach will continue and be completed for the Broadview NDS and Holden NDS projects with construction for both projects anticipated to start by the end of the year. The Pipers NDS project will begin Options Analysis and engage with community.

4.10 Expanded Arterial Street Sweeping Program

This program expanded the City's arterial street sweeping program, per commitments in the Plan to Protect Seattle's Waterways. During 2023, the team continued implementing the expanded program. SDOT street sweeping crews swept just over 15,000 broom-miles in the municipal separate storm sewer system area, capturing 187 dry tons of total suspended solids (TSS) equivalent (150% of planned commitments). Key tasks involved in completing the work included:

- Continued to utilize overtime to address difficulties maintaining a full crew due to a tight labor market and high turnover.
- Began developing an app – eSweep – which allows the sweeping operators to input daily performance digitally onboard their sweepers.

During 2024, the team will continue to implement the expanded program and adapt as needed to meet the regulatory targets. The key tasks planned for this year include:

- Continue sweeping established routes
- Rollout the eSweep app
- Increase sample collection frequency
- Continue to incorporate protected bike lanes into the program

The City is on schedule to meet the annual commitment of capturing 122 tons of TSS equivalent in 2024.

SECTION 5

Monitoring Programs and Results

This section provides a brief overview of SPU's precipitation and flow monitoring programs and presents 2023 results, including CSO overflow details, 5-year average overflow frequencies, and a summary of the outfalls meeting the CSO control standard.

5.1 Precipitation Monitoring Program

SPU collects precipitation data from a network of 22 rain gauges located throughout the City of Seattle, as shown in Figure 1-1. No changes were made to the network of permanent rain gauges in 2023.

Two tables summarizing 2023 precipitation monitoring results are included in this report:

- Table 5-1 provides precipitation by gauge and by month.
- Table 5-2 summarizes the last five years of precipitation monitoring results by year and by month.

Normal annual rainfall, averaged citywide, is 34.94 inches. In 2023, 26 of the 22 SPU rain gauges exceeded that amount. Totals ranged from 31.49 inches to 39.13 inches, and the average was 35.56 inches.

5.2 Flow Monitoring Program

In 2023, SPU's flow monitoring consultant operated and maintained 69 monitoring points while SPU staff operated and maintained an additional 24 monitoring points, for a total of 93 continuous monitoring sites.

Dedicated monitoring program staff review flow monitoring results on a regular basis and evaluate data quality and flow monitor performance. If emerging problems are identified during these reviews (such as data showing slow storage tank drainage or missing data), the issues are rapidly addressed by requesting field service from the monitoring consultant or from the SPU Drainage and Wastewater crews. The consultant and SPU staff also perform site-specific troubleshooting.

Each month, the consultant's lead data analyst and senior engineer and SPU monitoring staff review and analyze any apparent overflows that occurred the previous month, taking into consideration rainfall, knowledge of site hydraulics, and the best available monitoring data. When needed, SPU meets with consultant staff to make a final determination regarding whether an overflow occurred, and any necessary follow-up actions are documented.

5.3 Summary of 2023 Monitoring Results

Several tables summarizing 2023 flow monitoring and flow monitor performance are included in the following pages of this report:

- Table 5-3 shows the 2023 flow monitor performance by outfall and month
- Table 5-4 provides the details of all 2023 discharges by outfall and date
- Table 5-5 includes the most recent 5-year overflow frequency for each outfall and compares 2023 and baseline CSO conditions
- Table 5-6 compares 2019-2023 CSOs by outfall
- Table 5-7 compares 2019-2023 CSOs by receiving waterbody
- Table 5-8 shows which outfalls met the CSO performance standard for controlled outfalls in 2023

Exacerbated CSOs and DWOs are included in the table listing all 2023 overflows (Table 5-4).

Observations and conclusions from these tables include:

- System-wide, flow monitors were in service an average of 99.9%. With the exception of monitors at Outfalls 136 and 174, each SPU flow monitoring station was in service over 99% of the time. The monitors at Outfalls 136 and 174 were in service no less than 97.7% of the time.
- There were 166 CSOs in 2023, totaling 68.9 million gallons (MG).
- As noted in Section 3.1.5, there were also seven exacerbated CSOs.
- Approximately 27 percent of the 2023 CSO volume was discharged from Outfall 152 (Ballard), which serves the largest combined sewer area of any of the City of Seattle combined sewer basins.
- The four outfalls that will be controlled by the Ship Canal Water Quality Project (Outfalls 147, 151, 152, and 174) contributed 58 percent of the 2023 CSOs (97 of the 166 CSOs) and 43 percent of the 2023 CSO volume (29.8 of the 68.9 MG).

One outfall that was reported to be controlled in SPU's baseline report and has been uncontrolled in recent years is Outfall 139 in the Montlake Area. In July 2016, SPU increased the pumping capacity of Wastewater Pump Station 25 by approximately 20 percent to increase the rate of flow to DNRP. SPU will continue to monitor the performance of the pump station to refine the remaining control volume estimate ahead of possible partnership with DNRP on a Montlake area CSO storage project.

Table 5-8 indicates that the 2004-2023 20-year moving average number of CSOs per year at two outfalls identified as controlled in SPU's NPDES Permit exceeded the State CSO performance standard: Outfalls 59 and 68. SPU notified Ecology and EPA of the Outfall 59 noncompliance in the 2018 Annual Report, attributed to the unexpected failure of a force main serving Wastewater Pump Station (WWPS) 43. The 2018 Annual Report reported that SPU was in the process of replacing the force main using emergency contracting procedures. Prior to the force main break, Outfall 59 averaged 0.4 CSOs/year. For the period 2004-2023, Outfall 59 averaged 1.2 CSOs/year, including 11 exacerbated CSOs that occurred while WWPS 43 was bypassed in 2017-2019. Now that the WWPS 43 force main has been replaced, SPU believes that Outfall 59 is once again controlled.

SPU notified Ecology and EPA of the Outfall 68 noncompliance in the 2019 Annual Report. As noted in Table 5-8, some of the 5 CSOs that occurred in 2015-2016 and contributed to the 2001-2020 average of

1.2 CSOs/year were likely exacerbated by a partially clogged HydroBrake. SPU plans to continue monitoring this outfall to determine whether additional action is needed and, if so, the type of action.

In 2017, SPU notified Ecology and EPA that Outfall 62 no longer met the CSO performance standard and submitted a Supplemental Compliance Plan. On August 27, 2018, SPU raised the Basin 62 overflow weir to optimize use of the existing sewer system. Based on hydraulic modeling conducted in February 2021, and using modeling for the period 2001 through August 27, 2018, and flow monitoring for the remaining period, the 2004-2023 average number of CSOs is 0.6 CSOs/year and the outfall is considered controlled.

5.4 CSO Control Post-Construction Monitoring

Post-Construction Monitoring Program (PCMP) in-situ sediment sampling was completed at Outfall 44 on September 1, 2020. The sampling was performed by King County staff. Sampling was completed successfully, in accordance with the approved Quality Assurance Project Plan/Sediment Analysis Plan (QAPP/SAP). Seven sediment samples and one duplicate sample were collected in the vicinity of Outfall 44. The analytical results of these samples were included in the Outfall 44 Post Construction Monitoring Program report dated April 29, 2022. No additional Post-Construction Monitoring activities took place in 2023.

5.5 Integrated Plan Post-Construction Monitoring

The Integrated Plan, Volume 3 of the Plan to Protect Seattle Waterways, included a commitment to monitor the individual performance of the three Integrated Plan projects (NDS Partnering, South Park Water Quality Facility, and Expanded Arterial Street Sweeping) as data is available and to monitor overall performance once data is available from all three projects. Table 5-9 summarizes the Integrated Plan performance targets and the data that is available to date. As noted, overall performance is not assessed because performance data is not yet available on the South Park Water Quality Facility and NDS Partnering.

City staff completed the Expanded Arterial Street Sweeping Program post-construction monitoring sampling activities on December 20, 2018. A final report on the Street Sweeping Program post-construction monitoring was submitted with the 2018 Annual Report. As described in Section 4.7 and Section 4.8.2, the South Park Water Quality Facility and many of the NDS Partnering projects have not been constructed, so no post-construction monitoring was conducted during 2023.

Table 5-1. 2023 Precipitation by Gauge and by Month (inches)												
Rain Gauge	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
RG01	4.49	2.89	3.25	3.35	0.88	0.91	0.11	0.40	3.48	2.55	4.60	8.50
RG02	4.46	2.49	3.16	3.28	0.88	1.33	0.16	0.51	3.81	2.91	5.15	9.51
RG03	4.46	2.48	3.55	3.49	0.90	1.21	0.12	0.45	3.59	2.57	4.49	8.70
RG04	4.54	2.76	3.12	3.35	0.99	0.90	0.08	0.28	3.96	2.71	5.19	9.11
RG05	3.63	2.04	2.31	3.35	0.72	1.22	0.06	0.25	3.55	2.81	4.51	8.10
RG07	4.59	2.56	3.00	3.05	0.78	0.79	0.10	0.40	3.35	2.51	4.63	8.06
RG08	4.76	2.43	3.21	3.21	0.87	0.90	0.08	0.31	3.81	2.20	4.96	8.91
RG09	4.63	2.81	3.41	3.60	0.97	1.16	0.09	0.32	4.14	2.73	5.14	9.68
RG11	3.89	2.10	2.87	3.17	0.67	0.96	0.06	0.28	3.68	2.25	4.28	8.21
RG12	3.81	2.17	2.75	2.76	0.73	0.99	0.06	0.23	3.65	2.04	4.92	8.04
RG14	4.38	2.51	2.76	3.83	0.91	1.39	0.06	0.42	4.09	2.71	4.83	9.30
RG15	3.42	2.16	2.38	3.35	0.59	0.97	0.07	0.46	3.36	2.55	4.31	7.87
RG16	3.73	2.27	2.68	3.86	0.72	1.27	0.10	0.56	3.64	3.18	4.91	8.05
RG17	3.89	2.53	2.67	3.89	0.80	1.33	0.09	0.32	3.72	2.99	4.88	8.17
RG18	4.62	2.78	2.42	3.59	0.87	1.15	0.12	0.48	3.50	3.04	4.81	8.16
RG25	4.01	2.96	2.89	3.61	0.82	1.40	0.08	0.46	3.52	2.49	4.17	8.14
RG30	4.22	2.90	2.87	4.01	0.85	1.40	0.13	0.72	4.23	3.38	5.56	8.86
RG32	4.14	2.94	2.67	3.73	0.69	1.20	0.12	0.56	3.48	2.82	4.61	8.42
RG33	4.64	2.57	3.13	3.30	0.95	0.96	0.15	0.54	3.83	2.80	4.90	9.06
RG34	4.65	2.76	3.08	3.02	0.86	0.83	0.11	0.28	3.91	2.85	5.08	9.04
RG35	4.22	3.00	3.44	3.53	0.96	1.58	0.07	0.44	4.03	2.81	4.44	9.38
RG36	3.98	2.59	2.71	3.90	0.86	1.45	0.07	0.27	3.94	2.91	4.96	8.63
Monthly Average	**4.23**	**2.58**	**2.92**	**3.46**	**0.83**	**1.15**	**0.09**	**0.41**	**3.74**	**2.72**	**4.79**	**8.63**

Table 5-2. 2019-2023 Average Precipitation by Month (inches)					
Month/Year	**2019**	**2020**	**2021**	**2022**	**2023**
January	3.28	8.40	8.51	7.21	4.23
February	4.16	4.11	3.87	3.98	2.58
March	1.50	3.38	3.13	2.97	2.92
April	2.57	1.69	0.84	2.93	3.46
May	1.11	3.28	1.04	3.73	0.83
June	0.69	1.82	2.03	2.75	1.15
July	1.31	0.15	0.02	0.27	0.09
August	1.18	0.42	0.20	0.12	0.41
September	3.01	2.94	2.99	0.10	3.74
October	2.70	2.89	4.71	2.54	2.72
November	1.72	5.43	8.44	6.10	4.79
December	7.21	6.28	5.19	8.29	8.63
Annual Total	**30.43**	**40.79**	**40.96**	**40.98**	**35.56**

Table 5-3. 2023 Flow Monitor Performance by Outfall and Month

Outfall Number	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2023 Cumulative	
	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)
12	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
13	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
14	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
15	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
16	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
18	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.0	99.9	9.1	98.8	10.1	99.9
19	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
20	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
22	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
24	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
25	19.6	97.4	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	19.6	99.8
27	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
28	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
29	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
30	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
31	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
32	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	42.6	94.3	0.0	100.0	0.0	100.0	42.6	99.5
33	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	N/A	0.0	NA	0.0	N/A
34	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
35	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
36	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0

Outfall Number	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2023 Cumulative	
	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)
38	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
40	0.0	100.0	1.5	99.8	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.5	100.0
41	0.0	100.0	1.5	99.8	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.5	100.0
42	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
43	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
44	1.4	99.8	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.4	100.0
45	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
46	70.6	90.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	70.6	99.2
47	1.4	99.8	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.4	100.0
48	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
49	0.0	100.0	2.0	99.7	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	3.8	99.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	5.8	99.9
57	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
59	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
60	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
61	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
62	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
64	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
68	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
69	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	54.8	92.6	54.8	99.4
70	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	N/A	0.0	NA	0.0	N/A
71	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
72	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	NA	0.0	N/A	0.0	NA	0.0	N/A
78	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0

Outfall Number	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2023 Cumulative	
	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)
80	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
83	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
85	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
88	0.0	100.0	0.0	100.0	18.2	97.6	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	18.2	99.8
90	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
91	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
94	0.0	100.0	0.0	100.0	12.6	98.3	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	12.6	99.9
95	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
99	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
107	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
111	1.9	99.7	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	12.2	98.4	14.1	99.8
120	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	80.8	89.1	80.8	99.1
121	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
124	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
127	22.3	97.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	22.3	99.8
129	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
130	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
131	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
132	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
134	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
135	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
136	143.7	80.7	58.2	92.2	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	201.9	97.7
138	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0

Outfall Number	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2023 Cumulative	
	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)	Downtime (hrs)	Uptime (%)
139	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
140	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	4.2	99.4	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	4.2	100.0
141	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	30.3	95.8	35.8	95.2	0.0	100.0	0.0	100.0	66.1	99.2
144	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
145	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
146	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
147	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	87.6	87.8	0.0	100.0	87.6	99.0
148	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
150/151	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
152	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
161	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	22.9	96.9	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	22.9	99.7
165	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
168	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	18.4	97.5	18.4	99.8
169	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
170	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
171	0.0	100.0	0.0	100.0	0.0	100.0	30.5	95.8	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	30.5	99.6
174	107.7	85.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	107.7	98.8
175	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
TOTAL:	**368.6**	**99.4**	**63.1**	**99.9**	**30.8**	**99.9**	**30.5**	**99.9**	**0.0**	**100.0**	**4.2**	**100.0**	**22.9**	**100.0**	**3.8**	**100.0**	**30.3**	**99.9**	**78.4**	**99.9**	**88.6**	**99.8**	**175.3**	**99.7**	**896.5**	**99.9**

Notes:

1. Downtime refers to the number of hours that the CSO monitor was out of service, and therefore, no overflow data is available.
2. Uptime refers to the percentage of time during the month that the CSO monitor was in service and therefore, overflow data is available.

Table 5-4. 2023 CSO Details by Outfall and Date								
Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	12	City of Seattle	Lake Washington	11/04/23	4,442	0.43	13.83	1.19
				12/04/23	88,525	13.40	147.35	4.46
				Total	92,967	13.83	161.18	5.65
				Average	46,484	6.92	80.59	2.83
WA0031682	13	City of Seattle	Lake Washington	11/04/23	278,328	1.62	14.90	1.19
				12/05/23	6,523,563	25.75	160.10	5.05
				12/07/23[1]	651,036[1]	11.35[1]	196.72	6.08
				Total	7,452,928	38.72	371.72	12.32
				Average	2,484,309	12.91	123.91	4.11
WA0031682	14	City of Seattle	Lake Washington	11/04/23	1,777	0.17	14.27	1.17
				Total	1,777	0.17	14.27	1.17
				Average	1,777	0.17	14.27	1.17
WA0031682	15	City of Seattle	Lake Washington	11/04/23	4,502	0.42	14.60	1.17
				12/04/23	280,305	22.00	124.77	4.51
				Total	284,807	22.42	139.37	5.68
				Average	142,404	11.21	69.68	2.84
WA0031682	16	City of Seattle	Union Bay	11/04/23	605	0.23	14.43	1.17
				Total	605	0.23	14.43	1.17
				Average	605	0.23	14.43	1.17

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	18	City of Seattle	Union Bay	12/05/23	4,224,779	20.42	125.75	4.56
				Total	4,224,779	20.42	125.75	4.56
				Average	4,224,779	20.42	125.75	4.56
WA0031682	19	City of Seattle	Union Bay	*No combined sewer overflows during 2023*				
WA0031682	20	City of Seattle	Union Bay	*No combined sewer overflows during 2023*				
WA0031682	22	City of Seattle	Union Bay	*No combined sewer overflows during 2023*				
WA0031682	24	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				
WA0031682	25	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				
WA0031682	27	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				
WA0031682	28	City of Seattle	Lake Washington	09/25/23	1,167	0.43	55.17	1.47
				10/10/23	272	0.03	29.33	0.48
				11/04/23	17,070	0.27	14.27	0.98
				12/04/23	14,975	10.33	113.70	3.50
				Total	33,484	11.06	212.47	6.43
				Average	8,371	2.77	53.12	1.61

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	29	City of Seattle	Lake Washington	11/04/23	3,312	0.20	14.27	0.98
				12/04/23	260,132	22.27	125.30	4.30
				Total	263,444	22.47	139.57	5.28
				Average	131,722	11.24	69.78	2.64
WA0031682	30	City of Seattle	Lake Washington	12/04/23	95,416	17.75	121.35	4.11
				Total	95,416	17.75	121.35	4.11
				Average	95,416	17.75	121.35	4.11
WA0031682	31	City of Seattle	Lake Washington	11/04/23	51,082	1.50	14.27	0.98
				12/04/23	1,096,303	24.33	127.02	4.32
				Total	1,147,385	25.83	141.28	5.30
				Average	573,693	12.92	70.64	2.65
WA0031682	32	City of Seattle	Lake Washington	11/04/23	13,940	0.80	14.27	0.98
				12/04/23	523,641	18.27	122.00	4.11
				Total	537,581	19.07	136.27	5.09
				Average	268,791	9.54	68.13	2.55
WA0031682	33	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				
WA0031682	34	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	35	City of Seattle	Lake Washington	11/04/23	4,787	0.23	14.27	0.98
				Total	4,787	0.23	14.27	0.98
				Average	4,787	0.23	14.27	0.98
WA0031682	36	City of Seattle	Lake Washington	11/04/23	586	0.08	14.27	0.98
				Total	586	0.08	14.27	0.98
				Average	586	0.08	14.27	0.98
WA0031682	38	City of Seattle	Lake Washington	12/05/23	616,118	20.87	125.47	4.68
				Total	616,118	20.87	125.47	4.68
				Average	616,118	20.87	125.47	4.68
WA0031682	40	City of Seattle	Lake Washington	12/05/23	983,920	26.03	132.12	4.85
				Total	983,920	26.03	132.12	4.85
				Average	983,920	26.03	132.12	4.85
WA0031682	41	City of Seattle	Lake Washington	12/05/23	983,920	26.03	132.12	4.85
				Total	983,920	26.03	132.12	4.85
				Average	983,920	26.03	132.12	4.85
WA0031682	42	City of Seattle	Lake Washington	12/05/23	294,165	17.33	121.40	4.44
				Total	294,165	17.33	121.40	4.44
				Average	294,165	17.33	121.40	4.44

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	43	City of Seattle	Lake Washington	11/04/23[1]	57,521[1]	10.08[1]	21.77	1.23
				12/05/23	379,087	25.67	138.63	4.87
				Total	436,608	35.75	160.40	6.10
				Average	218,304	17.88	80.20	3.05
WA0031682	44	City of Seattle	Lake Washington	11/04/23[1]	3,651[1]	0.22[1]	14.83	1.24
				12/05/23	3,907,634	61.13	174.60	5.46
				Total	3,911,285	61.35	189.43	6.70
				Average	1,955,643	30.68	94.72	3.35
WA0031682	45	City of Seattle	Lake Washington	11/04/23[1]	15,137[1]	0.28[1]	14.97	1.24
				Total	15,137	0.28	14.97	1.24
				Average	15,137	0.28	14.97	1.24
WA0031682	46	City of Seattle	Lake Washington	09/20/23[1]	57,186[1]	1.80[1]	6.45	0.41
				Total	57,186	1.80	6.45	0.41
				Average	57,186	1.80	6.45	0.41
WA0031682	47	City of Seattle	Lake Washington	11/04/23	180,697	3.52	15.65	1.47
				12/04/23	1,495,691	29.20	69.58	3.98
				Total	1,676,388	32.72	85.23	5.45
				Average	838,194	16.36	42.62	2.73
WA0031682	48	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	49	City of Seattle	Lake Washington	11/04/23	195,489	1.73	16.28	1.47
				12/04/23	3,978,503	31.50	73.05	4.02
				Total	4,173,992	33.23	89.33	5.49
				Average	2,086,996	16.62	44.67	2.75
WA0031682	57	City of Seattle	Puget Sound - Central	*No combined sewer overflows during 2023*				
WA0031682	59	City of Seattle	Salmon Bay	11/04/23	6,462	0.08	14.60	1.18
				12/05/23	4,251	0.22	108.53	3.13
				Total	10,713	0.30	123.13	4.31
				Average	5,356	0.15	61.57	2.16
WA0031682	60	City of Seattle	Salmon Bay	*No combined sewer overflows during 2023*				
WA0031682	61	City of Seattle	Elliott Bay	11/04/23	13,278	0.27	14.37	1.38
				12/05/23	38,020	0.63	117.93	3.64
				Total	51,298	0.90	132.30	5.02
				Average	25,649	0.45	66.15	2.51
WA0031682	62	City of Seattle	Elliott Bay	11/04/23	5,126	0.17	14.27	1.37
				Total	5,126	0.17	14.27	1.37
				Average	5,126	0.17	14.27	1.37

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	64	City of Seattle	Elliott Bay	*No combined sewer overflows during 2023*				
WA0031682	68	City of Seattle	Elliott Bay	11/04/23	933	0.23	14.30	1.37
				12/04/23	278,823	11.67	120.53	3.94
				Total	279,756	11.90	134.83	5.31
				Average	139,878	5.95	67.42	2.66
WA0031682	69	City of Seattle	Elliott Bay	09/25/23	695	0.07	53.13	1.28
				11/04/23	54,767	0.33	14.62	1.23
				Total	55,462	0.40	67.75	2.51
				Average	27,731	0.20	33.87	1.26
WA0031682	70	City of Seattle	Elliott Bay	*No combined sewer overflows during 2023*				
WA0031682	71	City of Seattle	Elliott Bay	*No combined sewer overflows during 2023*				
WA0031682	72	City of Seattle	Elliott Bay	*No combined sewer overflows during 2023*				
WA0031682	78	City of Seattle	Elliott Bay	*No combined sewer overflows during 2023*				
WA0031682	80	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				
WA0031682	83	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	85	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				
WA0031682	88	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				
WA0031682	90	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				
WA0031682	91	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				
WA0031682	94	City of Seattle	Puget Sound	*No combined sewer overflows during 2023*				
WA0031682	95	City of Seattle	Puget Sound	10/10/23	1,737	0.15	31.95	0.74
				11/04/23	1,716	0.13	14.73	1.28
				Total	3,453	0.28	46.68	2.02
				Average	1,726	0.14	23.34	1.01
WA0031682	99	City of Seattle	West Waterway - Duwamish	12/05/23	801,303	16.05	122.43	4.79
				Total	801,303	16.05	122.43	4.79
				Average	801,303	16.05	122.43	4.79
WA0031682	107	City of Seattle	East Waterway - Duwamish	11/04/23	93	0.03	14.43	1.13
				12/04/23	104,161	14.90	55.65	2.82
				Total	104,254	14.93	70.08	3.95
				Average	52,127	7.47	35.04	1.98

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	111	City of Seattle	Duwamish River	12/05/23	138,803	15.17	59.75	3.13
				Total	138,803	15.17	59.75	3.13
				Average	138,803	15.17	59.75	3.13
WA0031682	120	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	121	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	124	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	127	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	129	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	130	City of Seattle	Lake Union	11/04/23	9,400	0.07	14.20	1.17
				Total	9,400	0.07	14.20	1.17
				Average	9,400	0.07	14.20	1.17
WA0031682	131	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	132	City of Seattle	Lake Union	11/04/23	45,368	0.20	14.27	1.17
				Total	45,368	0.20	14.27	1.17
				Average	45,368	0.20	14.27	1.17

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	134	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	135	City of Seattle	Lake Union	11/04/23	330	0.23	14.23	1.17
				12/04/23	49,164	12.67	116.08	4.06
				Total	49,494	12.90	130.32	5.23
				Average	24,747	6.45	65.16	2.62
WA0031682	136	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	138	City of Seattle	Portage Bay	11/04/23[1]	21,261[1]	0.60[1]	15.07	1.18
				12/04/23[1]	126,005[1]	7.00[1]	111.13	3.62
				Total	147,266	7.60	126.20	4.80
				Average	73,633	3.80	63.10	2.40
WA0031682	139	City of Seattle	Portage Bay	11/04/23	4,633	0.08	14.10	1.16
				Total	4,633	0.08	14.10	1.16
				Average	4,633	0.08	14.10	1.16
WA0031682	140	City of Seattle	Portage Bay	09/25/23	919	0.08	26.57	1.19
				11/04/23	6,635	0.25	14.18	1.17
				12/04/23	554,055	17.17	121.08	4.38
				Total	561,609	17.50	161.83	6.74
				Average	187,203	5.83	53.94	2.25

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	141	City of Seattle	Portage Bay	*No combined sewer overflows during 2023*				
WA0031682	144	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	145	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	146	City of Seattle	Lake Union	*No combined sewer overflows during 2023*				
WA0031682	147	City of Seattle	Lake Union	01/08/23	15,627	1.67	64.70	0.89
				01/09/23	377,747	9.42	99.37	1.74
				01/12/23	13,726	1.17	33.18	0.71
				01/15/23	17,269	0.42	106.52	1.43
				01/18/23	35,214	8.92	38.92	0.40
				01/21/23	29,697	0.42	5.08	0.27
				02/13/23	4,172	0.42	1.67	0.12
				02/21/23	18,490	1.42	7.04	0.26
				03/05/23	12,485	1.42	2.30	0.30
				03/12/23	127,743	12.67	17.63	0.87
				03/24/23	84,222	5.00	14.65	0.54
				04/02/23	4,678	0.42	53.97	0.57
				06/10/23	14,091	0.25	20.20	0.35
				06/19/23	8,137	0.25	12.55	0.15
				09/24/23	458,136	87.25	94.02	3.37
				10/10/23	116,021	18.08	40.48	0.93

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				10/16/23	56,737	2.33	62.90	0.52
				11/02/23	212,650	7.17	14.97	1.14
				11/03/23	89,882	10.50	12.12	0.89
				11/06/23	113,273	2.67	23.78	0.91
				11/21/23	134	0.17	4.32	0.31
				12/02/23	7,018	2.17	43.87	0.86
				12/03/23	3,130,840	56.25	135.70	5.53
				12/07/23	129,743	11.58	174.12	6.36
				12/09/23	40,648	2.42	4.35	0.40
				12/22/23	336,950	6.82	10.20	0.89
				12/25/23	69,620	12.25	28.70	0.86
				12/28/23	3,246	0.25	78.28	1.18
				Total	5,528,196	263.78	1,205.57	32.75
				Average	197,436	9.42	43.06	1.17
WA0031682	148	City of Seattle	Lake Washington – Ship Canal	*No combined sewer overflows during 2023*				
WA0031682	150/151	City of Seattle	Salmon Bay	01/09/23	93,119	7.58	123.27	1.71
				02/21/23	104	0.58	155.75	0.50
				03/24/23	26,746	0.50	0.73	0.20
				08/29/23	311	0.08	14.63	0.19
				09/24/23	145,338	69.33	77.40	2.88
				10/10/23	55,307	11.27	39.80	0.68
				10/16/23	9,818	0.42	18.20	0.31

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				11/02/23	69	2.92	10.78	0.71
				11/03/23	59,597	16.57	15.60	1.43
				11/06/23	5,797	4.53	23.07	0.69
				12/04/23	1,354,391	15.33	122.57	4.47
				12/07/23	34,928	6.93	169.75	5.68
				12/22/23	29,051	0.80	5.12	0.46
				12/25/23	50	11.58	14.18	0.74
				Total	1,814,626	148.42	790.85	20.65
				Average	129,616	10.60	56.49	1.48
WA0031682	152	City of Seattle	Salmon Bay	01/06/23	126,961	44.02	90.87	0.95
				01/09/23	551,866	10.85	126.05	1.87
				01/11/23	320,972	46.50	67.47	1.28
				01/15/23	220,649	3.68	110.65	1.67
				01/18/23	27,199	1.62	34.40	0.35
				01/21/23	91,089	5.58	10.13	0.35
				01/27/23	670	0.25	3.55	0.13
				02/03/23	1,327	0.23	10.38	0.14
				02/05/23	511	0.20	138.46	0.44
				02/07/23	1,202	0.30	21.88	0.21
				02/13/23	10,328	0.30	1.75	0.08
				02/21/23	214,890	1.60	157.67	0.56
				02/28/23	118	0.08	27.88	0.20
				03/02/23	28	0.83	3.08	0.18

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				03/04/23	28,258	10.28	20.55	0.57
				03/05/23	71,785	1.52	55.12	0.80
				03/10/23	7,991	1.90	2.40	0.23
				03/12/23	491,605	13.53	17.78	0.86
				03/24/23	179,366	5.90	6.10	0.50
				03/31/23	54,013	1.45	5.63	0.26
				04/06/23	118	1.00	12.47	0.40
				04/09/23	4,762	10.32	30.07	0.44
				04/10/23	19,779	2.87	58.70	0.96
				04/16/23	37,571	0.60	7.02	0.14
				04/17/23	2,315	4.80	41.55	0.41
				04/20/23	1,264	2.67	4.80	0.27
				04/22/23	3,981	0.45	5.32	0.18
				05/05/23	21,015	0.75	11.35	0.45
				06/10/23	20,706	0.40	19.32	0.27
				06/19/23	629	0.28	28.07	0.25
				08/29/23	103,714	0.73	15.03	0.20
				09/19/23	57,093	6.02	8.42	0.61
				09/24/23	1,331,653	89.10	94.67	3.08
				10/10/23	373,088	11.63	40.07	0.69
				10/16/23	542,756	2.65	20.10	0.43
				10/24/23	49,258	11.58	14.42	0.55
				11/02/23	661,731	8.47	15.60	1.17
				11/03/23	1,995,978	14.25	15.82	1.43

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				11/05/23	457,307	23.60	24.27	0.79
				11/11/23	25,935	2.25	5.72	0.32
				11/12/23	6,814	1.92	6.82	0.25
				11/18/23	1,391	0.88	16.83	0.19
				11/21/23	68,072	2.33	4.55	0.27
				12/01/23	448,096	26.72	48.45	1.09
				12/04/23	8,438,154	77.42	174.48	5.79
				12/09/23	389,473	14.38	19.60	0.68
				12/18/23	2,273	20.67	26.17	0.30
				12/22/23	765,918	7.72	10.45	0.79
				12/25/23	485,925	13.10	15.20	0.79
				12/28/23	8,214	0.47	64.40	1.04
				Total	18,725,811	510.65	1,771.48	35.86
				Average	374,516	10.21	35.43	0.72
WA0031682	161	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				
WA0031682	165	City of Seattle	Lake Washington	11/04/23	2,454	0.25	14.80	1.24
				12/05/23	3,287	0.75	104.80	2.78
				Total	5,741	1.00	119.60	4.02
				Average	2,871	0.50	59.80	2.01

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	168	City of Seattle	Longfellow Creek	12/05/23	2,760,242	30.27	141.32	5.00
				Total	2,760,242	30.27	141.32	5.00
				Average	2,760,242	30.27	141.32	5.00
WA0031682	169	City of Seattle	Longfellow Creek	12/05/23	3,439,765	26.10	133.33	4.98
				Total	3,439,765	26.10	133.33	4.98
				Average	3,439,765	26.10	133.33	4.98
WA0031682	170	City of Seattle	Lake Washington	*No combined sewer overflows during 2023*				
WA0031682	171	City of Seattle	Lake Washington	11/04/23	366,370	3.58	15.72	1.47
				12/04/23	2,856,750	29.25	69.63	3.99
				Total	3,223,120	32.83	85.35	5.46
				Average	1,611,560	16.42	42.68	2.73
WA0031682	174	City of Seattle	Lake Washington Canal	01/09/23	11,430	9.00	98.78	1.72
				09/27/23	3,939	0.58	66.68	2.92
				11/04/23	78,954	1.58	15.70	1.33
				12/04/23	3,641,189	26.75	135.28	5.53
				12/22/23	29,648	1.75	8.22	0.75
				Total	3,765,160	39.66	324.67	12.25
				Average	753,032	7.93	64.93	2.45

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	175	City of Seattle	Lake Union	11/04/23	62,003	0.37	14.33	1.17
				Total	62,003	0.37	14.33	1.17
				Average	62,003	0.37	14.33	1.17

Notes:
1. Exacerbated CSO

Table 5-5. Comparison of 2023 and Baseline CSOs by Outfall								
Outfall Number	2019 - 2023 Average CSO Frequency (No./year)	2023 CSO Discharge Events			Receiving Water	2010 Baseline CSO		2023 CSOs Compared to 2010 Baseline CSOs
		Frequency (No./year)	Duration (hours)	Volume (MG)		Frequency (No./year)	Volume (MG/year)	
12	1.6	2	13.83	0.1	Lake Washington	0	0	Above
13	4.0	3	38.72	7.5	Lake Washington	12	6.7	Frequency Below, Volume Above
14	0.4	1	0.17	0.002	Lake Washington	0	0	Above
15	2.0	2	22.42	0.3	Lake Washington	1.2	0.3	Frequency Above, Volume Below
16	0.6	1	0.23	0.001	Lake Washington	0	0	Above
18	1.8	1	20.42	4.2	Union Bay	6.6	0.5	Frequency Below, Volume Above
19	0.2	0	0.00	0	Union Bay	0.2	0	Frequency Below, Volume Equals
20	1.4	0	0.00	0	Union Bay	2.6	0.1	Below
22	0.2	0	0.00	0	Union Bay	0.7	0.1	Below
24	0.8	0	0.00	0	Lake Washington	0.2	0	Frequency Below, Volume Equals
25	0.8	0	0.00	0	Lake Washington	2.8	1.6	Below
27	0.0	0	0.00	0	Lake Washington	0	0	Equals
28	5.0	4	11.06	0.03	Lake Washington	15	0.4	Below
29	2.4	2	22.47	0.3	Lake Washington	4.7	0.3	Below
30	2.0	1	17.75	0.1	Lake Washington	5.4	0.7	Below
31	3.4	2	25.83	1.1	Lake Washington	9.3	0.5	Frequency Below, Volume Above
32	2.2	2	19.07	0.5	Lake Washington	8.4	0.3	Frequency Below, Volume Above
33	0.0	0	0.00	0	Lake Washington	NA	NA	Removed from service 2016
34	0.8	0	0.00	0	Lake Washington	1.4	0.5	Below
35	0.4	1	0.23	0.005	Lake Washington	2	0.3	Below
36	0.2	1	0.08	0.001	Lake Washington	2.7	0.1	Below
38	1.8	1	20.87	0.6	Lake Washington	0.7	0.4	Above
40	1.8	1	26.03	1.0	Lake Washington	6	0.8	Frequency Below, Volume Above
41	1.8	1	26.03	1.0	Lake Washington	7.5	0.9	Frequency Below, Volume Above
42	1.8	1	17.33	0.3	Lake Washington	0.6	0.02	Above
43	3.0	2	35.75	0.4	Lake Washington	7	0.7	Below
44	2.0	2	61.35	3.9	Lake Washington	13	9.3	Below
45	1.4	1	0.28	0.02	Lake Washington	5.9	1.1	Below
46	0.6	1	1.80	0.1	Lake Washington	6.5	0.9	Below

Outfall Number	2019 - 2023 Average CSO Frequency (No./year)	2023 CSO Discharge Events			Receiving Water	2010 Baseline CSO		2023 CSOs Compared to 2010 Baseline CSOs
		Frequency (No./year)	Duration (hours)	Volume (MG)		Frequency (No./year)	Volume (MG/year)	
47	4.0	2	32.72	1.7	Lake Washington	5.6	1.8	Below
48	0.0	0	0.00	0	Lake Washington	0	0	Equals
49	4.2	2	33.23	4.2	Lake Washington	1.6	0.8	Above
57	0.2	0	0.00	0	Puget Sound	0	0	Equals
59	1.2	2	0.30	0.01	Salmon Bay	0.2	0.4	Frequency Above, Volume Below
60	0.6	0	0.00	0	Salmon Bay	1.7	0.8	Below
61	1.8	2	0.90	0.1	Elliott Bay	0	0	Above
62	0.8	1	0.17	0.01	Elliott Bay	0.7	0	Above
64	0.0	0	0.00	0	Elliott Bay	0.1	0	Frequency Below, Volume Equals
68	1.8	2	11.90	0.3	Elliott Bay	1.4	1.3	Frequency Above, Volume Below
69	2.0	2	0.40	0.1	Elliott Bay	4.4	1.4	Below
70	0.0	0	0.00	0	Elliott Bay	0.9	0.2	Removed from service 2020
71	0.6	0	0.00	0	Elliott Bay	4.3	1.3	Below
72	0.0	0	0.00	0	Elliott Bay	1.2	0.3	Removed from service 2020
78	0.0	0	0.00	0	Elliott Bay	0.3	0.2	Below
80	0.0	0	0.00	0	Elliott Bay	0	0	Equals
83	0.0	0	0.00	0	Puget Sound	0	0	Equals
85	0.0	0	0.00	0	Puget Sound	0	0	Equals
88	0.4	0	0.00	0	Puget Sound	0.3	0.2	Below
90	0.0	0	0.00	0	Puget Sound	0.2	0	Frequency Below, Volume Equals
91	0.4	0	0.00	0	Puget Sound	0	0	Equals
94	0.0	0	0.00	0	Puget Sound	0.1	0	Frequency Below, Volume Equals
95	2.4	2	0.28	0.003	Puget Sound	3	0.4	Below
99	1.4	1	16.05	0.8	W Waterway - Duwamish River	0.5	2.8	Frequency Above, Volume Below
107	2.8	2	14.93	0.1	E Waterway - Duwamish River	3.8	1.9	Below
111	1.8	1	15.17	0.1	Duwamish River	3	7.9	Below
120	0.0	0	0.00	0	Lake Union	0	0	Equals
121	0.2	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
124	0.0	0	0.00	0	Lake Union	0	0	Equals

Outfall Number	2019 - 2023 Average CSO Frequency (No./year)	2023 CSO Discharge Events			Receiving Water	2010 Baseline CSO		2023 CSOs Compared to 2010 Baseline CSOs
		Frequency (No./year)	Duration (hours)	Volume (MG)		Frequency (No./year)	Volume (MG/year)	
127	0.0	0	0.00	0	Lake Union	0.7	0.1	Below
129	0.0	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
130	0.6	1	0.07	0.01	Lake Union	0	0	Above
131	0.0	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
132	1.2	1	0.20	0.05	Lake Union	0.7	0	Above
134	0.0	0	0.00	0	Lake Union	0	0	Equals
135	1.4	2	12.90	0.05	Lake Union	0.3	0	Above
136	0.0	0	0.00	0	Lake Union	0	0	Equals
138	2.2	2	7.60	0.1	Portage Bay	2.3	2	Below
139	2.8	1	0.08	0.005	Portage Bay	0.7	1.4	Frequency Above, Volume Below
140	3.8	3	17.50	0.6	Portage Bay	4.1	0.3	Frequency Below, Volume Above
141	0.0	0	0.00	0	Portage Bay	0.1	0	Frequency Below, Volume Equals
144	0.0	0	0.00	0	Lake Union	0.1	0.2	Below
145	0.0	0	0.00	0	Lake Union	0	0	Equals
146	0.0	0	0.00	0	Lake Union	0	0	Equals
147	38.2	28	263.78	5.5	Lake Union	33	19	Below
148	0.6	0	0.00	0	Lake Washington Ship Canal	0	0	Equals
150/151	22.0	14	148.42	1.8	Salmon Bay	15	2	Below
152	43.4	50	510.65	18.7	Salmon Bay	15	9.7	Above
161	0.0	0	0.00	0	Lake Washington	0	0	Equals
165	1.4	2	1.00	0.01	Lake Washington	1.1	0.02	Frequency Above, Volume Below
168	1.8	1	30.27	2.8	Longfellow Creek	3.9	1.6	Frequency Below, Volume Above
169	2.0	1	26.10	3.4	Longfellow Creek	2.2	49	Below
170	0.4	0	0.00	0	Longfellow Creek	0.4	0.1	Below
171	4.0	2	32.83	3.2	Lake Washington	4.1	0.75	Frequency Below, Volume Above
174	6.2	5	39.66	3.8	Lake Washington Ship Canal	11	5.9	Below
175	0.6	1	0.37	0.1	Lake Union	0.7	0	Above
Total	**203.6**	**166**	**1599**	**69**		**251**	**140**	**Below**

Table 5-6. 2019-2023 Summary Comparison of CSOs by Outfall

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	
12	1	3	0	2	2	8.70	5.57	0.00	3.37	13.83	164,728	73,378	0	9,543	92967	Lake Washington
13	2	5	4	6	3	30.87	36.11	25.35	86.98	38.72	10,525,382	7,707,124	4,068,045	7,979,211	7,452,928	Lake Washington
14	0	1	0	0	1	0.00	1.00	0.00	0.00	0.17	0	5,005	0	0	1,777	Lake Washington
15	1	1	2	4	2	20.17	3.73	24.37	12.83	22.42	162,483	372,636	47,778	284,941	284,807	Lake Washington
16	1	1	0	0	1	0.18	0.33	0.00	0.00	0.23	1,269	575	0	0	605	Lake Washington
18	1	2	2	3	1	26.10	25.75	4.08	20.83	20.42	3,225,836	2,421,116	986,572	3,397,459	4,224,779	Union Bay
19	0	1	0	0	0	0.00	0.16	0.00	0.00	0.00	0	215	0	0	0	Union Bay
20	1	3	1	2	0	39.00	30.56	1.33	4.50	0.00	1,595,375	834,150	27,907	142,943	0	Union Bay
22	0	1	0	0	0	0.00	0.95	0.00	0.00	0.00	0	461	0	0	0	Union Bay
24	1	1	0	2	0	2.13	2.33	0.00	13.00	0.00	41,198	540,526	0	100,808	0	Lake Washington
25	1	1	0	2	0	2.33	2.30	0.00	12.86	0.00	116,115	812,813	0	105,746	0	Lake Washington
27	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Washington
28	5	4	7	5	4	14.02	2.52	9.15	5.16	11.06	21,771	55,823	214,831	34,487	33,484	Lake Washington
29	2	2	2	4	2	7.72	3.70	26.86	25.70	22.47	157,589	105,678	199,900	291,733	263,444	Lake Washington
30	1	3	2	3	1	7.30	4.51	26.73	23.00	17.75	39,810	89,469	69,534	83,495	95,416	Lake Washington
31	1	6	3	5	2	28.67	42.16	47.67	56.83	25.83	547,576	864,078	918,527	2,277,912	1,147,385	Lake Washington
32	1	3	2	3	2	11.23	12.63	29.50	32.27	19.07	232,294	279,919	191,926	286,718	537,581	Lake Washington
33	NA	NA	NA	NA	0	NA	NA	NA	NA	0.00	NA	N/A	N/A	N/A	0	Lake Washington
34	1	1	1	1	0	3.23	2.75	1.25	1.00	0.00	27,359	139,256	15,606	4,552	0	Lake Washington
35	0	1	0	0	1	0.00	0.27	0.00	0.00	0.23	0	2,972	0	0	4,787	Lake Washington
36	0	0	0	0	1	0.00	0.00	0.00	0.00	0.08	0	0	0	0	586	Lake Washington
38	1	1	2	4	1	9.60	3.75	5.48	34.80	20.87	409,725	355,975	256,102	1,008,881	616,118	Lake Washington
40	1	2	2	3	1	38.23	52.97	48.05	53.52	26.03	915,369	327,145	684,204	1,838,620	983,920	Lake Washington
41	1	2	2	3	1	38.23	52.97	48.05	53.52	26.03	915,369	327,145	684,204	1,838,620	983,920	Lake Washington
42	1	1	3	3	1	14.00	7.40	33.61	32.50	17.33	258,181	176,049	335,339	347,470	294,165	Lake Washington
43	3	4	3	3	2	67.42	81.42	96.92	79.00	35.75	1,217,192	785,242	1,018,332	1,475,969	436,608	Lake Washington
44	1	1	3	3	2	57.67	0.40	90.12	81.23	61.35	5,435,510	3,068	5,115,155	8,944,053	3,911,285	Lake Washington

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	
45	1	1	2	2	1	9.70	2.43	22.63	2.07	0.28	52,700	113,592	68,754	55,260	15,137	Lake Washington
46	0	2	0	0	1	0.00	13.15	0.00	0.00	1.80	0	220,085	0	0	57,186	Lake Washington
47	3	2	5	8	2	19.42	8.56	54.61	82.83	32.72	2,477,342	1,144,837	1,532,159	3,140,221	1,676,388	Lake Washington
48	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Washington
49	2	4	6	7	2	40.70	27.19	60.43	107.39	33.23	6,930,074	2,877,370	5,315,419	8,514,038	4,173,992	Lake Washington
57	0	0	0	1	0	0.00	0.00	0.00	2.03	0.00	0	0	0	307,223	0	Puget Sound
59	1	1	0	2	2	0.75	0.92	0.00	2.07	0.30	195,533	119,284	0	40,806	10,713	Salmon Bay
60	2	0	0	1	0	3.37	0.00	0.00	0.07	0.00	25,117	0	0	15	0	Salmon Bay
61	1	2	1	3	2	0.67	1.21	0.17	3.54	0.90	37,629	71,812	2,113	36,680	51,298	Elliott Bay
62	0	2	0	1	1	0.00	0.50	0.00	0.07	0.17	0	8,674	0	133	5,126	Elliott Bay
64	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Elliott Bay
68	2	2	1	2	2	26.94	8.51	1.43	5.85	11.90	983,018	660,538	24,184	477,574	279,756	Elliott Bay
69	1	2	1	4	2	13.43	2.12	0.08	5.68	0.40	47,509	717,160	2,345	432,472	55,462	Elliott Bay
70	0	0	NA	NA	0	0.00	0.00	NA	NA	0.00	0	0	N/A	N/A	0	Elliott Bay
71	2	1	0	0	0	20.03	1.40	0.00	0.00	0.00	620,074	309,386	0	0	0	Elliott Bay
72	0	0	NA	NA	0	0.00	0.00	NA	NA	0.00	0	0	N/A	N/A	0	Elliott Bay
78	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Elliott Bay
80	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Elliott Bay
83	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Puget Sound
85	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Puget Sound
88	0	1	0	1	0	0.00	1.03	0.00	1.95	0.00	0	1,047,258	0	42,430	0	Puget Sound
90	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Puget Sound
91	0	0	0	2	0	0.00	0.00	0.00	2.08	0.00	0	0	0	18	0	Puget Sound
94	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Puget Sound
95	2	2	3	3	2	6.73	3.07	29.99	3.67	0.28	6,673	28,802	42,394	12,505	3,453	Puget Sound
99	1	2	0	3	1	10.20	12.02	0.00	26.55	16.05	740,333	1,144,773	0	1,087,950	801,303	W Waterway - Duwamish River
107	1	1	1	9	2	39.03	4.57	1.60	60.56	14.93	176,732	90,815	14,358	186,131	104,254	E Waterway - Duwamish River
111	1	1	2	4	1	7.97	4.47	4.91	11.38	15.17	1,401,251	292,182	309,788	444,498	138,803	Duwamish River

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	
120	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
121	0	1	0	0	0	0.00	0.70	0.00	0.00	0.00	0	0	0	0	0	Lake Union
124	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
127	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
129	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
130	0	1	0	1	1	0.00	0.92	0.00	0.20	0.07	0	86,940	0	36,864	9,400	Lake Union
131	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
132	0	2	2	1	1	0.00	1.50	0.34	0.43	0.20	0	441,749	64,169	165,695	45,368	Lake Union
134	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
135	0	3	1	1	2	0.00	2.16	0.42	0.43	12.90	0	11,528	5,065	6,225	49,494	Lake Union
136	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
138	0	3	2	4	2	0.00	28.00	25.70	10.53	7.60	0	429,730	329,070	634,607	147,266	Portage Bay
139	3	2	3	5	1	37.11	5.75	6.92	10.92	0.08	1,849,563	334,584	265,003	399,154	4,633	Portage Bay
140	5	3	2	6	3	26.67	8.91	27.00	32.50	17.50	569,810	267,340	401,757	850,854	561,609	Portage Bay
141	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Portage Bay
144	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
145	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
146	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Union
147	34	47	40	42	28	179.12	358.40	573.00	372.67	263.78	21,385,295	21,102,048	6,380,778	9,849,427	5,528,196	Lake Union
148	1	0	0	2	0	1.25	0.00	0.00	2.87	0.00	23,649	0	0	137,907	0	Lake Washington Ship Canal
150/ 151	9	21	31	35	14	22.17	111.01	236.11	272.30	148.42	2,349,832	2,056,525	1,422,363	2,672,440	1,814,626	Salmon Bay
152	33	49	41	44	50	291.33	589.37	733.78	554.73	510.65	19,992,281	27,157,824	33,277,406	42,006,279	18,725,811	Salmon Bay
161	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Washington
165	1	1	2	1	2	0.17	13.42	1.33	1.75	1.00	1,754	127,525	1,806	446	5,741	Lake Washington
168	1	2	2	3	1	24.82	11.84	19.12	52.55	30.27	1,477,082	528,881	1,798,523	7,576,097	2,760,242	Longfellow Creek
169	1	2	2	4	1	27.38	20.70	35.18	66.93	26.10	1,335,434	1,253,119	2,416,798	7,159,239	3,439,765	Longfellow Creek
170	1	1	0	0	0	2.32	1.33	0.00	0.00	0.00	13,333	13,634	0	0	0	Longfellow Creek
171	3	2	5	8	2	18.90	8.73	55.00	83.26	32.83	1,759,209	844,280	2,673,547	6,115,060	3,223,120	Lake Washington

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	
174	2	6	11	7	5	43.50	53.25	81.46	56.59	39.66	5,368,115	5,599,153	7,401,924	8,651,075	3,765,160	Lake Washington Ship Canal
175	0	1	0	1	1	0.00	1.55	0.00	0.40	0.37	0	327,474	0	78,276	62,003	Lake Union
Total	**142**	**224**	**207**	**279**	**166**	**1,300**	**1,685**	**2,490**	**2,470**	**1,599**	**95,829,473**	**85,708,718**	**78,583,685**	**131,570,761**	**68,881,868**	

Table 5-7. 2019-2023 Summary Comparison of CSOs by Receiving Water															
Receiving Water	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)				
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023
Duwamish River	1	1	2	4	1	8	5	5	11	15	1,401,251	292,182	309,788	444,498	138,803
East Waterway	1	1	1	9	2	39	5	2	61	15	176,732	90,815	14,358	186,131	104,254
Elliott Bay	6	9	3	10	7	61	14	2	15	13	1,688,230	1,767,570	28,642	946,859	391,642
Lake Union	34	54	43	46	33	179	364	574	374	277	21,385,295	21,969,739	6,450,012	10,136,487	5,694,461
Lake Washington	36	56	58	82	40	451	393	707	885	461	32,409,998	18,351,564	23,411,168	44,737,784	26,293,348
Lake Washington Ship Canal	3	6	11	9	5	45	53	81	59	40	5,391,764	5,599,153	7,401,924	8,788,982	3,765,160
Longfellow Creek	3	5	4	7	2	55	34	54	119	56	2,825,850	1,795,633	4,215,321	14,735,336	6,200,007
Portage Bay	8	8	7	15	6	64	43	60	54	25	2,419,373	1,031,654	995,830	1,884,615	713,508
Puget Sound	2	3	3	7	2	7	4	30	10	0	6,673	1,076,060	42,394	362,176	3,453
Salmon Bay	45	71	72	82	66	318	701	970	829	659	22,562,763	29,333,633	34,699,769	44,719,540	20,551,150
Union Bay	2	7	3	5	1	65	57	5	25	20	4,821,211	3,255,942	1,014,479	3,540,402	4,224,779
West Waterway	1	2	0	3	1	10	12	0	27	16	740,333	1,144,773	0	1,087,950	801,303
TOTAL:	142	223	207	279	166	1,300	1,685	2,490	2,470	1,599	95,829,473	85,708,718	78,583,685	131,570,761	68,881,868

Table 5-8. Outfalls Meeting Performance Standard for Controlled CSOs Based on Flow Monitoring Results and Modeling

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																			Average Annual Overflow Frequency	Meets Performance Standard (2023) [2]	Long-Term Simulation Source	Notes
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023				
12	0	0	0	0	0	0	1	0	1	1	2	1	0	1	1	1	3	0	2	2	0.8	Yes	N/A	4
13	2	1	2	1	0	2	1	0	1	1	4	5	2	4	1	2	5	4	6	3	2.4	No	Mike URBAN results, March 2017	3
14				1	0	1	0	0	0	0	0	1	1	1	0	0	1	0	0	1	0.4	Yes	N/A	4
15	1	1	3	1	0	2	1	1	1	2	6	7	3	4	2	1	1	2	4	2	2.3	No	Mike URBAN results, March 2017	3
16	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0.3	Yes	N/A	4
18	2	1	0	3	1	0	0	1	0	1	0	1	1	0	1	1	2	2	3	1	1.1	No	Mike URBAN results, October 2019	5
19	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0.2	Yes	N/A	4
20	1	0	1	1	0	0	1	0	1	1	0	3	0	0	0	1	1	1	2	0	0.7	Yes	SWMM5 results, December 2022	7
22	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0.2	Yes	EPA-SWMM results, February 2019	8
24	2	2	0	4	1	0	1	1	0	1	1	0	0	1	1	0	1	1	2	0	1.0	Yes	LTCP Long Term Simulation Results February 2013	6
25	2	1	0	3	1	1	2	1	0	1	1	0	0	1	1	0	1	1	2	0	1.0	Yes	LTCP Long Term Simulation Results February 2013	9
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	Mike URBAN results, January 2019	11
28	2	0	1	1	1	0	0	0	0	2	2	2	2	3	1	5	4	7	5	4	2.1	No	Mike URBAN results, January 2019	11
29	1	0	1	0	0	0	0	0	0	0	0	1	1	2	1	2	2	2	4	2	1.0	Yes	Mike URBAN results, January 2019	11
30	2	1	4	1	1	2	1	1	3	3	5	5	3	4	1	1	3	2	3	1	2.4	No	Mike URBAN results, January 2019	11
31	3	2	4	1	1	5	2	2	4	3	9	9	6	7	3	1	6	3	5	2	3.9	No	Mike URBAN results, January 2019	11
32	1	0	1	1	1	0	0	0	1	2	2	2	2	1	3	1	3	2	3	2	1.4	No	Mike URBAN results, January 2019	11
33	0	0	1	0	0	1	0	0	1	0	0	0	0								NA	NA	NA	6, 10
34	1	0	2	1	1	0	1	1	1	1	2	1	1	1	1	1	1	1	1	0	1.0	Yes	Mike URBAN results, January 2019	11
35	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.2	Yes	Mike URBAN results, January 2019	11

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																			Average Annual Overflow Frequency	Meets Performance Standard (2023) [2]	Long-Term Simulation Source	Notes
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023			
36	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	Yes	Mike URBAN results, January 2019	11
38	0	0	2	1	0	1	1	1	1	1	0	0	0	3	1	1	1	2	4	1	1.1	No	Mike URBAN results, June 2018	12
40	1	1	5	1	0	3	1	2	2	1	2	3	1	3	1	1	2	2	3	1	1.8	No	Mike URBAN results, June 2018	12
41	1	1	5	1	0	3	1	2	2	1	2	3	1	3	1	1	2	2	3	1	1.8	No	Mike URBAN results, June 2018	12
42	0	0	3	1	1	1	1	1	1	1	0	3	0	2	1	1	1	3	3	1	1.3	No	Mike URBAN results, June 2018	12
43	1	2	6	1	1	5	3	2	5	2	4	5	4	5	3	3	4	3	3	2	3.2	No	Mike URBAN results, June 2018	12
44	0	0	2	1	0	0	1	1	3	0	0	3	0	2	1	1	1	3	3	2	1.2	No	Mike URBAN results, July 2018	13
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	1	0.4	Yes	Mike URBAN results, July 2018	13
46	1	0	1	1	0	3	1	1	2	0	1	2	0	0	0	0	2	0	0	1	0.8	Yes	InfoWorks results, December 2016	14
47	0	4	5	3	2	6	4	2	5	3	4	6	4	2	1	3	2	5	8	2	3.6	No	Mike URBAN results, December 2018	15
48					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	6
49	1	3	8	3	1	4	5	4	7	3	6	5	4	5	3	2	4	6	7	2	4.2	No	Mike URBAN results, February 2018	15
57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	Yes	N/A	4
59	0	0	0	1	0	0	0	1	2	1	0	0	1	8	4	1	1	0	2	2	1.2	No	N/A	4
60	1	4	4	3	0	3	4	2	6	1	2	4	2	3	0	2	0	0	1	0	2.1	No	LTCP Long Term Simulation Results February 2013	6
61	0	1	1	1	0	0	0	1	2	1	0	2	0	0	0	1	2	1	3	2	0.9	Yes	N/A	6
62	0	1	1	1	0	0	0	0	1	1	0	2	0	0	0	0	2	0	1	1	0.6	Yes	EPA-SWMM results, February 2021	16
64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	6
68	0	1	1	1	0	1	1	0	1	1	2	4	1	2	1	2	2	1	2	2	1.3	No	LTCP Long Term Simulation Results February 2013	6
69	1	1	2	1	1	3	1	2	2	3	3	4	4	2	0	1	2	1	4	2	2.0	No	LTCP Long Term Simulation Results February 2013	6
70	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0				N/A	N/A	AWVSRP Modeling Support Alternative	17

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																			Average Annual Overflow Frequency	Meets Performance Standard (2023) [2]	Long-Term Simulation Source	Notes
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023				
																						Modeling Report May 2012, Appendix D	
71	1	1	2	1	2	9	7	3	5	3	2	5	2	5	2	2	1	0	0	0	2.7	No	AWVSRP Modeling Support Alternative Modeling Report May 2012, Appendix D	6
72	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0				N/A	N/A	AWVSRP Modeling Support Alternative Modeling Report May 2012, Appendix D	18
78	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	4
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
88	1	0	0	2	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0.4	Yes	N/A	4
90	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	4
91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0.1	Yes	N/A	4
94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
95	0	0	2	1	1	2	1	0	1	1	0	0	0	2	0	2	2	3	3	2	1.2	No	EPA-SWMM results, February 2019	19
99	0	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	2	0	3	1	0.5	Yes	SWMM5 results, December 2022	20
107			9	3	1	9	11	4	4	2	4	5	5	5	2	1	1	1	9	2	4.3	No	EPA-SWMM results, February 2019	21
111	0	2	2	1	0	1	1	0	1	3	2	3	0	2	1	1	1	2	4	1	1.4	No	EPA-SWMM results, February 2019	22
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
121	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.1	Yes	N/A	4
124	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
127	1	0	3	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.4	Yes	N/A	4
129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	Yes	N/A	4
130					0	0	0	0	0	0	0	3	0	0	0	0	1	0	1	1	0.4	Yes	N/A	4
131	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	4
132					0	0	0	1	0	2	0	3	0	0	0	0	2	2	1	1	0.8	Yes	N/A	4
134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
135					0	1	0	0	0	0	0	2	0	0	0	0	3	1	1	2	0.6	Yes	N/A	4
136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																			Average Annual Overflow Frequency	Meets Performance Standard (2023) [2]	Long-Term Simulation Source	Notes
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023				
138	2	0	1	1	0	1	1	0	1	1	0	3	0	0	0	1	1	0	4	2	1.0	Yes	SWMM5 results, December 2022	23
139	3	1	1	1	0	1	1	0	1	4	0	3	0	3	3	3	2	3	5	1	1.8	No	EPA-SWMM results, February 2019	24
140	5	6	5	1	1	7	8	2	4	5	13	10	10	7	4	5	3	2	6	3	5.4	No	LTCP Long Term Simulation Results February 2013	6
141	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	4
144	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	4
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
147	29	37	45	35	50	45	63	40	47	27	49	32	58	42	37	34	47	40	42	28	41.4	No	LTCP Long Term Simulation Results February 2013	6
148	0	0	0	0	0	0	1	2	0	0	0	1	0	0	0	1	0	0	2	0	0.4	Yes	N/A	4
150/151	6	15	23	11	2	22	29	25	31	14	34	28	31	29	22	9	21	31	35	14	21.6	No	LTCP Long Term Simulation Results February 2013	25
152	44	46	42	43	11	29	63	48	57	44	53	34	63	50	45	33	49	41	44	50	44.5	No	LTCP Long Term Simulation Results February 2013	6
161	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	4
165	0	0	1	2	0	0	2	1	2	2	0	2	0	2	1	1	1	2	1	2	1.1	No	Mike URBAN results, June 2018	12
168	1	2	5	2	0	1	1	0	2	0	2	2	0	2	1	1	2	2	3	1	1.5	No	EPA-SWMM results, February 2019	26
169	1	3	5	2	1	1	2	2	3	0	2	3	1	3	0	1	2	2	4	1	2.0	No	EPA-SWMM results, February 2019	26
170					0	2	1	0	1	0	0	0	0	1	0	1	1	0	0	0	0.4	Yes	N/A	6
171	0	3	5	2	1	6	4	2	4	2	4	6	3	1	1	3	2	5	8	2	3.2	No	Mike URBAN results, December 2018	15
174	6	10	21	6	6	14	13	10	17	7	20	15	12	7	6	2	6	11	7	5	10.1	No	LTCP Long Term Simulation Results February 2013	6
175					0	1	0	0	0	2	0	4	0	0	1	0	1	0	1	1	0.7	Yes	N/A	6

Notes:

1. Per Section S4.B of the NPDES Permit, the determination of whether an outfall is meeting the performance standard for controlled outfalls has been made based on up to 20 years of data and modeling. Numbers in the colorless cells were obtained from flow monitoring. Numbers in blue-shaded cells were obtained using precipitation data and basin-specific models and are used in the long-term average annual overflow calculation for years when flow monitoring data either is not available or the accuracy of the flow monitoring data cannot be confirmed.
2. Responses in this column are “Yes” if the calculated Average Annual Overflow Frequency is no more than 1 per year and “No” if the calculated Average Annual Overflow Frequency is more than 1 per year.
3. The Basin 13 storage tank was operationally complete on July 21, 2015. Due to the hydraulic connectivity between Basin 13 and Basin 15 via the Lake Line, flow modeling data is used to estimate overflow events from both basins prior to this date.
4. The flow monitoring configuration prior to 2007 cannot be confirmed and the pre-2007 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2007 and 2022.
5. In October 2012, SPU completed sewer system improvements in Sub-Basin 18A. Flow modeling is used to predict Sub-Basin 18A overflows prior to this date. In April 2017, SPU completed sewer system improvements in Sub-Basin 18B. Flow modeling is used to predict Sub-Basin 18B overflows prior to this date.
6. The flow monitoring configuration prior to 2008 cannot be confirmed and the pre-2008 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2008 and 2022.
7. The Basin 20 sewer system improvement project was completed in July 2021. Hydraulic modeling data is used prior to that date and flow monitoring data is used thereafter.
8. Several exacerbated CSOs occurred at Outfall 22 in recent years because of the deteriorating performance of WWPS 50. The pump station was rehabilitated, and existing air-lift style pumps replaced with submersible pumps. WWPS 50 began pumping at its design rate on December 20, 2016. Flow modeling data is used prior to this date.
9. SPU raised the weir at Outfall 25 in early 2008, so the calculated Average Annual Overflow Frequency uses flow modeling through 2008 and flow monitoring for subsequent years.
10. The CSO overflow pipe to Outfall 33 was sealed and the outfall was removed from CSO service on July 22, 2016.
11. The weir at Outfall 34 was lowered on February 15, 2017, to protect WWPS 2 from an elevated grade line. Due to the hydraulic connectivity of the Leschi basins along the Lake Line, flow modeling data is used for all Leschi outfalls prior to this date.
12. The Lake Line connecting the Genesee CSO basins was jet cleaned on March 17, 2016, allowing for maximum hydraulic conveyance capacity. Due to the connectivity of the Genesee CSO basins along the Lake Line, flow modeling data is used for all Genesee outfalls prior to this date.
13. The hydraulic model for Basins 44 and 45 was updated in Dec 2021 to reflect the most current operations of the North Henderson CSO Reduction facilities and associated pump stations.
14. SPU completed the Pump Station 9 Rehabilitation Project in 2016 and subsequently updated the hydraulic model for Basin 46 to reflect the constructed facilities.
15. On July 19, 2013, SPU replaced a HydroBrake in South Henderson Basin 49 with an orifice plate. Flow modeling is used to predict Basin 49 CSOs prior to this date. SPU completed the South Henderson CSO Reduction Projects (weir retrofits and 52nd Ave Conveyance Project) in August 2015 and, on November 9, 2017, removed the orifice in the 52nd Avenue South flow control structure that was restricting flows. Flow modeling is used to predict Basin 47 and 171 flows prior to this date.
16. The Basin 62 overflow weir was raised on August 27, 2018, optimizing use of the existing sewer system. Hydraulic modeling data is used for January 1, 2001, through August 27, 2018, with flow monitoring data used thereafter.
17. The CSO overflow pipe to Outfall 70 was sealed and the outfall was removed from CSO service on April 20, 2020.
18. The CSO overflow pipe to Outfall 72 was sealed and the outfall was removed from CSO service on May 26, 2020.
19. The Basin 95 retrofit project was substantially complete on April 4, 2013. Flow modeling is used prior to this date.
20. The Basin 99 sewer system improvement project was completed in November 2021. Hydraulic modeling data is used prior to that date and flow monitoring data is used thereafter.
21. Basin 107 overflows are induced by an elevated hydraulic grade line (HGL) in the Elliot Bay Interceptor. Reliable HGL data, necessary for flow modeling, is available from 2006 to present. The backwater valve retrofit was installed on August 19, 2017. Therefore, flow modeling data is used for January 1, 2006, through August 19, 2017, with flow monitoring data used thereafter.
22. The last hydraulic modification in Basin 111 was performed on December 1, 2014. Flow modeling data is used prior to this date.
23. The Basin 138 sewer system improvement project was completed in December 2021. Hydraulic modeling data is used prior to that date and flow monitoring data is used thereafter.
24. The Basin 139 sewer system improvement project was completed in July 2016. Hydraulic modeling data is used prior to that date and flow monitoring data is used thereafter.
25. SPU removed Outfall 150 from service on February 27, 2019. Any Basin 150/151 CSOs now discharge from Outfall 151.
26. SPU completed the valve retrofit for Basins 168 and 169 on November 5, 2015. Flow modeling data is used prior to this date.

Table 5-9. Integrated Plan Performance Targets and Results to Date								
Status	**Project Name**	**Average volume treated or removed (MG/year)**	**Fecal coliform (billion CFU/year)[1]**	**PCB (g/year)[1]**	**Total phosphorus (kg/year)[1]**	**Total copper (kg/year)[1]**	**TSS (kg/year)[1]**	**Total zinc (kg/year)[1]**
Target	NDS Partnering	32[1]	10,649	1.3	11	1.1	6,478	9.2
	South Park Water Quality Facility	67[1]	31,000	5.2	38	3.8	20,935	25
	Expanded Arterial Street Sweeping	1,477[1,2]	1,380	2.0	14	3.3	20,700	6.3
	Total	1,576	43,029	9	63	8.2	48,113	41
2017 Interim Results	Expanded Arterial Street Sweeping[3]	1,900	1,464	4.0	44	9.1	59,000	20
2018 Interim Results	Expanded Arterial Street Sweeping[3]	1,700	801	2.6	41	8.4	53,000	18

Notes:

1. These values represent the 95% lower confidence limits (LCL) from the Integrated Plan pollutant load model (PLM) results.
2. Volume of runoff from swept streets.
3. Data is only available for the Expanded Arterial Street Sweeping Program. NDS Partnering and South Park Water Quality Facility monitoring has not begun. Post-construction monitoring results will not be compared to the total performance monitoring targets until monitoring has been completed for all three stormwater projects because the goals are based on the total load reductions for the three projects combined.

Appendix A: Additional CMOM Information

Table A-1. 2023 Sewer Overflow (SSO) Details							
Event Number	**ERTS Number**	**Location**	**Event Date and Time**	**Estimated Total Overflow Volume (gallons)**	**Estimated Volume to Receiving Water (gallons)**	**Receiving Water, if applicable**	**Primary Cause**
23001	720165	65 S HORTON ST	1/12/2023, 10:51	200	0	NONE	STRUCTURAL FAILURE - GRAVITY
23002	720438	5080 BEACH DR SW	1/25/2023, 23:23	4000	4000	PUGET SOUND	STRUCTURAL FAILURE - FORCE MAIN
23003	720487	5202 BEACH DR SW	1/27/2023, 19:30	200	0	NONE	OPERATIONS ERROR
23004	720552	1249 S ORR ST	2/1/2023, 7:50	8	0	NONE	DEBRIS
23005	722271	9401 26TH AVE SW	4/17/2023, 11:44	200	0	NONE	CITY CONSTRUCTION
23006	722565	4760 21ST AVE NE	5/2/2023, 15:23	20	0	NONE	ROOTS
23007	723371	2800 39TH AVE W	6/11/2023, 13:55	5	0	NONE	DEBRIS
23008	723629	1023 E ALDER ST	6/22/2023, 12:41	10	0	NONE	DEBRIS
23009	723739	1718 N 107TH ST	6/26/2023, 14:26	30	0	NONE	ROOTS
23010	724247	2303 NW 86TH ST	7/13/2023, 12:37	80	0	NONE	DEBRIS
23011	725557	118 REPUBLICAN ST	9/19/2023, 11:15	12,000	0	NONE	ROOTS
23012	725689	1423 N 45TH ST	9/24/2023, 20:56	2450	0	NONE	ROOTS
23013	725729	365 NEWTON ST	9/26/2023, 14:33	10	0	NONE	ROOTS
23014	725731	4022 MERIDIAN AVE N	9/26/2023, 12:23	1270	0	NONE	ROOTS
23015	726572	153 MCGRAW ST	11/4/2023, 11:52	100	0	NONE	ROOTS
23016	726560	9700 RAVENNA AVE NE	11/4/2023, 12:21	9000	8990	THORNTON CREEK	ROOTS
23017	726574	5205 12TH AVE S	11/4/2023, 12:41	1660	0	NONE	VANDALISM
23018	726569	8039 & 8056 20TH AVE NE	11/4/2023, 13:04	980	0	NONE	CAPACITY- GRAVITY

Event Number	ERTS Number	Location	Event Date and Time	Estimated Total Overflow Volume (gallons)	Estimated Volume to Receiving Water (gallons)	Receiving Water, if applicable	Primary Cause
23019	726800	1212 3RD AVE W	11/6/2023, 14:31	50	0	NONE	ROOTS
23020	726647	8039 20TH AVE NE	11/7/2023, 10:55	18,290	0	NONE	CAPACITY- GRAVITY
23021	726660	6324, 6322, & 6321 18TH AVE NE	11/7/2023, 11:25	2617	0	NONE	ROOTS
23022	726646	6818 21ST AVE NE	11/7/2023, 15:28	1100	0	NONE	CAPACITY- GRAVITY
23023	726122	3003 NE 75TH ST	11/8/2023, 8:17	1000	0	NONE	CAPACITY- GRAVITY
23024	726724	9444 5TH AVE SW	11/12/2023, 14:44	1500	0	NONE	VANDALISM
23025	726855	8500 14TH AVE NW	11/18/2023, 16:33	200	0	NONE	DEBRIS
23026	726916	13018 LAKE CITY WAY NE	11/22/2023, 18:23	3650	3450	THORNTON CREEK	ROOTS
23027	727188	LAKE WASHINGTON BLVD S & 53RD AVE S	12/4/2023, 23:13	144,900	144900	LAKE WASHINGTON	OPERATIONS ERROR
23028	727094	903 N 36TH ST	12/5/2023, 3:23	1000	0	NONE	VANDALISM
23029	727233	4203 S NORFOLK ST.	12/5/2023, 0:38	400,000	400000	DUWAMISH RIVER	PUMP STATION - CAPACITY
23030	727110	8415 AIRPORT WAY S	12/5/2023, 0:55	135,000	0	NONE	PUMP STATION - CAPACITY

Table A-2. Pump Station Location and Capacity										
Number	Name	Address	Type [1]	Basin Area (acres)	Average Annual Inflow (gpm)	Average Wet Weather Inflow (gpm)	Number of Pumps and Rating	Static Head (feet)	Average Annual Storage Time (hours)	Average Wet Weather Storage Time (hours)
1	Lawton Wood	5645 45th Ave West	WW/DW	31.8	10	27	2 at 350 gpm each	60.5	25.7	9.5
2	Charles Street	901 Lakeside Dr	WW/DW	108.1	180	303	2 at 450 gpm each	20	7.6	4.5
4	South Director Street	5135 South Director St	Air Lift	3.1	33	48	2 at 150 gpm each	28.5	2.1	1.4
5	46th Avenue South	3800 Lake Washington Blvd	WW/DW	198.2	250	715	2 at 1000 gpm each	13.9	4.7	1.7
6	South Alaska Street	4645 Lake Washington Blvd	WW/DW	10.2	24	88	2 at 300 gpm each	14	3.0	0.82
7	East Lee Street	4214 East Lee St	WW/DW	227	373	961	2 at 2800 gpm each	50	11.8	4.6
9	South Grattan Street	8400 55th Ave South	WW/DW	422.2	372	1074	2 at 2700 gpm each	13.9	2.8	1.1
10	South Holly Street	5711 South Holly St	WW/DW	188.4	201	494	2 at 1000 gpm each	13.5	1.7	0.70
11	North Sand Point	63rd Ave NE and NE 78th St	Submersible	32.8	45	80	2 at 180 gpm each	23	6.9	3.9
13	Montlake	2160 East Shelby St	WW/DW	64.9	49	154	2 at 600 gpm each	29.7	44.2	14.0
17	Empire Way	42nd Ave South and South Norfolk St	WW/DW	395	546	804	2 at 2000 gpm each	27.7	4.5	3.0
18	South 116th Place	6700 South 116th Pl	Submersible	2.5	2.8	3.7	2 at 150 gpm each	45	21.7	16.4
19	Leroy Place South	9400 Leroy Pl South	Submersible	6.84	4.3	5.5	2 at 150 gpm each	45	14.9	11.6
20	East Shelby Street	1205 East Shelby St	WW/DW	48.6	94	278	2 at 600 gpm each	45	20.5	6.9
21	21st Avenue West	2557 21st Ave West	Submersible	3.55	6.7	7.2	2 at 150 gpm each	45	9.8	9.2
22	West Cramer Street	5400 38th Ave West	WW/DW	26.9	44	224	2 at 750 gpm each	62	6.0	1.2
25	Calhoun Street	1812 East Calhoun St	WW/DW	52.2	123	328	2 at 850 gpm each	36	2.9	1.1
28	North Beach	9001 View Ave NW	Submersible	4.8	2.7	6.0	2 at 150 gpm each	40.7	17.5	7.9
30	Esplanade	3206 NW Esplanade St	Submersible	5.7	8.7	19	2 at 150 gpm each	63	14.0	6.6
31	11th Avenue NW	12007 11th Ave NW	Submersible	2	0.81	1.1	2 at 150 gpm each	20	41.0	30.8
35	25th Avenue NE	2734 NE 45th St	WW/DW	71	170	202	2 at 600 gpm each 1 at 900 gpm	39.8	1.2	0.98

Number	Name	Address	Type [1]	Basin Area (acres)	Average Annual Inflow (gpm)	Average Wet Weather Inflow (gpm)	Number of Pumps and Rating	Static Head (feet)	Average Annual Storage Time (hours)	Average Wet Weather Storage Time (hours)
36	Maryland	1122 Harbor Ave SW	Air Lift	12.2	60	83	2 at 150 gpm each	10	5.0	3.6
37	Fairmont	1751 Harbor Ave SW	WW/DW	281.5	275	744	2 at 3000 gpm each	12.8	5.1	1.9
38	Arkansas	1411 Alki Ave SW	Air Lift	46.5	108	164	2 at 300 gpm each	10	5.4	3.6
39	Dawson	5080 Beach Dr SW	WW/DW	55	114	340	2 at 850 gpm each	36.7	5.4	1.8
42	Lincoln Park	8617 Fauntleroy Way SW	WW/DW	6.5	18	35	2 at 200 gpm each	55.5	6.3	3.2
43	Seaview No. 1	5635 Seaview Ave NW	WW/DW	177.4	82	211	2 at 2750 gpm each	40.4	19.7	7.7
44	Boeing No. 1	6820 Perimeter Rd S	WW/DW	168.5	196	361	2 at 800 gpm each	19	2.4	1.3
45	Boeing No. 2	7609 Perimeter Rd S	WW/DW	133.5	92	167	2 at 350 gpm each	16.5	3.8	2.1
46	Seaview No. 2	6541 Seaview Ave NW	Air Lift	52.6	64	96	2 at 150 gpm each	14.6	1.9	1.2
47	Seaview No. 3	7242 Seaview Ave NW	Air Lift	11	14	17	2 at 150 gpm each	9.5	6.8	5.6
48	Brooklyn	3701 Brooklyn Ave NE	WW/DW	31.4	91	108	2 at 1000 gpm each	53.3	3.8	3.2
49	Latona	3750 Latona Ave NE	WW/DW	22.4	20	40	2 at 250 gpm each	33.3	19.0	9.6
50	39th Avenue East	2534 39th Ave East	Submersible	10.6	5.3	14	2 at 120 gpm each	17	19.6	7.3
51	NE 60th Street	6670 NE 60th St	WW/DW	44.5	38	94	2 at 325 gpm each	126.3	3.5	1.4
53	SW Hinds Street	4951 SW Hinds St	WW/DW	10.6	7.1	22	2 at 150 gpm each	66	10.9	3.5
54	NW 41st Street	647 NW 41st St	WW/DW	24.5	50	149	2 at 350 gpm each	27	5.1	1.7
55	Webster Street	3021 West Laurelhurst NE	Air Lift	2.4	5.6	8.8	2 at 150 gpm each	31	1.1	0.7
56	Bedford Court	10334 Bedford Ct NW	Air Lift	1.6	4.8	12	2 at 150 gpm each	30.3	0.62	0.26
57	Sunnyside	3600 Sunnyside Ave North	WW/DW	16.3	12	17	2 at 300 gpm each	31.5	14.3	10.0
58	Woodlawn	1350 North Northlake Way	WW/DW	33.4	34	41	2 at 685 gpm each	30	8.0	6.7
59	Halliday	2590 Westlake Ave North	WW/DW	21.2	8.5	8.0	2 at 325 gpm each	17.7	25.7	27.4
60	Newton	2010 Westlake Ave North	WW/DW	57.6	65	94	2 at 250 gpm each	67.4	4.4	3.1
61	Aloha	912 Westlake Ave North	WW/DW	26.3	13	11	2 at 450 gpm each	19.1	15.8	19.4
62	Yale	1103 Fairview Ave North	WW/DW	12.2	27	27	2 at 300 gpm each	18.4	6.0	6.0
63	East Blaine	140 East Blaine St	WW/DW	33.1	103	136	2 at 600 gpm each	31	2.4	1.8

Number	Name	Address	Type [1]	Basin Area (acres)	Average Annual Inflow (gpm)	Average Wet Weather Inflow (gpm)	Number of Pumps and Rating	Static Head (feet)	Average Annual Storage Time (hours)	Average Wet Weather Storage Time (hours)
64	East Lynn Street No. 2	2390 Fairview Ave East	WW/DW	9.4	63	103	2 at 300 gpm each	16.2	2.4	1.4
65	East Allison Street	2955 Fairview Ave East	WW/DW	19.2	23	31	2 at 200 gpm each	47.2	10.4	7.8
66	Portage Bay No. 1	3190 Portage Bay Pl East	WW/DW	6.5	20	20	2 at 200 gpm each	12.2	7.2	7.2
67	Portage Bay No. 2	1209 East Shelby St	WW/DW	14.7	30	30	2 at 250 gpm each	17	5.0	5.0
69	Sand Point	6451 65th Ave NE	WW/DW	15.5	44	58	2 at 300 gpm each	79	2.0	1.5
70	Barton No. 2	4890 SW Barton St	WW/DW	73	37	76	2 at 290 gpm each	29	12.5	6.1
71	SW 98th Street	5190 SW 98th St	WW/DW	36.3	26	46	2 at 450 gpm each	16	6.2	3.5
72	SW Lander Street	2600 13th Ave SW	WW/DW	203.5	98	272	3 at 2100 gpm each	22.8	12.2	4.4
73	SW Spokane St	1190 SW Spokane St	WW/DW	336.5	96	258	3 at 2400 gpm each	16.3	9.5	3.5
74	26th Avenue SW	2799 26th Ave SW	Submersible	144	26	38	2 at 300 gpm each	30	12.3	8.4
75	Point Place SW	3200 Point Pl SW	Air Lift	4.9	n/a	n/a	2 at 150 gpm each	12.2	n/a	n/a
76	Lowman Park	7025 Beach Dr SW	WW/DW	20.4	15	22	2 at 100 gpm each	34	18.8	13.0
77	32nd Avenue West	1499 32nd Ave West	WW/DW	206.5	84	256	2 at 1400 gpm each	48	21.0	6.9
78	Airport Way South	8415 Airport Way South	Air Lift	18.4	11	12	2 at 150 gpm each	14.5	4.5	4.1
80	South Perry Street	9724 Rainier Ave South	Air Lift	4.6	4.8	5.2	2 at 150 gpm each	22	14.1	13.1
81	72nd Avenue South	10199 Rainier Avenue South	WW/DW	11	10	13	2 at 200 gpm each	53.3	19.0	14.7
82	Arroyo Beach Place	11013 Arroyo Beach Pl SW	Air Lift	6	4.5	4.8	2 at 150 gpm each	19.8	16.2	15.2
83	West Ewing Street	390 West Ewing St	Air Lift	6.1	44	29	2 at 150 gpm each	19	1.4	2.1
84	28th Avenue NW	5390 28th Ave NW	WW/DW	691.4	81	191	2 at 500 gpm each	24.4	3.9	1.6
114	35th Avenue NE	10701 36th Ave NE	Submersible	3.2	11	24	2 at 150 gpm each	5.6	19.4	9.1
118	Midvale Avenue North	1200 North 107th St	WW/DW	22.4	7.6	13	2 at 300 gpm each	11.5	48.4	28.1

1. WW/DW = Wet Well/Dry Well

Table A-3. 2023 Pump Station Work Order Summary			
WWPS Number	**Inspection**	**Maintenance**	**Total Work Orders**
WWPS001	24	3	27
WWPS002	19	13	32
WWPS004	23	10	33
WWPS005	31	8	39
WWPS006	15	4	19
WWPS007	28	7	35
WWPS009	36	10	46
WWPS010	26	9	35
WWPS011	13	9	22
WWPS013	50	19	69
WWPS017	63	35	98
WWPS018	18	8	26
WWPS019	25	20	45
WWPS020	25	14	39
WWPS021	26	16	42
WWPS022	17	8	25
WWPS025	26	13	39
WWPS028	17	9	26
WWPS030	20	13	33
WWPS031	24	11	35
WWPS035	26	11	37
WWPS036	32	13	45
WWPS037	13	7	20
WWPS038	13	14	27
WWPS039	24	20	44
WWPS042	21	8	29
WWPS043	24	19	43
WWPS044	36	9	45
WWPS045	34	9	43
WWPS046	27	6	33
WWPS047	34	5	39
WWPS048	21	12	33
WWPS049	19	21	40
WWPS050	9	3	12
WWPS051	33	16	49
WWPS053	14	5	19
WWPS054	32	9	41
WWPS055	20	5	25

WWPS Number	Inspection	Maintenance	Total Work Orders
WWPS056	44	11	55
WWPS057	13	13	26
WWPS058	14	11	25
WWPS059	16	6	22
WWPS060	13	6	19
WWPS061	15	7	22
WWPS062	15	33	48
WWPS063	16	6	22
WWPS064	9	8	17
WWPS065	32	13	45
WWPS066	11	4	15
WWPS067	13	4	17
WWPS069	23	19	42
WWPS070	17	6	23
WWPS071	19	4	23
WWPS072	18	6	24
WWPS073	25	5	30
WWPS074	23	16	39
WWPS075	15	4	19
WWPS076	29	25	54
WWPS077	16	10	26
WWPS078	17	6	23
WWPS080	23	26	49
WWPS081	22	2	24
WWPS082	14	4	18
WWPS083	21	12	33
WWPS084	15	4	19
WWPS114	16	9	25
WWPS118	28	12	40
Grand Total	**1,510**	**723**	**2,233**