Seattle Public Utilities

Protecting Seattle's Waterways

Wastewater Collection System: 2021 Annual Report

March 30, 2022

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List of Abbreviations

Term	Definition
BMP	Best Management Practice
CMOM	Capacity, Management, Operations, and Maintenance
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

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 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 the 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 per outfall per year based on a 20-year moving average. DNRP owns and operates an additional 39 CSO outfalls in the City of Seattle and has a similar program to reduce CSOs.

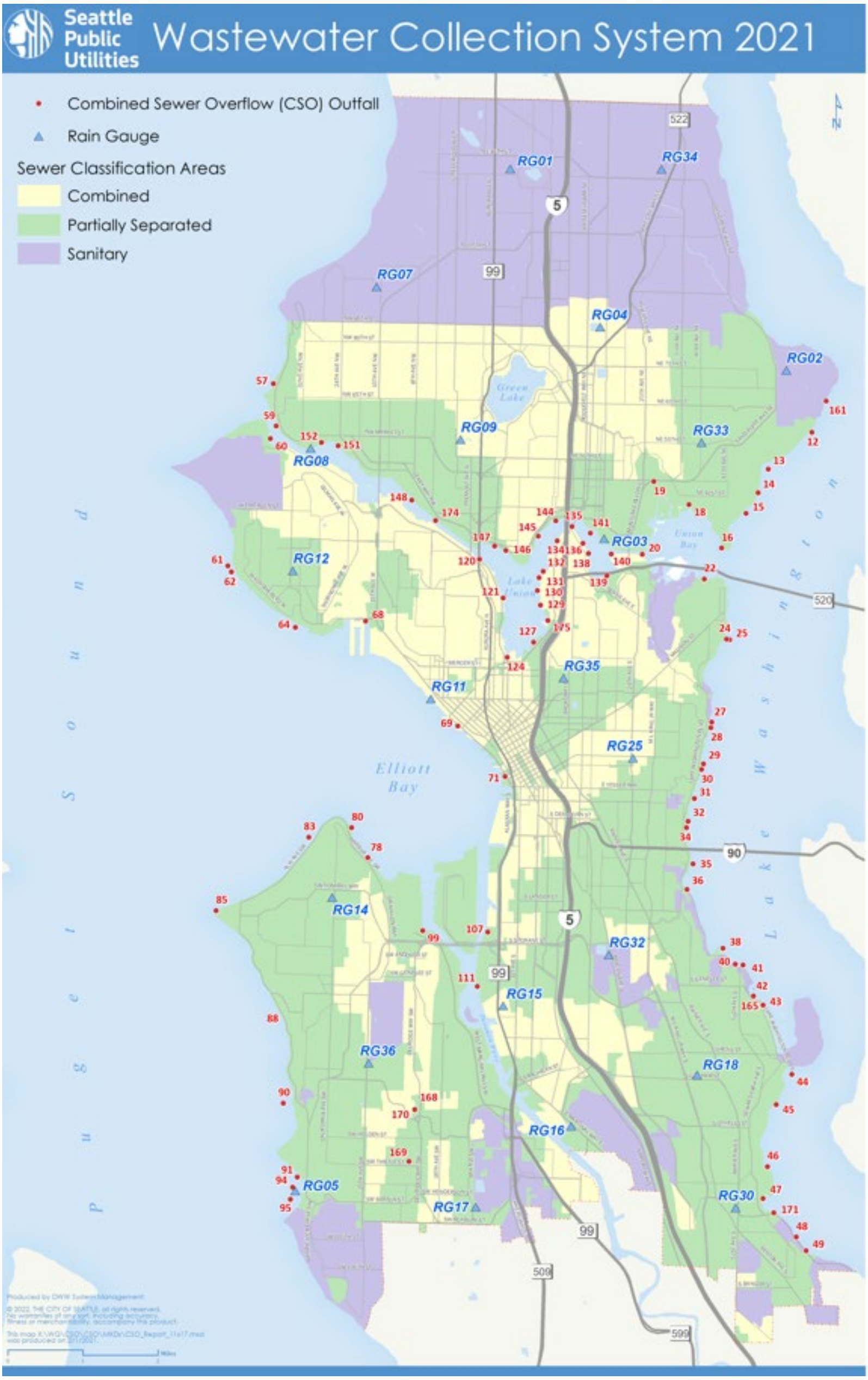

Figure 1-1. City of Seattle Sewer Classification Areas

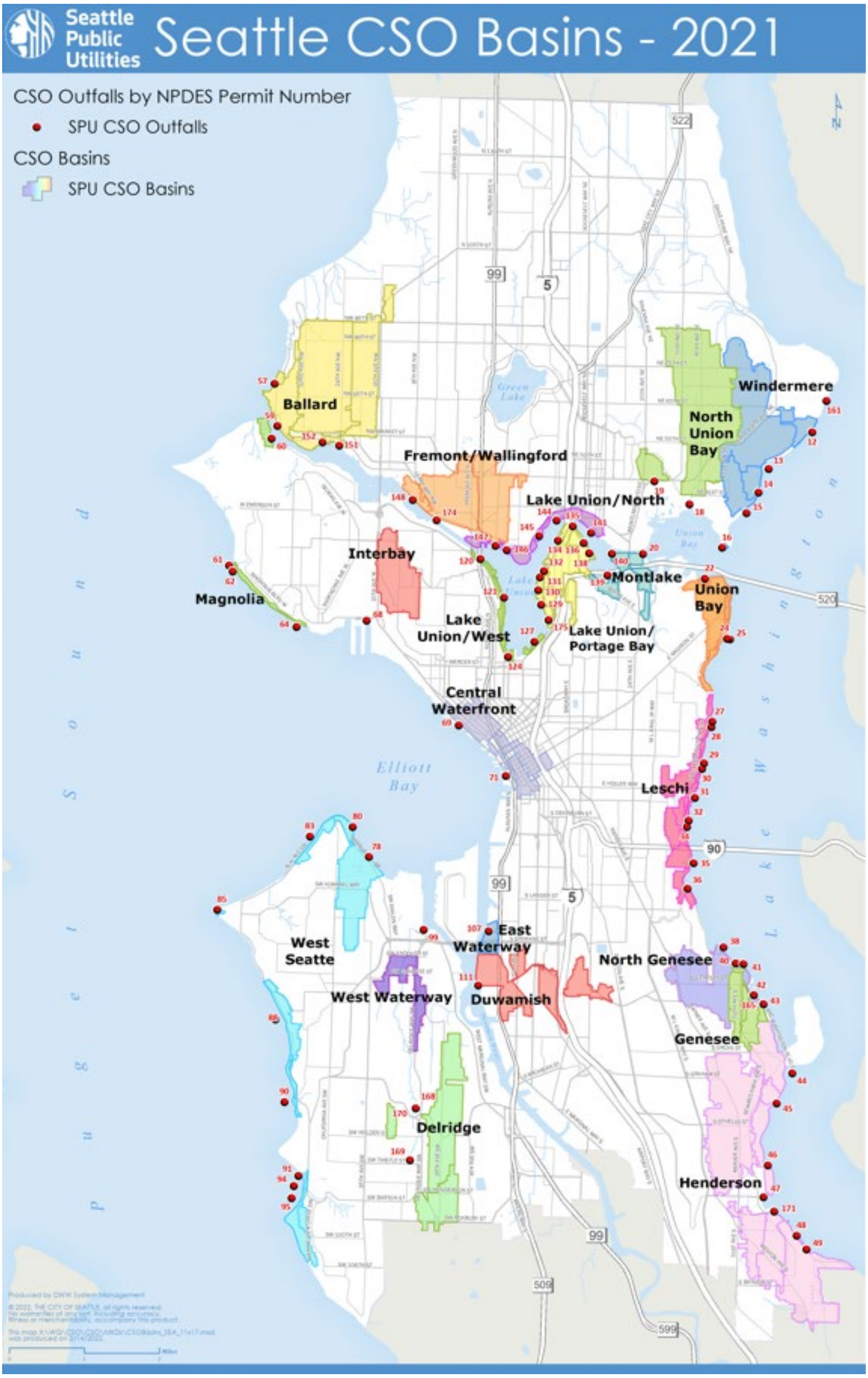

Figure 1-2. City of Seattle Combined Sewer Basins

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 31st, 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. 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 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 DNRP 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 26th, 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 2021 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. 2021 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. 2021 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; e. 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. No changes 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, 4.1.3, 4.3.1, 4.5, 4.6, 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 4.6 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 4.3.1, 4.5, 4.6 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 2021, 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 following describes each commitment and the progress made in 2021:

- 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 2021/2022 wet season, a meeting was held in September 2021 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 three meetings 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 two workshops in June as part of the annual process to review flow monitoring data collected by each agency and provide recommendations for future monitoring.
    - SPU and DNRP held a workshop in the Spring to confirm the scope and schedule of the upgraded real-time data sharing platform. SPU and DNRP are in process of updating the agreement before implementing the recommended upgrades to the data sharing platform.

- 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. In addition, SPU and DNRP shared modeling results from the Henderson CSO basin. SPU updated the Henderson North CSO model to represent the recent facility improvements while DNRP identified regional impacts to their system from recent SPU projects and began 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. The joint modeling work plan, initially developed in 2018, was updated to reflect current and future work. This plan will continue to provide a framework for coordination 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 2021, SPU commissioned the East Montlake (Basin 20) sewer system improvements and Wastewater Pump Station 118 (Northgate) 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 2021, DNRP and SPU held a coordination meeting in November to review saltwater intrusion monitoring conducted in 2021, discuss work planned for 2022, and identify strategies for reducing saltwater intrusion.
- WTD and SPU kicked off the effort to complete the second update of the JOSOP, focusing on the progress made to each of the areas depicted above. The second update of the JOSOP was submitted to EPA and Ecology on February 28th, 2022.

2.2 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 (formerly known as the Integrated System Plan). The purpose of Shape Our Water is to plan future infrastructure investments that improve water quality while providing the greatest community value. The effort will integrate planning across drainage and wastewater systems,

emphasize engagement, and focus on leveraging effective partnerships to meet Seattle's infrastructure and receiving water body challenges. Additional information on the intent of 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 2021.
- ***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 2020, SPU redesigned our engagement approach in response 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 will identify and sequence 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 is launching the planning stage in 2022 and anticipates substantial completion at the end of 2023.
- ***Implementation:*** The implementation stage will begin in 2023 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.

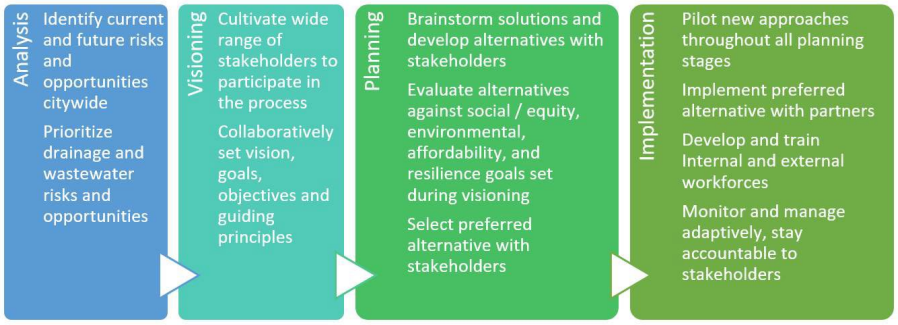

Figure 2-1. Shape Our Water Planning Process

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 system 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 2021 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.

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 2021 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 2020, 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 4.6.

Table 3-1. 2021 O&M Accomplishments

Activity	Quantity
Miles of Mainline Pipes Cleaned	318.54
Miles of WW Mainline Pipes CCTV	272.75
Miles of mainline pipe repaired/replaced/rehabilitated	5.9
Number of pump station inspections	1,755

Number of maintenance holes inspected	97
Number of force mains repaired/replaced/rehabilitated	1
Number of CSO structures inspections	265
Number of CSO structures cleanings	499
Number of CSO HydroBrake inspections	201
Number of CSO HydroBrake cleanings	27
Linear ft of pipe receiving chemical treatment to inhibit chemical root	136,185
Number of catch basins inspected	1161
Number of catch basins cleaned	1599
Number of catch basin repaired	13
Number of catch basin traps replaced	30
Number of catch basins repaired	13

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 2021 and work planned in 2022 are summarized in Section 3.3.

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.

Figure 3-1. FOG Deposits in Sanitary Sewer Mainline – Pike Place Market Area

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 2021, SPU completed rehabilitation projects at Wastewater Pump Station 118 (Northgate) and CSO Facility 14 (Basin 35) and a sewer system improvement project in East Montlake (Basin 20). The sewer system improvement project is described in Section 4.1 of this report. Each 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 stabilization phase. Stabilization includes monitoring and analysis to ensure the facility is functioning as intended. SPU completed the stabilization phase for the completed Delridge (Basin 99) sewer system improvement project, the completed Magnolia (Basin 60), and Portage Bay (Basin 138) sewer system improvement projects in 2021. SPU began the stabilization phase of the completed sewer system improvement project in East Montlake (Basin 20) in 2021 which expected to be complete in 2022.

In 2022, SPU also expects to begin rehabilitating Wastewater Pump Stations 17 (Beacon Hill) and 38 (West Seattle).

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 four DWOs in 2021. Three DWOs occurred at Outfall 174 discharging approximately a combined 6,815 gallons of sewage as a result of surges from a City contractor-operated pump and bypass system. The DWOs occurred on March 2nd, 9th, and 12th and on April 22nd the contractor removed the pump and bypass system and basin flows returned to normal. There was one DWO at Outfall 13 on May 22nd that discharged approximately 54,718 gallons of sewage caused by a malfunctioning level sensor. The sensor was repaired on the same day and the CSO facility was returned to normal operation.

There were no exacerbated CSOs in 2021.

A summary of the DWOs, exacerbated CSOs, and exacerbated sewer overflows from 2016-2021 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 2016 – 2021

Year	DWOs[1]		CSOs and Sewer Overflows Exacerbated by System Maintenance Issues[1]	
	No. of Overflows	Volume (gallons)	No. of Overflows	Volume (gallons)
2016	2	113,349	6	2,061,875
2017	0	0	8	465,938
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

1. *DWOs and 'exacerbated CSOs' are included in the table listing all 2021 overflows (Table 5-4). Exacerbated CSOs are also included in the table comparing 2021 CSOs with 2010 baseline (Table 5-5), the tables comparing 2016-2021 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 2021, SPU continued its Protect Your Pipes: Flush Only Toilet Paper pilot outreach campaign to educate customers that only toilet paper and human waste should be flushed down the toilet. This campaign built on knowledge and materials developed in preceding years. 2018 research looked at potential audiences. A pilot outreach campaign in 2019 focused on University of Washington students, and focus groups were held after the outreach campaign to research what might be more effective in eliciting behavior change. In 2020, SPU worked with input from community partners (the University of Washington, Seattle University, Seattle Pacific University, and Seattle Housing Authority) to develop new graphics and an animated social media video. SPU conducted focus groups and a survey to test the effectiveness of these new materials and ran a social media ad campaign in late Summer 2020 featuring the new social media video, which received more than 18,600 views on YouTube. In 2021, SPU finalized materials utilizing the information gathered from the focus groups and surveys. SPU then sent out a baseline survey to gauge current behavior and level of knowledge of impacts of flushing materials to a broader audience within the community partners' students and residents. The baseline survey was followed by university staff posting materials in campus residence hall restrooms and SPU staff distributing doorhangers to Seattle Housing Authority residents. SPU also posted targeted social media ads on Instagram, YouTube, and Spotify via the universities' zip codes.

SPU utilized social media to bring What to Flush messaging about the problems with flushing non-flushables to city residents at large, developing 3 animated What to Flush videos and posting them on social media. 2021 Facebook posts reached an estimated 145,000, and social media ads reached an estimated 500,000 viewers.

In response to the large uptick in the purchase of wet wipes during the COVID-19 pandemic, SPU developed shelf talkers for grocers and other retailers who sell wet wipes and other commonly flushed products like paper towels. In 2021, SPU posted over 185 shelf talkers and 126 stall signs in 50 grocery and convenience stores.

In 2021, SPU engaged 270 single family customers and over 400 multi-family buildings in root risk areas, where the risk of sewer backups from improperly flushed materials is greater than other areas. SPU's

outreach materials included a door hanger, sink strainers, and virtual informational quiz for multi-family residents to reinforce this messaging.

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 city wide. 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 re-launched an invigorated Adopt-a-Drain program 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 in 2021 to reduce the amount of pollutants entering the sewer system. The Seattle Department of Transportation (SDOT) performs street sweeping, including street sweeping downtown streets every night and cleaning alleys three nights per week. In 2021, SDOT street sweeping crews swept 9,224 miles in the SPU combined sewer area, removing 1,223 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 2021, SPU received 29,229 illegal dumping complaints from customers. More than 2,937,660 pounds of debris were removed from Seattle's public property. 99.85 percent of complaints were addressed in 10 days or less. Thanks to new ways of using technology, customer engagement, and process improvements, SPU reduced the average time for removing illegally dumped materials from 21 days in 2015 to under 10 days in 2021.

Other Pollution Prevention Programs

- 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 Seattle Department of Transportation. 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 Seattle Public Utilities' 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 2021 the program provided 1,546 wastewater collections. The effort appears to be having the desired impact on spills and dumping of sewage which have fallen nearly 70% from their 2019 peak.

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 was partially completed in

2021 due to O&M staffing reductions resulting from the COVID-19 pandemic and will be completed as staff availability allows.

Figure 3-2: 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 CSO overflows. 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 use of local waters. The screen shot in Figure 3-3 the zoomable map the public sees when they access the website.

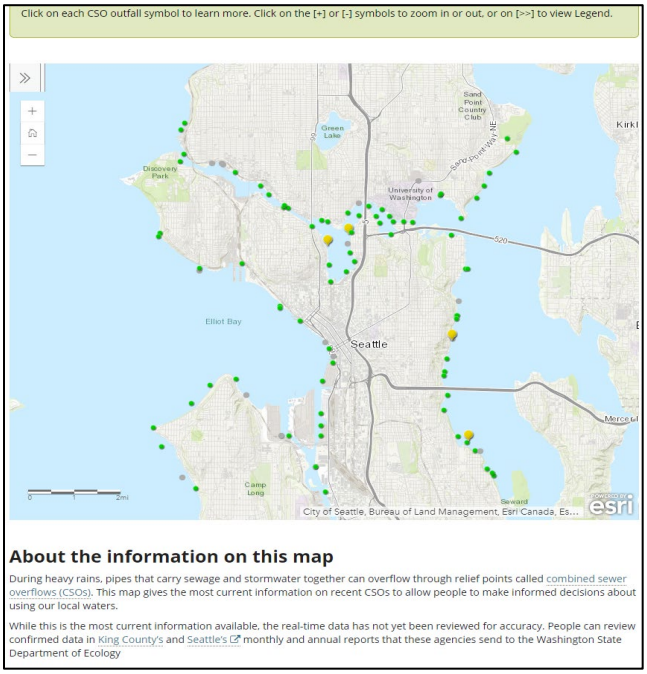

Figure 3-3: CSO Overflow Site Screen Shot

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. The current roadmap has initiatives in the following program areas:

- Sewer cleaning;
- Sewer condition assessment; and
- Sewer rehabilitation.

SPU develops and implements program plans 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. SPU will begin implementation in 2022. The plans include initiatives in the following core program areas, among others:

- Sewer cleaning;
- Sewer condition assessment; and
- 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 2021 and planned for 2022 includes:

- Chemical Root Control Application, Evaluation and Increased Root Cleaning – Since 2018, SPU has significantly increased the annual application of chemical root control agents. In 2021, that increased level of investment continued with nearly 25 miles treated in pipes with known root intrusion. SPU also is conducting a comprehensive review of the pipes selected for treatment. This will continue into 2022 to help ensure chemical root control activities are most effectively and efficiently applied. Due to an uptick in root-caused SSOs in 2020, SPU conducted over 25 miles of focused maintenance activities in areas with known high levels of root intrusion (Magnolia, Queen Anne, Capitol Hill and the Central District).
- 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 with the reorganization of SPU's Planning

and Scheduling Group and in light of COVID-19 related staffing shortages. This work will continue into 2022 with an emphasis on coordinating various maintenance-related work activities into a coordinated maintenance strategy.

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 2021 and planned for 2022 includes:

- Increased Condition Assessment via CCTV – In 2017, SPU increased its annual goal for wastewater collection system condition assessment via CCTV from 190 to 240 miles of pipe, prioritizing areas with a higher risk of failure (based on likelihood and consequence of failure) and where no CCTV data currently exists.
- Management Areas – 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 and inspection work completed since 2012. The Management Area work was essentially paused in 2020 due to staffing shortages and was resumed in 2021. SPU is catching up on work from 2020 and now plans to complete inspection of the wastewater collection system by 2024.

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 2021 and planned for 2022 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 identified the need to replace enterprise technology tools that support the Rehabilitation Program. New risk management software was fully implemented in 2020. SPU also implemented various process improvements to gain efficiencies in rehabilitation project delivery. Implementation of SPU's Rehabilitation Strategy, which includes a long-term investment forecast, began in 2021 and will continue into 2022.
- Increased Rehabilitation Budget – SPU has increased sewer rehabilitation funding each year since 2013. Sewer renewal spending in 2021 was $29.1 million. SPU plans to continue increasing investment in sewer renewal, spending up to $35 million per year by 2041.

3.2.4 SSO Performance

There were 51 sewer overflows in 2021, and they are summarized by cause in Table 3-3. The greatest number of sewer overflows were caused by roots (12 events).

Table 3-3. 2021 Sewer Overflows by Category

Category	Primary Cause of Sewer Overflows	Number of 2021 Sewer Overflows
1	Roots	12
2	FOG	8
3	Debris	5
4	Structural Failure – Gravity	6
5	Structural Failure – Force Main	0
6	Capacity – Gravity	6
7	Pump Station – Mechanical	0
8	Pump Station - Capacity	3
9	Power Outage	1
10	Operator Error	0
11	Maintenance Error	0
12	Pressure Release	0
13	City Construction	1
14	New Facility Startup	0
15	Private Side Sewer Issue	1
16	Capacity – King County	3
17	Private Construction	3
18	Other Agency Construction	0
19	Vandalism	2
20	Extreme Weather Event (≥25year)	0
	Total for Categories 1 – 20	**51**
	Total for Categories 1 – 15	**43**

SSO performance for the years 2013 through 2021 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. 2013-2021 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

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. In 2021, SPU conducted a review of all repeat SSO locations. Further review of each underlying asset's preventive maintenance schedules and work plans was also performed. SPU plans to track these locations each year to help ensure mitigation activities are proving effective at reducing repeat SSOs.

3.3 FOG Control Program Activities

The purpose of the Fats, Oils, and Grease Control Program is to reduce the number of FOG-related sanitary sewer overflows (SSOs) 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 2021 and planned for 2022 is described in the following sections. It should be noted that SPU continued to use an adaptive approach in 2021 to implement the Fog Control Program due to significant COVID-19 impacts to the restaurant industry. Details of the process changes SPU Wastewater Source Control carried out in response to COVID-19 pandemic are outlined in the paragraphs below.

3.3.1 Implement the FOG Management Plan

Analysis of SPU FOG Hotspot data indicates a nearly even distribution of hotspots between commercial and residential sources. To mitigate these sources, the FOG Management Plan focuses on residential community engagement and a commercial regulatory program. Each of these areas of focus is 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. SPU has continued to develop and update new resources, including in-language, trans-created materials. The FOG team continued expansion of use of social media to increase our online presence and continue to engage a high number of people. Below are the highlights of SPU's residential efforts in 2021:

- Delivered outreach materials to 64 multi-family property managers representing more than 6,400 multi-family residential customers located in or near FOG "hotspot" areas;
- Delivered outreach materials to over 1,200 single-family residential customers located in or near FOG "hotspot" areas;
- Our communications contractor, Cascadia Consulting Group, also conducted FOG specific outreach to 102 additional multifamily property managers;
- Posted new outreach handouts on SPU website and shared FOG messages via social media channels;
- Finalized a new, simplified quiz for the multifamily outreach door hanger;
- Continued trans-creation of outreach materials to better serve the community and expand our program reach;

- Through our customer service web portal and individual inquiries, distributed 4,579 FOG educational flyers (primarily to multi-family property owners and managers);

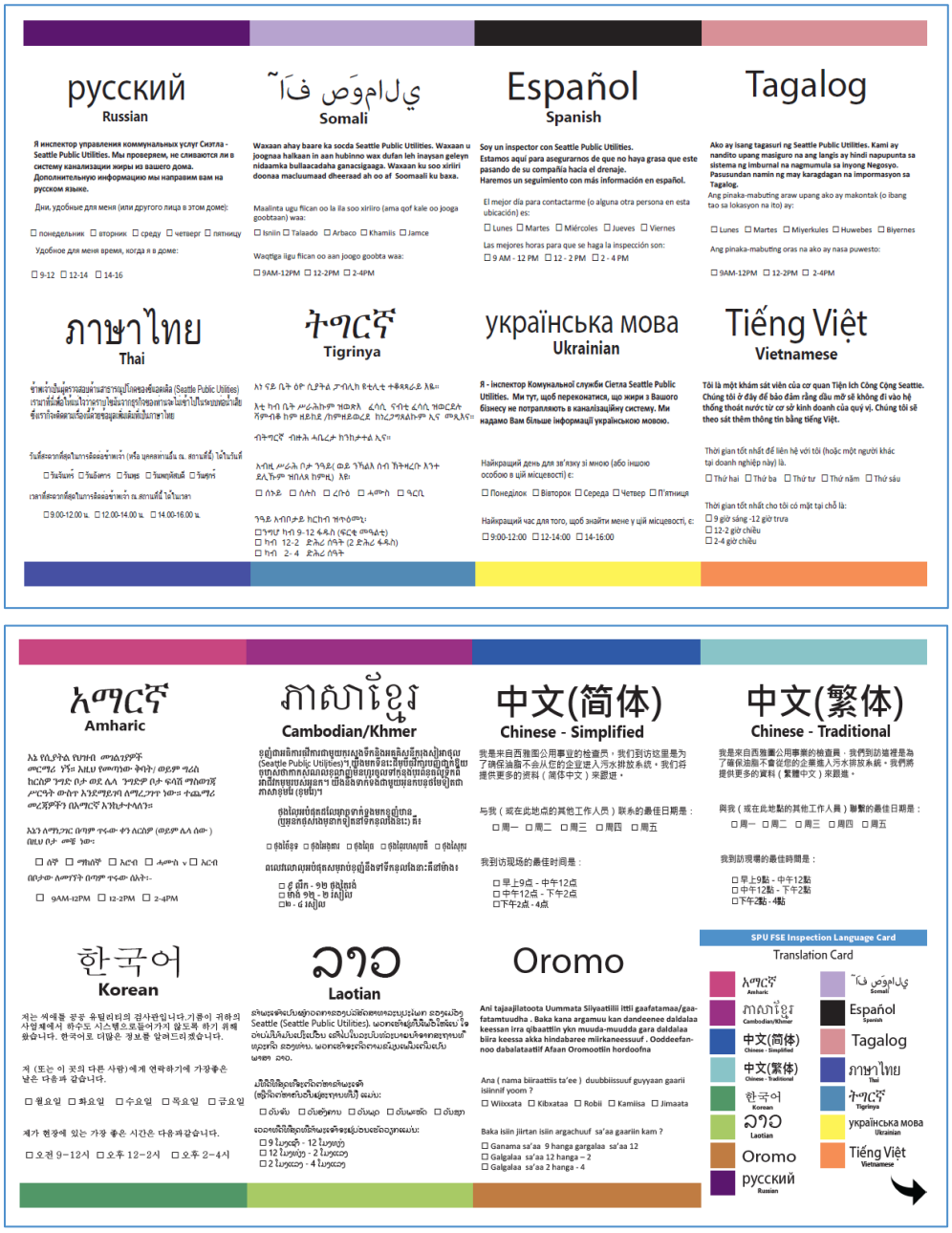

Figure 3-4. Front and back of residential FOG messaging postcard in Multiple Languages

3.3.1.2 Commercial – Regulatory FOG Program

The commercial FOG program consists of restaurant engagement, site assessment, inspections, and enforcement. In 2021, COVID related obstacles remained a barrier to providing in-person, onsite assessments, and inspections at the same rate as pre-COVID years. Inspectors split their time between regulatory inspection work and CCTV-based inspections to assess the condition of restaurant connections to the SPU system. Inspectors flagged connections with visible accumulations of FOG for follow-up when onsite, in-person inspection of these facilities becomes feasible. In addition to this work, inspectors also reviewed CCTV footage showing residential connections. Connections with FOG, root, or structural issues were flagged and inspectors then engaged the property owners via mailed letters and video screenshots to encourage proactive maintenance on their side sewers to prevent back-ups and overflows onto their private property and into their homes.

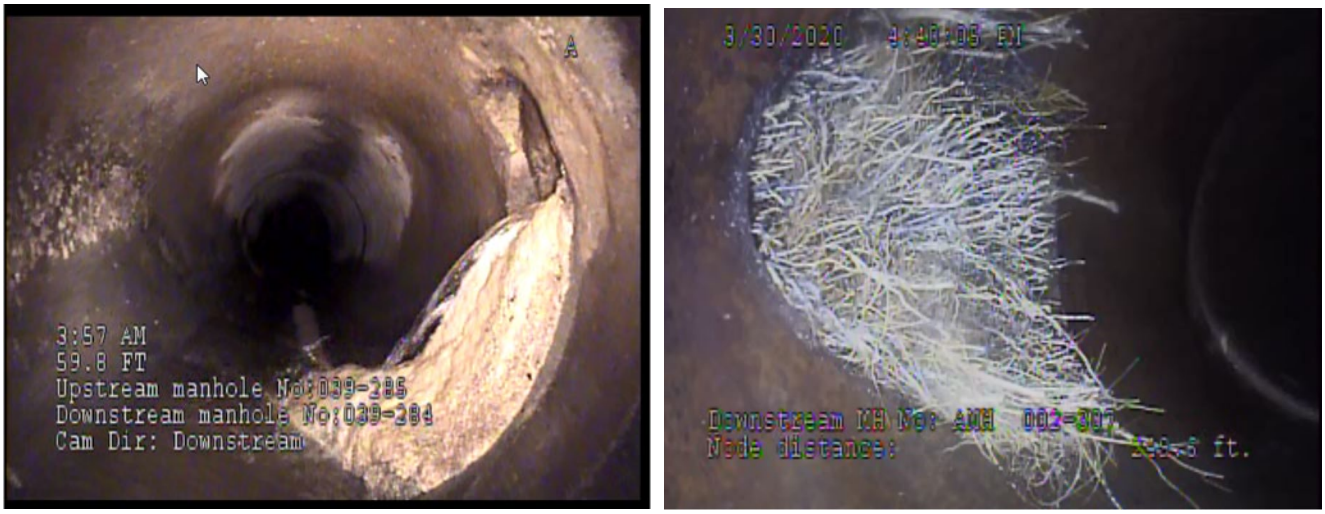

Figure 3-5. Private side sewer connections demonstrating visible FOG accumulations and impacts from root intrusion

In 2020, SPU migrated to a new Aquatics Compliance Platform database system that is a marked improvement over the split system - access database and online inspection platform. Inspectors now have access to all records electronically using any computer, tablet, or smartphone with internet access. The ease of use and access of the new system should greatly improve inspector efficiency when restaurant and business activities resume and onsite inspections ramp up, as COVID-19 conditions allow. In 2021, the new database platform continued to evolve with the introduction of a customizable system dashboard, new inspection forms, and the Hauler Self Reporting portal.

The new dashboard (Figure 3-6) within the Aquatics Compliance Platform is a customizable data visualization tool that allows SPU FOG team members to select and display key information to help monitor and track compliance statuses, open violations, upcoming and completed inspections, and other key performance indicators. This allows for at-a-glance, real-time data rather than crafting multiple queries to track efficiencies, gaps, areas where improvement may be needed.

In 2020, SPU engaged Aquatic Informatics to create a new inspection type and online form to conduct telephone audit inspections to be utilized by our inspectors until onsite inspections are again feasible. The goal of the phone audit process was to gain an understanding of the COVID related impacts on businesses. The audit assesses compliance based on question responses and electronic verification provided by the businesses (e.g. submission of pictures and invoices). It also provides an opportunity to engage the restaurants and provide program materials. The success of the new inspection type brought awareness to benefits of continued phone audits moving forward, even as businesses reopen after COVID-19 mandates are lifted. This will allow the City to perform non-invasive, phone-based inspections on low risk businesses such as convenience stores. In September, SPU updated their Routine, Risk Assessment, and Phone Audit forms and created new Demand Inspection and Engagement Visit forms.

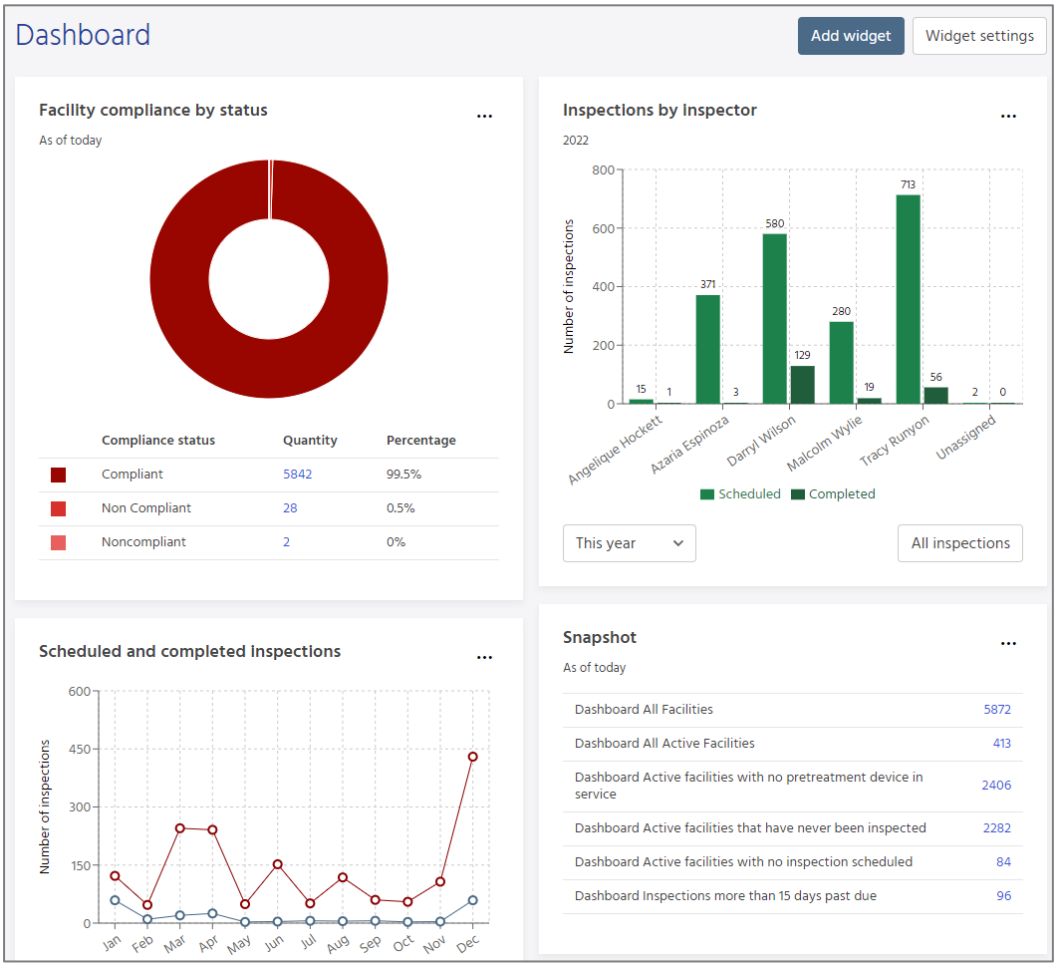

Figure 3-6 Aquatics Compliance Platform Dashboard

In 2021, SPU developed the Hauler Portal which allows grease interceptor waste haulers to report their own cleaning activities directly into the FOG database. Once a hauler has an account and is associated with a facility, they may submit cleaning records in real time. Additionally, once a cleaning has been submitted, a new cleaning is automatically scheduled based on the periodicity set by SPU.

Other 2021 highlights included:

- Completed 481 FSE FOG discharge risk assessments and regulatory compliance inspections. This number included 400 "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 COVID-19 impacts the number of inspections completed remains below the stated annual goal of 1,300 total inspections including 275 "High Priority" facility inspections;
- Work in lieu of FSE FOG discharge risk assessments and regulatory compliance inspections included:
    - Completed 715 Phone Audit inspections;
    - Reviewed CCTV footage in residential areas. Flagged 170 private side sewers and provided property owners with information pertaining to FOG accumulations, root intrusion, and/or structural deficiencies;
- Continued collaboration with the King County Plumbing and Gas Piping Program 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.

Although their production remained impacted by COVID-19, SPU's contracted engagement firm (Cascadia Consulting Group) completed the following commercial, FOG-related engagement tasks:

- Delivered in-language FOG messaging, maintenance logs, kitchen posters, and sink strainers to 56 businesses through onsite, virtual, or hotline assistance;
- Provided FOG site assessment assistance to 285 businesses;
- Delivered free spill kits to 126 facilities, including 65 FSEs, as part of a Seattle EnviroStars Program multi-faceted conservation, pollution prevention, and recycling campaign;
- Finished translation of content for FOG outreach language cards in 15 languages (see Figure 3-4).
- Partnered with GreenShoots, a community engagement subcontractor, and SPU in anticipation of SPU's 2022 (deferred from 2021), Non-enforcement Based Compliance Project Pilot in the Seattle International District. The group developed an interview guide and interviewed 21 businesses in the International District to assess their knowledge of regulatory FOG requirements, their ability to achieve compliance, and financial resources available as part of the community designed outreach effort.

2022 goals and efforts will include the following activities pending a reduction in COVID-19 restrictions, to be adjusted as conditions dictate:

- Conduct regulatory compliance inspections on a minimum of 90% of all Priority 1, 2, and 3 facilities as identified in the Aquatics Compliance Platform;
- Conduct regulatory compliance inspections on 90% of facilities scheduled in 2022 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 2021);
- Craft and implement a “Preferred Service Provider” Program for companies who install, repair, and maintain grease interceptors (deferred from 2021).

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 2021, SPU updated the FSE database quarterly 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 2021, SPU continued work to shift from the Access-based LinkoFOG program to the Aquatics Compliance Platform. This online database includes web access portals for SPU staff, FSE Owners/Management, and Service Providers. Direct access by FSEs and Service Providers will allow 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.

3.3.3 Standard Operating Procedures

SPU FOG Inspectors reviewed all FOG Standard Operating Procedures (SOPs) in 2021. As a result of this review, the Linko Database SOP, FOG Enforcement SOP, and Regulatory Inspection SOPs were updated to reflect procedural changes. This annual review process:

- Helps ensure field staff are familiar with and are utilizing SOPs;
- Helps ensure SOPs accurately reflect actual field activity processes; and
- 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. Linko Online Database User’s Manual and Data Entry SOP (to be changed to Aquatics Compliance Platform User’s Manual and Data Entry SOP in 2022)
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

Due to travel restrictions, opportunities for training were limited. However, continued education and training of FOG Inspectors remains a fundamental component of the SPU FOG Program. FOG Inspector training in 2021 included the following activities:

- In-house FOG inspector training included informal discussions concerning procedural changes brought about by technology improvement projects and program improvements. These sessions occur bi-weekly during FOG Team meetings and in conjunction with software and procedural updates;
- FOG Team Members attended the Western States Alliance FOG Forum in April 2021;
- FOG Team Members participated in a training provided by Alma Villeyas Consulting which focused on interacting with BIPOC FSE business owners and employees, with an emphasis on English as a second language.
- FOG Team members actively participated in periodic online meetings of the APWA PREFOG Sub-Committee.

In 2022, SPU will continue to participate in the activities outlined above and seek out other training resources and opportunities.

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.

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.

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 2021 and work that SPU plans to complete in 2022. During 2021, 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. 2021 project spending is summarized in Table 4-1.

Table 4-1. 2021 Plan Implementation Spending

Project Name	Amount Spent
Ship Canal Water Quality Project	$75,352,570
Central Waterfront CSO Reduction Project (70,71,72)	$3,138,950
Delridge 168/169 CSO Control	$489,104
Sewer System Improvement Projects (Retrofits)	$3,923,350
Pump Station Rehabilitation	$5,105,018
Outfall Rehabilitation	$12,207
Sewer Renewal	$29,107,455
RainWise	$1,253,695
NDS Partnering	$246,059
South Park Water Quality Facility	$333,040
Expanded Street Arterial Sweeping	$1,524,055
Total	**$120,485,503**

4.1 Sewer System Improvement Projects

SPU made significant progress on a variety of combined sewer system improvement projects in 2021, 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 will be monitoring the performance of the new facility and making further modifications, as required

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. In 2022 SPU will continue to monitor performance of this upgraded facility.

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 SPU will monitor and adjust the

operation of the pump station's variable frequency drives to help ensure its performance meets the design intent.

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 SPU will be closely monitoring the performance of the gate and upgraded pump station to verify that they operate at the design intent.

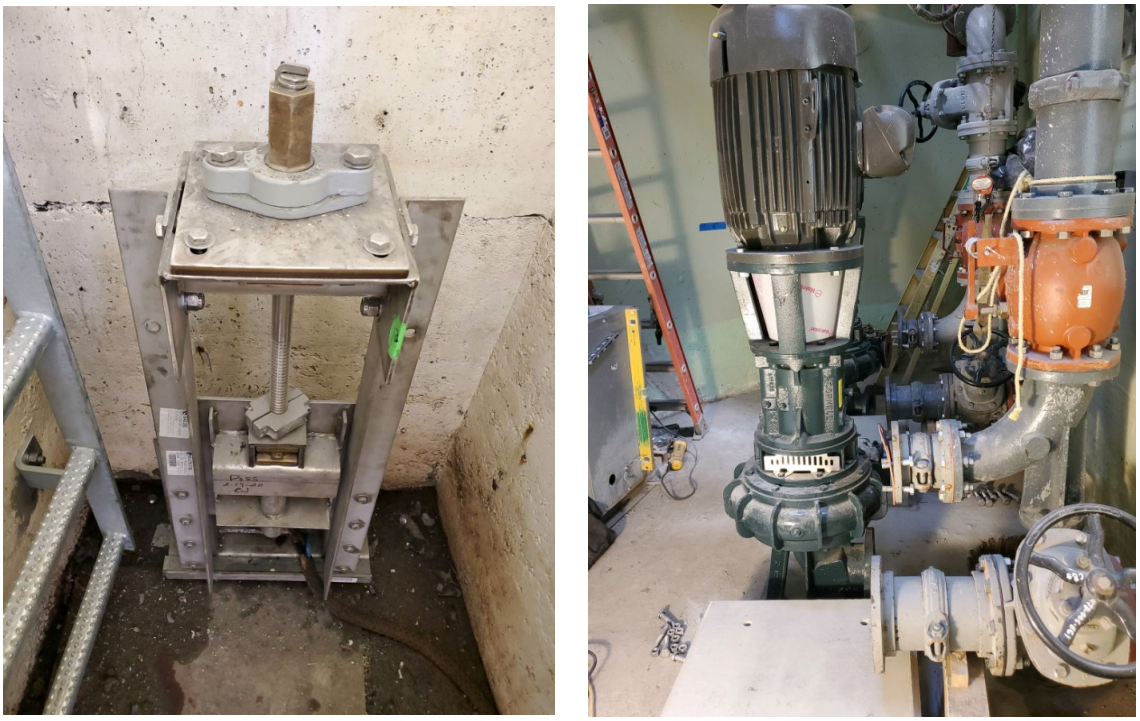

Figure 4-4. Installation of Basin 138 slide gate (left) and new higher capacity pumps (right)

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 2021, the project team made significant progress on project design and construction:

- Construction of the Storage Tunnel work package continued. All five drop shafts were constructed, and the team launched two tunnel boring machines – the 18 ft.-10 in. diameter storage tunnel and the 8 ft. diameter conveyance tunnel under the Ship Canal. Excavation began for several below grade diversion structures and mechanical/electrical vaults.
- The Tunnel Effluent Pump Station (TEPS) work package team completed 90% design as a joint deliverable with the Ballard Conveyance work package. The 90% design was submitted to the Department of Ecology and EPA for review as the draft plans and specifications. The Ship Canal

Program decided in 2020 to merge the TEPS and Ballard Conveyance design documents into a single construction contract. This decision will greatly reduce coordination and construction risks for the two projects. The 90% TEPS design received final approval from the Seattle Design Commission.

- The Wallingford Conveyance work package team completed 100% design. The 100% design was submitted to the Department of Ecology and EPA for review as the final plans and specifications. This work package will be advertised for bids in 2022 with construction scheduled to begin later in 2022.
- The SCWQP program completed hydraulic modeling of the North Queen Anne system to confirm that the project will not unacceptably impact the hydraulics of the system.
- The SCWQP program completed a 60% Operations and Maintenance (O&M) manual deliverable for the overall facility.
- The overall Ship Canal Water Quality Project received notice that it had achieved an Envision platinum award for sustainable infrastructure.
- Finally, SPU executed a $66M State Revolving Fund loan with Ecology for the Ship Canal Water Quality Project and was informed that it has been selected for a separate SRF loan to be executed in 2022.

Issues encountered in 2021 include:

- Quality issues were discovered in the microtunnel pipe for the 8 ft. diameter conveyance tunnel. Tunneling has been paused, and SPU is evaluating corrective action proposals from the Contractor. It is anticipated that the 8 ft. diameter tunnel will be completed successfully in 2022.
- Mining progress for the 18 ft.-10 in. diameter storage tunnel has been slower than planned, in part due to impacts from Covid 19. SPU is working with the Contractor to evaluate corrective actions and fully understand the impacts. It is anticipated that completion of the storage tunnel will delay the planned start of TEPS/Ballard Conveyance and the critical path to complete the Ship Canal Water Quality Facility; however, the SCWQP team still forecasts to complete the project prior to the Consent Decree milestone date.

Figure 4-5. 18 ft.-10 in. Storage Tunnel in Construction

SPU continued with community outreach for the Ship Canal Project during 2021, as summarized below:

- 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, the King County Regional Water Quality Committee, Ecology, and EPA.
- Conducted numerous stakeholder briefings with property owners and businesses along the proposed project sites and tunnel alignment.
- Created a public campaign to name the 18 ft.-10 in. diameter tunnel boring machine and raise awareness for the project and water quality issues in the region. The naming contest received over 1,200 name suggestions and over 30,000 votes and significant regional and national media attention.
- Delivered listserv updates on Storage Tunnel construction progress to over 1,500 recipients approximately monthly.
- Produced short public relations videos for the website and social media to promote project artwork and other highlights.

Figure 4-6. 8 ft. Diameter Microtunnel Installation

In 2022, the project team anticipates completing design of the remaining projects and continuing construction:

- Construction will continue for the Storage Tunnel work package. Work will include completion of the 8-foot diameter conveyance tunnel beneath the Ship Canal, mining completion of the 18 ft-10 in diameter storage tunnel, and construction of below grade structures such as mechanical/electrical vaults and diversion structures.
- The TEPS and Ballard Conveyance work packages are scheduled to complete a joint 100% design in the 2nd quarter of 2022 and advertise for bids in the 3rd quarter of 2022.
- The Wallingford Conveyance team is scheduled to advertise for bids in the 1st quarter of 2022 and begin construction in the 4th quarter of 2022.
- SPU plans to execute a 2022 SRF loan with the Department of Ecology in 2022.

SPU's planned 2022 outreach activities include:

- Conduct outreach to contractors ahead of bid advertisement for Wallingford Conveyance and TEPS/Ballard Conveyance.

- Deliver project briefings at organizations, boards and/or associations focused on potential project impacts to trees, bicycles, pedestrians, residents, and industry.
- Continue to deliver listserv updates, notices, and mailers along the tunnel alignment, as appropriate and necessary.
- Continue stakeholder briefings and attend community meetings.
- Provide project information via fact sheets, website, listserv, and other materials.

The Ship Canal Water Quality Project is on track to meet all remaining Consent Decree and NPDES Permit regulatory milestones.

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 is currently installing approximately 2,000 linear feet of new 24 to 36-inch diameter sewer and connecting combined sewer basins 70, 71, and 72. The project is designed to eliminate Outfalls 70 (University Street) and 72 (Washington Street) and limit CSOs from Outfall 71 (Madison Street) to no more than one 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. Also in 2019, SPU completed the final measures to mitigate impacts of the completed project on our customers. Construction of the project will continue in 2022, and 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 – Dewatering System

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 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 will collaboratively engage various City departments and external stakeholders in the development and evaluation of potential infrastructure scenarios. Phase B will identify CSO reduction and stormwater quality approaches that best support the community's vision for southern Delridge. SPU anticipates to kickoff Phase B in late 2022.

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 CSO Control Supplemental Compliance Plans

4.6.1 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 2022, SPU will continue to work with DNRP to identify other short-term system operational improvements.

4.6.2 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 and will continue to do so in 2022.

4.6.3 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 SPU coordinated with DNRP to evaluate the impact of the operational adjustments on downstream DNRP infrastructure. In 2022 SPU will continue to coordinate with DNRP on the operational adjustments.

4.6.5 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.

4.7 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 is in construction and, when complete, will enable the existing stormwater collection system and outfall to function during all tidal conditions in the Lower Duwamish Waterway.

In 2018, SPU determined that the South Park Pump Station will require full use of the site previously slated for both the Pump Station and the Water Quality Facility. In 2019, SPU continued evaluation of other potential Water Quality Facility sites in the industrial area of the South Park neighborhood. In early January 2021, SPU's Asset Management Committee approved the recommendation to purchase property for the purpose of building a regional, stormwater quality improvement facility in the South Park neighborhood. In 2021, SPU selected three consultant teams to support the site cleanup, Water Quality Facility, and community investment elements of the project. In 2022, the project will engage Ecology in discussions regarding remedial investigations on the identified property for purchase and will begin the options analysis project phase.

4.8 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 2021 included:

- Adding the updated GSI Manuals to the joint www.700milliongallons.org website to make them more accessible to a broader audience of users.
- Identifying training needs for GSI and developing and delivering two trainings.
- Evaluating and drafting updated presettling guidance, including identifying presettling technologies to test on specific projects.

In 2022, planned collaborative work includes:

- Evaluating and updating (if appropriate) current design standards for inlets and orifice control.
- Updating the GSI Design Manual to incorporate lessons learned and any new or updated guidance, such as for presettling.

4.8.1 RainWise Program

Since 2010, RainWise has offered rebates 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, property owners are able to 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. This year we offered one webinar-based training for contractors and initiated migration to an on demand, verifiable online curriculum we will launch in 2022.

There are currently 35 active contractors listed on the RainWise website that are available to bid and install systems for RainWise customers. Of them, four are multilingual. In 2021, 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. In addition, there are several contractors with RainWise training who choose not to be on the RainWise list because they develop RainWise elements as part of larger projects.

COVID-19 continued to impact the Rainwise Program in 2021. Contractor fairs and training as well as customer workshops were delivered virtually via webinar and online meeting programs. Additionally, the program enabled rebate paperwork to be submitted electronically.

In 2021, nine contractor meet-ups were offered to connect interested participants with participating contractors. Additionally, the Rainwise Program and its community partners held eight information webinars for potential RainWise customers to learn about the program, talk with satisfied participants, and meet contractors. In an ongoing effort to provide equitable outreach, all events were either offered in multiple languages or direct translation was available at the regular event.

In addition to previous efforts to improve outreach, education and program delivery to potential customers and contractors, the RainWise program implemented recommendations from the program's racial equity toolkit, which guides program efforts related to BIPOC communities, customers and contractors. In 2021, SPU piloted a contractor mentoring program, began collecting demographic information on participants, and laid the groundwork for customer and contractor feedback groups focused on appropriate messaging for BIPOC audiences. Translation and transcreation of materials continued to be provided.

Upon completion, installations are inspected by a RainWise inspector and property owners apply for the rebate. RainWise rebates for rain gardens remain at four dollars per square foot of roof area controlled. Rebates for cisterns equal 69 percent or more of the rain garden rate, depending on the size of the cistern and contributing area.

Figure 4-8: RainWise school installation at Leschi Elementary (left) and typical cistern installation (right)

In 2021, the RainWise Program rebated 87 projects in the Ballard, North Union Bay, Delridge, Fremont, Genesee, Henderson, Leschi, Montlake, and Windermere basins. Since program inception, 1,182 installations have been rebated in combined sewer basins managed by SPU. These installations control approximately 36 acres of impervious roof area and an estimated 16.8 million gallons (MG) per year of stormwater, and they provide an estimated 316,000 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 Ballard/West Phinney, University, Montlake, Central District, Highland Park, and South Park. DNRP rebated 71 installations in 2021, for a total of 1018 installations since 2013 and an estimated 12.58 million gallons of stormwater managed per year.

SPU will continue to offer its RainWise Program in 2022.

4.8.2 NDS Partnering

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 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 the Seattle Department of Transportation (SDOT), meeting the NDS Partnering regulatory milestone of issuing construction NTP 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 2021 SPU continued to perform options analysis on the **North Thornton Creek NDS Project**. SPU slowed the pace of this work in order to more fully engage with the community in identifying project locations. SPU is trying a newer approach for engaging with the community, and in particular underserved populations, by implementing a community liasion program that brings local community members to the table to reach out to and support community members who wouldn't ordinarily participate in more traditional outreach events. In 2021, the North Thornton Creek NDS Project also brought a new consultant team on board to complete options analysis through 30% design. Work under this project included identifying potential project blocks with potential partnership opportunities (such as with SDOT and the community).

In 2021 SPU finished design of the **Longfellow NDS Project** and awarded the construction contract. The contractor requested a delay in NTP to avoid constructing in the wet winter months and will begin construction in April 2022. At the Kenyon site of the Longfellow NDS project, we were able to partner with SDOT for significant pedestrian improvements at a street end where we will install bioretention that includes a walkway and bridge that will be retrofitted as part of this project. In addition, this site includes 1% for Art dollars to work with an artist to bring art to this transformed community space. Figure 4-9 shows a rendering of what is proposed.

Figure 4-9: Rendering of Art at Kenyon Site

In 2021 design of the **South Thornton Creek NDS Proje**ct and **Broadview NDS Project** continued and both required extensive coordination and redesign due to changes in SDOT requirements for pedestrian walkways, as a result, they both completed their 60% redesign work and community outreach. The South Thornton NDS Project incorporated an SDOT partnership at one of it's sites to include a walkway on the opposite side of the street from the bioretention facilities.

Finally, in 2021 the NDS Partnering Program identified and began work on what is anticipated as the last two project sites needed to meet our regulatory requirement under the NDS Partnering Program, the **Pipers NDS** and **Holden NDS** projects. For Pipers NDS, this work included community outreach and narrowing down of potential project streets based on community input and other identified needs, such as flooding and system capacity issues and partnership potential with SDOT for walkways. The work at the Holden NDS site involved feasibility analysis to help ensure that this was a viable site.

In 2022, options analysis and community outreach will continue for the North Thornton Creek NDS Project, Pipers NDS, and Holden NDS projects, including conducting geotechnical analysis, developing concept plans, implementing outreach plans and stategies for reaching underserved communities, incorporating community feedback into the concept plans, and finalizing the selection of preferred

blocks for design. The Longfellow NDS Project will begin construction in Spring 2022. The South Thornton NDS Project will complete design in 2022 and begin construction in 2023. The Broadview NDS Project will complete design in 2022 and then will be shelved until the Pipers NDS project hits 90%, at which point it will be incorporated into the Pipers NDS project for construction.

4.9 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 2021, the team continued implementing the expanded program. SDOT street sweeping crews swept just under 12,000 miles in the municipal separate storm sewer system area, capturing 183 dry tons of total suspended solids (TSS) equivalent (150% of plan). 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; and
- Adapted operations in response to the COVID-19 pandemic.

During 2022, 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;
- Continue sample collection on a quarterly basis; and
- Improve process efficiency with a focus on incorporating protected bike lanes into the program.

The City is on schedule to meet the annual commitment of capturing 122 tons of TSS equivalent in 2022.

SECTION 5

Monitoring Programs and Results

This section provides a brief overview of SPU's precipitation and flow monitoring programs and presents 2021 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 2021.

Two tables summarizing 2021 precipitation monitoring results are included in this report:

- Table 5-1 provides precipitation by gauge and by month; and
- 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 2021, every SPU rain gauge exceeded that amount. Totals ranged from 37.35 inches to 44.99 inches, and the average was 40.96 inches. The 2021 January and November rain was the highest of the last 5 years.

5.2 Flow Monitoring Program

In 2021, 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 2021 Monitoring Results

Several tables summarizing 2021 flow monitoring and flow monitor performance are included in the following pages of this report:

- Table 5-3 show the 2021 flow monitor performance by outfall and month;
- Table 5-4 provides the details of all 2021 discharges by outfall and date;
- Table 5-5 includes the most recent 5-year overflow frequency for each outfall and compares 2021 and baseline CSO conditions;
- Table 5-6 compares 2016-2021 CSOs by outfall;
- Table 5-7 compares 2016-2021 CSOs by receiving waterbody;
- Table 5-8 shows which outfalls met the CSO performance standard for controlled outfalls in 2021.

Exacerbated CSOs and DWOs are included in the table listing all 2021 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 16, 48, and 67, each SPU flow monitoring station was in service over 99% of the time. The monitors at Outfalls 16, 48, and 67 were in service no less than 98.4% of the time.
- There were 207 CSOs in 2021, totaling 78.6 million gallons (MG).
- As noted in Section 3.1.5, there were also 4 DWOs and no exacerbated CSOs.
- Over 42 percent of the 2021 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 60 percent of the 2021 CSOs (123 of the 220 CSOs) and 62 percent of the 2021 CSO volume (48.5 of the 78.5 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 2002-2021 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 2002-2021, Outfall 59 averaged 1.1 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 2002-2021 average number of CSOs is 0.5 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 will be included in the Outfall 44 Post Construction Monitoring Program report due April 30, 2022.

5.5 Integrated Plan Post-Construction Monitoring

Volume 3 of the Plan to Protect Seattle Waterways included a commitment to monitor the individual performance of the three Integrated Plan projects as data is available and to monitor overall performance once data is available from all three Integrated Plan 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. The South Park Water Quality stormwater facility and many of the NDS Partnering projects have not been constructed, so no post-construction monitoring was conducted during 2021.

Table 5-1. 2021 Precipitation by Gauge and by Month (inches)												
Rain Gauge	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
RG01	8.53	3.99	3.15	0.90	1.17	1.80	0.10	0.26	3.60	4.79	7.63	5.39
RG02	7.82	4.22	3.13	0.84	1.22	1.92	0.06	0.24	2.85	4.30	7.03	4.40
RG03	8.47	4.10	3.16	0.91	0.94	2.02	0.00	0.11	2.98	4.69	7.84	5.09
RG04	8.27	4.27	3.21	0.86	1.32	2.03	0.04	0.18	3.45	5.03	8.18	5.42
RG05	8.26	3.21	2.46	0.61	0.91	2.02	0.01	0.00	2.43	4.02	8.78	4.64
RG07	8.62	3.43	2.96	0.83	1.16	1.87	0.00	0.21	3.78	5.03	8.08	5.54
RG08	9.37	3.68	2.96	0.74	1.03	1.93	0.00	0.10	3.54	4.71	7.82	5.16
RG09	8.99	4.00	3.42	0.92	1.01	2.07	0.00	0.13	3.74	5.22	8.97	5.26
RG11	8.18	3.38	2.92	0.89	0.88	2.12	0.00	0.04	2.75	4.30	7.65	4.57
RG12	8.13	3.31	3.05	0.65	0.87	1.93	0.00	0.08	3.25	4.60	7.78	4.57
RG14	8.96	3.65	3.27	0.90	1.06	2.21	0.00	0.11	2.94	4.64	8.74	5.11
RG15	8.71	3.66	3.21	0.70	1.04	2.16	0.00	0.56	2.53	4.74	9.19	5.66
RG16	8.51	4.02	3.07	0.75	0.80	2.24	0.00	0.33	2.48	4.50	9.17	5.30
RG17	8.32	3.58	2.66	0.79	0.93	1.93	0.00	0.07	2.43	4.26	9.25	5.14
RG18	8.74	3.97	3.07	0.78	1.03	2.25	0.01	0.39	2.55	4.81	9.10	5.53
RG25	8.30	4.32	3.58	0.99	1.14	2.11	0.00	0.11	2.75	4.66	8.38	5.14
RG30	9.25	4.57	3.14	0.97	1.03	1.96	0.01	0.34	2.77	5.38	9.83	5.74
RG32	8.45	3.68	3.12	0.67	1.07	2.05	0.00	0.29	2.37	4.64	8.78	5.39
RG33	7.92	4.29	3.60	0.95	1.10	2.00	0.02	0.18	3.12	4.91	8.06	5.15
RG34	7.87	3.75	3.17	0.93	1.01	1.90	0.17	0.29	3.44	4.87	7.89	5.61
RG35	8.72	4.21	3.27	0.99	1.00	2.08	0.01	0.17	3.10	4.76	8.08	4.73
RG36	8.74	3.77	3.22	0.84	1.12	2.16	0.01	0.12	2.90	4.84	9.50	5.56
Monthly Average	**8.51**	**3.87**	**3.13**	**0.84**	**1.04**	**2.03**	**0.02**	**0.20**	**2.99**	**4.71**	**8.44**	**5.19**

Table 5-2. 2017-2021 Average Precipitation by Month (inches)					
Month/Year	**2017**	**2018**	**2019**	**2020**	**2021**
January	4.00	8.11	3.28	8.40	8.51
February	8.61	2.75	4.16	4.11	3.87
March	6.80	2.12	1.50	3.38	3.13
April	4.09	5.34	2.57	1.69	0.84
May	2.55	0.21	1.11	3.28	1.04
June	1.16	1.26	0.69	1.82	2.03
July	0.01	0.01	1.31	0.15	0.02
August	0.09	0.21	1.18	0.42	0.20
September	0.93	1.18	3.01	2.94	2.99
October	3.39	3.42	2.70	2.89	4.71
November	8.39	4.72	1.72	5.43	8.44
December	4.80	6.02	7.21	6.28	5.19
Annual Total	**44.82**	**35.35**	**30.43**	**40.79**	**40.96**

Table 5-3. 2021 Flow Monitor Performance by Outfall and Month

Outfall Number	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sept		Oct		Nov		Dec		2021 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	2.3	99.7	2.3	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	9.0	98.8	0.0	100.0	9.0	99.9
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	5.8	99.2	0.0	100.0	0.0	100.0	5.8	99.9
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	73.0	89.9	38.9	94.8	111.9	98.7
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	0.0	100.0	0.0	100.0	0.0	100.0
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	2.2	99.7	2.2	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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	15.8	97.9	0.0	100.0	0.0	100.0	15.8	99.8
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	NA
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		2021 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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	9.0	98.8	2.2	99.7	11.2	99.9
41	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	9.0	98.8	2.2	99.7	11.2	99.9
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	11.8	98.4	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	9.0	98.8	0.0	100.0	20.8	99.8
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	3.0	99.6	2.2	99.7	5.2	99.9
46	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
47	7.6	99.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	35.6	95.2	0.0	100.0	99.1	86.2	0.0	100.0	0.0	100.0	0.0	100.0	142.2	98.4
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	9.0	98.8	0.0	100.0	9.0	99.9
49	2.9	99.6	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	0.0	100.0	0.0	100.0	2.9	100.0
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	5.1	99.3	0.0	100.0	5.1	99.9
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	26.3	96.5	58.3	91.3	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	0.0	100.0	84.7	99.0
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	10.6	98.4	0.0	100.0	53.2	92.9	56.2	92.5	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	119.9	98.6
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	0.0	100.0	0.0	100.0
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	NA
71	0.0	100.0	79.1	88.2	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	79.1	99.0
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	NA
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		2021 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	9.0	98.8	4.2	99.4	13.2	99.8
83	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	9.8	98.6	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	54.0	92.5	43.0	94.2	106.8	98.8
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	9.0	98.8	0.0	100.0	9.0	99.9
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	4.5	99.4	4.5	99.9
94	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	9.0	98.8	0.0	100.0	9.0	99.9
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	0.0	100.0	0.0	100.0	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	96.1	0.0	100.0	0.0	100.0	0.0	100.0	28.0	99.7
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	0.0	100.0	0.0	100.0
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	58.5	92.1	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	58.5	99.3
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	61.5	91.7	0.0	100.0	4.2	99.4	65.7	99.3
136	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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		2021 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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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	2.2	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	2.2	100.0
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	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	32.5	95.5	0.0	100.0	32.5	99.6
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	0.9	99.9	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	9.0	98.8	4.5	99.4	14.4	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	9.0	98.8	2.2	99.7	11.2	99.9
170	0.0	100.0	3.7	99.5	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	3.7	100.0
171	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
174	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
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:	**48.6**	**99.9**	**153.9**	**99.7**	**0.0**	**100.0**	**54.0**	**99.9**	**56.2**	**99.9**	**9.8**	**100.0**	**35.6**	**99.9**	**58.5**	**99.9**	**127.1**	**99.8**	**83.2**	**99.9**	**257.6**	**99.6**	**112.4**	**99.8**	**996.9**	**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. 2021 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	*No combined sewer overflows during 2021*				
WA0031682	13	City of Seattle	Lake Washington	01/02/21	66,093	1.05	103.65	2.21
				01/05/21	359,384	3.88	177.67	4.04
				01/12/21	2,532,471	10.22	70.85	2.94
				05/22/21	54,718[1]	2.47	0.00	0.00
				10/28/21	1,110,097	10.20	36.95	2.16
				Total	4,122,763	27.82	389.12	11.35
				Average	824,553	5.56	77.82	2.27
WA0031682	**14**	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	**15**	City of Seattle	Lake Washington	01/02/21	24,447	2.17	102.77	2.74
				01/12/21	23,331	22.20	70.93	2.99
				Total	47,778	24.37	173.70	5.73
				Average	23,889	12.19	86.85	2.86
WA0031682	**16**	City of Seattle	Union Bay	*No combined sewer overflows during 2021*				

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	01/02/21	134,388	1.75	104.13	2.79
				01/12/21	852,184	2.33	70.93	2.99
				Total	986,572	4.08	175.07	5.78
				Average	493,286	2.04	87.53	2.89
WA0031682	19	City of Seattle	Union Bay	*No combined sewer overflows during 2021*				
WA0031682	20	City of Seattle	Union Bay	11/23/21	27,907	1.33	16.05	0.60
				Total	27,907	1.33	16.05	0.60
				Average	27,907	1.33	16.05	0.60
WA0031682	22	City of Seattle	Union Bay	*No combined sewer overflows during 2021*				
WA0031682	24	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	25	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	27	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	28	City of Seattle	Lake Washington	01/01/21	1,673	0.20	69.97	1.24
				01/02/21	2,779	1.93	102.27	2.95
				01/13/21	205,101	5.43	70.93	2.69
				09/17/21	842	0.20	16.60	0.34
				09/19/21	127	0.03	59.57	1.25

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				10/28/21	3,368	1.13	21.67	1.08
				11/11/21	941	0.23	21.73	0.78
				Total	214,831	9.15	362.73	10.33
				Average	30,690	1.31	51.82	1.48
WA0031682	29	City of Seattle	Lake Washington	01/02/21	64,700	2.53	102.80	3.00
				01/12/21	135,200	24.33	70.93	2.69
				Total	199,900	26.86	173.73	5.69
				Average	99,950	13.43	86.87	2.85
WA0031682	30	City of Seattle	Lake Washington	01/02/21	10,051	2.50	102.82	3.00
				01/12/21	59,483	24.23	70.93	2.69
				Total	69,534	26.73	173.75	5.69
				Average	34,767	13.37	86.88	2.85
WA0031682	31	City of Seattle	Lake Washington	01/02/21	318,931	12.33	107.23	3.06
				01/05/21	29,491	3.17	176.32	4.87
				01/11/21	570,105	32.17	70.93	2.69
				Total	918,527	47.67	354.48	10.62
				Average	306,176	15.89	118.16	3.54

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	32	City of Seattle	Lake Washington	01/02/21	62,753	4.60	104.60	3.06
				01/12/21	129,173	24.90	70.93	2.69
				Total	191,926	29.50	175.53	5.75
				Average	95,963	14.75	87.77	2.88
WA0031682	33	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	34	City of Seattle	Lake Washington	01/02/21	15,606	1.25	103.15	3.01
				Total	15,606	1.25	103.15	3.01
				Average	15,606	1.25	103.15	3.01
WA0031682	35	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	36	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	38	City of Seattle	Lake Washington	01/02/21	241,919	4.23	103.60	3.57
				01/12/21	14,183	1.25	39.90	2.81
				Total	256,102	5.48	143.50	6.38
				Average	128,051	2.74	71.75	3.19
WA0031682	40	City of Seattle	Lake Washington	01/02/21	300,294	20.68	120.75	3.77
				01/12/21	383,910	27.37	39.90	2.81
				Total	684,204	48.05	160.65	6.58
				Average	342,102	24.02	80.33	3.29

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	41	City of Seattle	Lake Washington	01/02/21	300,294	20.68	120.75	3.77
				01/12/21	383,910	27.37	39.90	2.81
				Total	684,204	48.05	160.65	6.58
				Average	342,102	24.02	80.33	3.29
WA0031682	42	City of Seattle	Lake Washington	01/02/21	166,475	9.67	105.10	3.57
				01/06/21	2,943	1.17	177.67	5.46
				01/12/21	165,921	22.77	39.90	2.81
				Total	335,339	33.61	322.67	11.84
				Average	111,780	11.20	107.56	3.95
WA0031682	43	City of Seattle	Lake Washington	01/02/21	578,229	52.58	146.70	4.34
				01/05/21	18,630	11.42	178.03	5.48
				01/12/21	421,473	32.92	39.90	2.81
				Total	1,018,332	96.92	364.63	12.63
				Average	339,444	32.31	121.54	4.21
WA0031682	44	City of Seattle	Lake Washington	01/03/21	967,060	38.32	145.48	4.34
				01/05/21	963,175	19.95	178.03	5.48
				01/12/21	3,184,920	31.85	39.90	2.81
				Total	5,115,155	90.12	363.42	12.63
				Average	1,705,052	30.04	121.14	4.21

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	45	City of Seattle	Lake Washington	01/02/21	44,995	1.17	102.38	3.53
				01/12/21	23,759	21.47	39.90	2.81
				Total	68,754	22.63	142.28	6.34
				Average	34,377	11.32	71.14	3.17
WA0031682	46	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	47	City of Seattle	Lake Washington	01/02/21	953,667	10.00	105.57	3.71
				01/12/21	541,587	23.80	70.82	3.22
				10/28/21	14,948	11.47	33.87	2.29
				11/11/21	17,599	8.77	27.77	1.43
				11/13/21	4,358	0.57	7.12	0.73
				Total	1,532,159	54.61	245.14	11.38
				Average	306,432	10.92	49.03	2.28
WA0031682	48	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	49	City of Seattle	Lake Washington	01/02/21	2,159,834	19.88	115.67	3.92
				01/06/21	164,712	4.63	178.95	5.79
				01/12/21	2,760,702	28.72	70.82	3.22
				10/28/21	220,833	5.67	34.83	2.35
				11/12/21	3,632	0.70	39.22	1.95
				11/14/21	5,706	0.83	30.58	1.51
				Total	5,315,419	60.43	470.07	18.74

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				Average	885,903	10.07	78.34	3.12
WA0031682	**57**	City of Seattle	Puget Sound - Central	*No combined sewer overflows during 2021*				
WA0031682	**59**	City of Seattle	Salmon Bay	*No combined sewer overflows during 2021*				
WA0031682	**60**	City of Seattle	Salmon Bay	*No combined sewer overflows during 2021*				
WA0031682	**61**	City of Seattle	Elliott Bay	01/12/21	2,113	0.17	40.12	2.94
				Total	2,113	0.17	40.12	2.94
				Average	2,113	0.17	40.12	2.94
WA0031682	**62**	City of Seattle	Elliott Bay	*No combined sewer overflows during 2021*				
WA0031682	**64**	City of Seattle	Elliott Bay	*No combined sewer overflows during 2021*				
WA0031682	**68**	City of Seattle	Elliott Bay	01/12/21	24,184	1.43	40.27	2.96
				Total	24,184	1.43	40.27	2.96
				Average	24,184	1.43	40.27	2.96
WA0031682	**69**	City of Seattle	Elliott Bay	11/11/21	2,345	0.08	21.87	0.76
				Total	2,345	0.08	21.87	0.76
				Average	2,345	0.08	21.87	0.76

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	**70**	City of Seattle	Elliott Bay	*No combined sewer overflows during 2021*				
WA0031682	**71**	City of Seattle	Elliott Bay	*No combined sewer overflows during 2021*				
WA0031682	**72**	City of Seattle	Elliott Bay	*No combined sewer overflows during 2021*				
WA0031682	**78**	City of Seattle	Elliott Bay	*No combined sewer overflows during 2021*				
WA0031682	**80**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**83**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**85**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**88**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**90**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**91**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**94**	City of Seattle	Puget Sound	*No combined sewer overflows during 2021*				
WA0031682	**95**	City of Seattle	Puget Sound	01/02/21	9,905	6.78	102.43	3.13
				01/12/21	31,724	23.03	41.33	2.91

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				11/11/21	765	0.17	21.72	0.83
				Total	42,394	29.99	165.48	6.87
				Average	14,131	10.00	55.16	2.29
WA0031682	**99**	City of Seattle	West Waterway - Duwamish	*No combined sewer overflows during 2021*				
WA0031682	**107**	City of Seattle	East Waterway - Duwamish	01/12/21	14,358	1.60	19.93	1.64
				Total	14,358	1.60	19.93	1.64
				Average	14,358	1.60	19.93	1.64
WA0031682	**111**	City of Seattle	Duwamish River	01/02/21	141,638	2.83	103.45	3.22
				01/13/21	168,150	2.08	40.12	2.91
				Total	309,788	4.91	143.57	6.13
				Average	154,894	2.46	71.78	3.07
WA0031682	**120**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**121**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**124**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**127**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**129**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	**130**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**131**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**132**	City of Seattle	Lake Union	01/13/21	63,827	0.27	70.93	2.99
				09/19/21	342	0.07	59.38	1.37
				Total	64,169	0.34	130.32	4.36
				Average	32,085	0.17	65.16	2.18
WA0031682	**134**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**135**	City of Seattle	Lake Union	01/12/21	5,065	0.42	70.93	2.99
				Total	5,065	0.42	70.93	2.99
				Average	5,065	0.42	70.93	2.99
WA0031682	**136**	City of Seattle	Lake Union	*No combined sewer overflows during 20210*				
WA0031682	**138**	City of Seattle	Portage Bay	01/02/21	32,690	2.70	102.77	2.74
				01/12/21	296,380	23.00	70.93	2.99
				Total	329,070	25.70	173.70	5.73
				Average	164,535	12.85	86.85	2.87
WA0031682	**139**	City of Seattle	Portage Bay	01/02/21	205,453	5.50	102.63	2.74
				01/12/21	50,235	1.25	50.32	1.70

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				09/19/21	9,315	0.17	59.38	1.37
				Total	265,003	6.92	212.33	5.81
				Average	88,334	2.31	70.78	1.94
WA0031682	**140**	City of Seattle	Portage Bay	01/02/21	113,890	4.25	104.05	2.79
				01/12/21	287,867	22.75	70.93	2.99
				Total	401,757	27.00	174.98	5.78
				Average	200,879	13.50	87.49	2.89
WA0031682	**141**	City of Seattle	Portage Bay	*No combined sewer overflows during 2021*				
WA0031682	**144**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**145**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**146**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				
WA0031682	**147**	City of Seattle	Lake Union	01/01/21	1,313,520	107.58	177.38	4.86
				01/11/21	1,920,599	42.58	117.07	3.52
				01/14/21	2,969	0.17	1.15	0.11
				01/28/21	441	0.17	28.05	0.30
				02/01/21	150,942	17.83	90.77	1.84
				02/06/21	236	0.08	1.37	0.07
				02/15/21	166,809	5.25	28.77	1.38

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				02/21/21	587	0.17	1.37	0.10
				02/26/21	12,894	0.25	0.52	0.10
				03/07/21	76,279	3.92	25.02	0.33
				03/18/21	13,811	0.33	2.47	0.17
				03/20/21	58,968	0.67	51.72	0.63
				03/22/21	15,510	9.42	95.72	1.17
				03/24/21	68,841	10.42	11.80	0.52
				03/28/21	7,207	0.83	2.78	0.27
				05/07/21	47,737	9.75	14.22	0.33
				06/06/21	97,540	10.17	14.42	0.68
				06/11/21	36,966	0.50	12.62	0.38
				06/13/21	60,695	3.00	55.78	1.16
				09/17/21	310,804	43.33	59.68	1.75
				09/26/21	268,368	24.50	25.08	1.34
				09/30/21	5,922	0.42	23.92	0.50
				10/05/21	9,601	0.75	1.47	0.23
				10/10/21	10,782	20.42	29.73	0.45
				10/21/21	38,091	1.08	2.18	0.32
				10/24/21	15,788	1.58	31.85	0.38
				10/26/21	15,966	0.33	80.03	0.68
				10/28/21	738,233	28.58	38.78	2.66
				11/03/21	152,664	14.75	69.52	1.47
				11/06/21	76,678	28.08	143.77	2.41
				11/09/21	45,144	15.92	16.23	0.58

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				11/11/21	173,484	25.25	41.78	1.61
				11/13/21	190,712	43.00	113.10	3.24
				11/23/21	78,198	4.25	29.07	0.70
				11/25/21	8,820	15.75	89.15	1.34
				11/27/21	10,018	24.25	156.15	2.09
				12/11/21	68,353	24.17	33.32	0.87
				12/18/21	50,839	8.00	19.82	0.88
				12/21/21	58,106	25.25	28.43	1.04
				12/24/21	1,656	0.25	71.10	1.29
				Total	6,380,778	573.00	1837.14	43.75
				Average	159,519	14.33	45.93	1.09
WA0031682	**148**	City of Seattle	Lake Washington - ShipCanal	*No combined sewer overflows during 2021*				
WA0031682	**150/151**	City of Seattle	Salmon Bay	01/01/21	30,844	0.42	68.97	1.09
				01/02/21	176,251	5.50	101.47	2.98
				01/05/21	11,412	1.95	172.50	4.81
				01/11/21	583,946	37.48	40.33	3.26
				02/01/21	31,979	0.53	72.38	1.62
				03/22/21	3,600	0.20	95.53	0.89
				03/25/21	11,650	0.30	8.47	0.27
				05/07/21	8,860	0.45	13.92	0.32
				06/06/21	793	0.17	6.58	0.39
				06/11/21	10,711	0.35	11.95	0.34

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				09/17/21	49,844	16.58	32.75	1.38
				09/19/21	147,463	0.38	59.22	1.73
				09/26/21	103,672	24.30	24.95	1.31
				10/05/21	7	0.08	0.87	0.12
				10/10/21	316	0.13	25.92	0.38
				10/21/21	88	0.23	1.47	0.21
				10/24/21	93	0.17	66.90	0.85
				10/26/21	11,837	0.22	115.87	1.26
				10/28/21	3,566	13.88	38.17	2.26
				11/03/21	10,940	13.58	68.90	1.29
				11/06/21	40,557	19.63	144.03	2.11
				11/09/21	90	1.58	2.27	0.24
				11/11/21	112,389	12.05	29.63	0.94
				11/13/21	723	0.37	71.37	1.60
				11/15/21	3,706	1.48	112.40	2.77
				11/23/21	15,738	0.37	14.63	0.47
				11/25/21	47	0.08	7.42	0.20
				11/27/21	581	22.95	88.95	1.13
				12/11/21	5,627	40.42	51.02	1.07
				12/22/21	21,556	18.93	26.83	0.95
				12/24/21	23,477	1.35	74.13	1.53
				Total	1,422,363	236.11	1649.78	39.77
				Average	45,883	7.62	53.22	1.28

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	**152**	City of Seattle	Salmon Bay	01/01/21	8,545,858	110.42	177.90	5.02
				01/08/21	11,316	5.67	10.47	0.31
				01/11/21	10,397,406	49.33	40.33	3.26
				02/01/21	558,267	30.93	83.12	1.79
				02/08/21	995	0.38	35.52	0.05
				02/15/21	702,970	9.38	54.17	1.52
				02/21/21	777	0.72	1.82	0.12
				02/25/21	67,036	0.83	12.98	0.20
				03/04/21	51,961	3.13	8.00	0.46
				03/07/21	77,802	10.63	29.23	0.41
				03/18/21	71,180	0.65	2.57	0.17
				03/22/21	143,608	9.83	95.60	0.90
				03/25/21	103,277	4.35	11.43	0.42
				03/28/21	109,088	1.50	3.10	0.27
				05/07/21	262,377	1.17	14.47	0.34
				05/27/21	84	0.08	9.82	0.29
				06/06/21	362,372	9.80	10.55	0.53
				06/11/21	242,199	0.73	12.25	0.34
				06/13/21	123,741	15.32	53.92	1.12
				09/17/21	1,240,354	43.32	59.48	1.73
				09/26/21	1,170,888	24.77	25.35	1.31
				09/29/21	48,614	13.22	23.57	0.41
				10/05/21	74,805	0.85	1.63	0.21
				10/10/21	105,661	20.48	29.55	0.43

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				10/21/21	175,615	5.07	5.90	0.58
				10/24/21	83,153	1.57	67.90	0.96
				10/26/21	31,527	0.53	115.92	1.27
				10/28/21	1,955,891	28.75	38.43	2.29
				11/03/21	793,540	35.65	90.47	1.39
				11/06/21	658,520	28.27	144.50	2.11
				11/09/21	206,288	15.78	16.07	0.46
				11/11/21	1,237,353	37.50	42.58	1.37
				11/13/21	594,184	43.67	112.95	2.82
				11/18/21	8,715	3.90	4.87	0.27
				11/23/21	570,346	4.33	15.53	0.57
				11/25/21	57,389	16.42	23.58	0.58
				11/27/21	98,796	24.58	90.33	1.21
				12/10/21	751,739	54.12	61.22	1.21
				12/17/21	320,344	19.07	20.45	0.89
				12/21/21	851,627	25.68	27.97	1.02
				12/24/21	409,743	21.40	74.43	1.53
				Total	33,277,406	733.78	1759.91	42.14
				Average	811,644	17.90	42.92	1.03
WA0031682	**161**	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	**165**	City of Seattle	Lake Washington	01/02/21	1,430	1.08	101.70	3.47
				01/13/21	376	0.25	39.90	2.81

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
				Total	1,806	1.33	141.60	6.28
				Average	903	0.67	70.80	3.14
WA0031682	**168**	City of Seattle	Lake Washington	01/03/21	82,563	4.08	107.87	3.14
				01/12/21	1,715,960	15.03	137.82	3.25
				Total	1,798,523	19.12	245.68	6.39
				Average	899,261	9.56	122.84	3.19
WA0031682	**169**	City of Seattle	Lake Washington	01/02/21	823,663	11.40	113.25	3.26
				01/12/21	1,593,135	23.78	137.82	3.25
				Total	2,416,798	35.18	251.07	6.51
				Average	1,208,399	17.59	125.53	3.25
WA0031682	**170**	City of Seattle	Lake Washington	*No combined sewer overflows during 2021*				
WA0031682	**171**	City of Seattle	Lake Washington	01/02/21	1,142,844	10.08	105.70	3.71
				01/12/21	1,392,308	23.92	70.82	3.22
				10/28/21	57,758	11.50	33.75	2.28
				11/11/21	55,149	8.83	27.70	1.43
				11/13/21	25,488	0.67	7.10	0.73
				Total	2,673,547	55.00	245.07	11.37
				Average	534,709	11.00	49.01	2.27

Permit No	Outfall No	Facility Name	Receiving Water	CSO Events				
				Starting Date	Volume (gallons)	Duration (hours)	Storm Duration (hours)	Precipitation (inches)
WA0031682	**174**	City of Seattle	Lake Washington Canal	01/02/21	1,750,316	7.67	105.22	2.95
				01/05/21	641,576	11.75	183.22	4.91
				01/08/21	178	0.08	4.88	0.10
				01/11/21	3,770,624	44.00	117.07	3.52
				02/01/21	4,175	0.08	74.77	1.59
				02/28/21	4,973	10.08	0.08	0.01
				03/02/21	1,321[1]	0.08	0.00	0.00
				03/07/21	2,819	0.08	24.60	0.31
				03/09/21	1,876[1]	0.08	0.00	0.00
				03/12/21	3,618[1]	0.08	0.00	0.00
				03/24/21	696	0.08	0.63	0.02
				09/19/21	7,929	0.17	59.68	1.75
				10/28/21	1,144,671	6.47	32.85	2.35
				12/11/21	73,967	1.00	12.13	0.66
				Total	7,408,739	81.70	615.13	18.17
				Average	529,196	5.84	43.94	1.30
WA0031682	**175**	City of Seattle	Lake Union	*No combined sewer overflows during 2021*				

Notes:

1. Dry Weather Overflow

2. Exacerbated CSO

Table 5-5. Comparison of 2021 and Baseline CSOs by Outfall								
Outfall Number	2017 - 2021 Average CSO Frequency (No./year)	2021 CSO Discharge Events			Receiving Water	2010 Baseline CSO		2021 CSOs Compared to 2010 Baseline CSOs
		Frequency (No./year)	Duration (hours)	Volume (gallons)		Frequency (No./year)	Volume (MG/year)	
12	0	0	0.00	0	Lake Washington	0	0	Equals
13	3.2	4	25.35	4,068,045	Lake Washington	12	6.7	Below
14	0.4	0	0.00	0	Lake Washington	0	0	Equals
15	2	2	24.37	47,778	Lake Washington	1.2	0.3	Frequency Above, Volume Below
16	0.4	0	0.00	0	Lake Washington	0	0	Equals
18	1.4	2	4.08	986,572	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	2.8	1	1.33	27,907	Union Bay	2.6	0.1	Below
22	0.2	0	0.00	0	Union Bay	0.7	0.1	Below
24	0.6	0	0.00	0	Lake Washington	0.2	0	Frequency Below, Volume Equals
25	0.6	0	0.00	0	Lake Washington	2.8	1.6	Below
27	0	0	0.00	0	Lake Washington	0	0	Equals
28	4.2	7	9.15	214,831	Lake Washington	15	0.4	Below
29	2.4	2	26.86	199,900	Lake Washington	4.7	0.3	Below
30	2	2	26.73	69,534	Lake Washington	5.4	0.7	Below
31	4	3	47.67	918,527	Lake Washington	9.3	0.5	Frequency Below, Volume Above
32	2.4	2	29.50	191,926	Lake Washington	8.4	0.3	Below
33	N/A	NA	NA	N/A	Lake Washington	NA	NA	Removed from service 2016
34	1	1	1.25	15,606	Lake Washington	1.4	0.5	Below
35	0.2	0	0.00	0	Lake Washington	2	0.3	Below
36	0	0	0.00	0	Lake Washington	2.7	0.1	Below
38	1.6	2	5.48	256,102	Lake Washington	0.7	0.4	Frequency Above, Volume Below
40	1.8	2	48.05	684,204	Lake Washington	6	0.8	Below
41	1.8	2	48.05	684,204	Lake Washington	7.5	0.9	Below
42	1.6	3	33.61	335,339	Lake Washington	0.6	0.02	Above
43	3.6	3	96.92	1,018,332	Lake Washington	7	0.7	Frequency Below, Volume Above
44	3.4	3	90.12	5,115,155	Lake Washington	13	9.3	Below
45	1.8	2	22.63	68,754	Lake Washington	5.9	1.1	Below
46	0.4	0	0.00	0	Lake Washington	6.5	0.9	Below

Outfall Number	2017 - 2021 Average CSO Frequency (No./year)	2021 CSO Discharge Events			Receiving Water	2010 Baseline CSO		2021 CSOs Compared to 2010 Baseline CSOs
		Frequency (No./year)	Duration (hours)	Volume (gallons)		Frequency (No./year)	Volume (MG/year)	
47	2.8	5	54.61	1,532,159	Lake Washington	5.6	1.8	Below
48	0	0	0.00	0	Lake Washington	0	0	Equals
49	4	6	60.43	5,315,419	Lake Washington	1.6	0.8	Above
57	0	0	0.00	0	Puget Sound	0	0	Equals
59	2.8	0	0.00	0	Salmon Bay	0.2	0.4	Below
60	1	0	0.00	0	Salmon Bay	1.7	0.8	Below
61	1.2	1	0.17	2,113	Elliott Bay	0	0	Above
62	1.2	0	0.00	0	Elliott Bay	0.7	0	Frequency Below, Volume Equals
64	0	0	0.00	0	Elliott Bay	0.1	0	Frequency Below, Volume Equals
68	1.6	1	1.43	24,184	Elliott Bay	1.4	1.3	Below
69	1.2	1	0.08	2,345	Elliott Bay	4.4	1.4	Below
70	0	NA	NA	N/A	Elliott Bay	0.9	0.2	Removed from service 2020
71	2	0	0.00	0	Elliott Bay	4.3	1.3	Below
72	0	NA	NA	N/A	Elliott Bay	1.2	0.3	Removed from service 2020
78	0	0	0.00	0	Elliott Bay	0.3	0.2	Below
80	0	0	0.00	0	Elliott Bay	0	0	Equals
83	0	0	0.00	0	Puget Sound	0	0	Equals
85	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	0.00	0	Puget Sound	0.2	0	Frequency Below, Volume Equals
91	0	0	0.00	0	Puget Sound	0	0	Equals
94	0	0	0.00	0	Puget Sound	0.1	0	Frequency Below, Volume Equals
95	1.8	3	29.99	42,394	Puget Sound	3	0.4	Frequency Equals, Volume Below
99	2.2	0	0.00	0	W Waterway - Duwamish River	0.5	2.8	Below
107	2.2	1	1.60	14,358	E Waterway - Duwamish River	3.8	1.9	Below
111	1.4	2	4.91	309,788	Duwamish River	3	7.9	Below
120	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	0.00	0	Lake Union	0	0	Equals

Outfall Number	2017 - 2021 Average CSO Frequency (No./year)	2021 CSO Discharge Events			Receiving Water	2010 Baseline CSO		2021 CSOs Compared to 2010 Baseline CSOs
		Frequency (No./year)	Duration (hours)	Volume (gallons)		Frequency (No./year)	Volume (MG/year)	
127	0	0	0.00	0	Lake Union	0.7	0.1	Below
129	0	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
130	0.2	0	0.00	0	Lake Union	0	0	Equals
131	0	0	0.00	0	Lake Union	0.1	0	Frequency Below, Volume Equals
132	0.8	2	0.34	64,169	Lake Union	0.7	0	Above
134	0	0	0.00	0	Lake Union	0	0	Equals
135	0.8	1	0.42	5,065	Lake Union	0.3	0	Above
136	0	0	0.00	0	Lake Union	0	0	Equals
138	1.8	2	25.70	329,070	Portage Bay	2.3	2	Below
139	2.8	3	6.92	265,003	Portage Bay	0.7	1.4	Frequency Above, Volume Below
140	4.2	2	27.00	401,757	Portage Bay	4.1	0.3	Frequency Below, Volume Above
141	0	0	0.00	0	Portage Bay	0.1	0	Frequency Below, Volume Equals
144	0	0	0.00	0	Lake Union	0.1	0.2	Below
145	0	0	0.00	0	Lake Union	0	0	Equals
146	0	0	0.00	0	Lake Union	0	0	Equals
147	40	40	573.00	6,380,778	Lake Union	33	19	Frequency Above, Volume Below
148	0.2	0	0.00	0	Lake Washington Ship Canal	0	0	Equals
150/151	22.4	31	236.11	1,422,363	Salmon Bay	15	2	Frequency Above, Volume Below
152	43.6	41	733.78	33,277,406	Salmon Bay	15	9.7	Above
161	0	0	0.00	0	Lake Washington	0	0	Equals
165	1.4	2	1.33	1,806	Lake Washington	1.1	0.02	Frequency Above, Volume Below
168	1.6	2	19.12	1,798,523	Longfellow Creek	3.9	1.6	Frequency Below, Volume Above
169	1.6	2	35.18	2,416,798	Longfellow Creek	2.2	49	Below
170	0.6	0	0.00	0	Longfellow Creek	0.4	0.1	Below
171	2.8	5	55.00	2,673,547	Lake Washington	4.1	0.75	Above
174	6.4	11	81.46	7,401,924	Lake Washington Ship Canal	11	5.9	Frequency Equals, Volume Above
175	0.4	0	0.00	0	Lake Union	0.7	0	Frequency Below, Volume Equals
Total	**202**	**207**	**2489.73**	**78,583,685**		**251**	**140**	

Table 5-6. 2017-2021 Summary Comparison of CSOs by Outfall

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	
12	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Washington
13	4	1	2	5	4	35.90	4.17	30.87	36.11	25.35	4,106,126	360,187	10,525,382	7,707,124	4,068,045	Lake Washington
14	1	0	0	1	0	0.08	0.00	0.00	1.00	0.00	1	0	0	5,005	0	Lake Washington
15	4	2	1	1	2	5.00	1.97	20.17	3.73	24.37	135,288	19,287	162,483	372,636	47,778	Lake Washington
16	0	0	1	1	0	0.00	0.00	0.18	0.33	0.00	0	0	1,269	575	0	Lake Washington
18	1	1	1	2	2	1.47	4.97	26.10	25.75	4.08	44,582	392,952	3,225,836	2,421,116	986,572	Union Bay
19	0	0	0	1	0	0.00	0.00	0.00	0.16	0.00	0	0	0	215	0	Union Bay
20	6	3	1	3	1	68.47	14.80	39.00	30.56	1.33	1,693,470	530,191	1,595,375	834,150	27,907	Union Bay
22	0	0	0	1	0	0.00	0.00	0.00	0.95	0.00	0	0	0	461	0	Union Bay
24	1	0	1	1	0	6.50	0.00	2.13	2.33	0.00	877,185	0	41,198	540,526	0	Lake Washington
25	1	0	1	1	0	5.67	0.00	2.33	2.30	0.00	459,487	0	116,115	812,813	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	4	1	5	4	7	5.37	1.87	14.02	2.52	9.15	24,045	6,611	21,771	55,823	214,831	Lake Washington
29	5	1	2	2	2	75.60	3.40	7.72	3.70	26.86	297,430	53,616	157,589	105,678	199,900	Lake Washington
30	3	1	1	3	2	14.38	3.12	7.30	4.51	26.73	24,363	14,492	39,810	89,469	69,534	Lake Washington
31	7	3	1	6	3	86.10	3.00	28.67	42.16	47.67	1,271,673	213,963	547,576	864,078	918,527	Lake Washington
32	3	3	1	3	2	50.10	3.80	11.23	12.63	29.50	251,033	54,332	232,294	279,919	191,926	Lake Washington
33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N/A	N/A	Lake Washington
34	1	1	1	1	1	4.23	6.90	3.23	2.75	1.25	98,569	347,045	27,359	139,256	15,606	Lake Washington
35	0	0	0	1	0	0.00	0.00	0.00	0.27	0.00	0	0	0	2,972	0	Lake Washington
36	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Lake Washington
38	3	1	1	1	2	12.53	6.43	9.60	3.75	5.48	587,079	113,752	409,725	355,975	256,102	Lake Washington
40	3	1	1	2	2	73.92	15.42	38.23	52.97	48.05	2,052,156	232,494	915,369	327,145	684,204	Lake Washington
41	3	1	1	2	2	73.92	15.42	38.23	52.97	48.05	2,052,156	232,494	915,369	327,145	684,204	Lake Washington
42	2	1	1	1	3	12.20	9.10	14.00	7.40	33.61	250,946	199,773	258,181	176,049	335,339	Lake Washington

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	
43	5	3	3	4	3	71.00	26.25	67.42	81.42	96.92	2,837,201	173,312	1,217,192	785,242	1,018,332	Lake Washington
44	11	1	1	1	3	302.23	13.75	57.67	0.40	90.12	16,067,339	566,412	5,435,510	3,068	5,115,155	Lake Washington
45	5	0	1	1	2	85.27	0.00	9.70	2.43	22.63	1,131,582	0	52,700	113,592	68,754	Lake Washington
46	0	0	0	2	0	0.00	0.00	0.00	13.15	0.00	0	0	0	220,085	0	Lake Washington
47	3	1	3	2	5	18.08	7.77	19.42	8.56	54.61	2,094,545	520,612	2,477,342	1,144,837	1,532,159	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	5	3	2	4	6	70.90	17.70	40.70	27.19	60.43	6,726,873	1,391,210	6,930,074	2,877,370	5,315,419	Lake Washington
57	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	Puget Sound
59	8	4	1	1	0	26.07	21.42	0.75	0.92	0.00	236,432	591,114	195,533	119,284	0	Salmon Bay
60	3	0	2	0	0	7.60	0.00	3.37	0.00	0.00	39,088	0	25,117	0	0	Salmon Bay
61	2	0	1	2	1	0.40	0.00	0.67	1.21	0.17	14,854	0	37,629	71,812	2,113	Elliott Bay
62	4	0	0	2	0	0.92	0.00	0.00	0.50	0.00	3,434	0	0	8,674	0	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	1	2	2	1	0.63	0.13	26.94	8.51	1.43	14,620	766	983,018	660,538	24,184	Elliott Bay
69	2	0	1	2	1	1.18	0.00	13.43	2.12	0.08	146,360	0	47,509	717,160	2,345	Elliott Bay
70	0	0	0	0	NA	0.00	0.00	0.00	0.00	NA	0	0	0	0	N/A	Elliott Bay
71	5	2	2	1	0	7.83	3.40	20.03	1.40	0.00	400,921	84,372	620,074	309,386	0	Elliott Bay
72	0	0	0	0	NA	0.00	0.00	0.00	0.00	NA	0	0	0	0	N/A	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	1	0	0	1	0	1.43	0.00	0.00	1.03	0.00	51,735	0	0	1,047,258	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	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0	0	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	0	2	2	3	1.14	0.00	6.73	3.07	29.99	14,958	0	6,673	28,802	42,394	Puget Sound
99	5	3	1	2	0	74.23	13.30	10.20	12.02	0.00	4,548,780	1,083,831	740,333	1,144,773	0	W Waterway - Duwamish River

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	
107	6	2	1	1	1	63.15	3.77	39.03	4.57	1.60	947,028	29,605	176,732	90,815	14,358	E Waterway - Duwamish River
111	2	1	1	1	2	5.93	2.77	7.97	4.47	4.91	317,148	56,370	1,401,251	292,182	309,788	Duwamish River
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	0	0	1	0	0.00	0.00	0.00	0.70	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	0	0	1	0	0.00	0.00	0.00	0.92	0.00	0	0	0	86,940	0	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	0	0	2	2	0.00	0.00	0.00	1.50	0.34	0	0	0	441,749	64,169	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	0	0	3	1	0.00	0.00	0.00	2.16	0.42	0	0	0	11,528	5,065	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	3	1	0	3	2	22.00	6.83	0.00	28.00	25.70	392,526	65,996	0	429,730	329,070	Portage Bay
139	3	3	3	2	3	10.50	12.53	37.11	5.75	6.92	389,283	443,323	1,849,563	334,584	265,003	Portage Bay
140	7	4	5	3	2	36.90	9.28	26.67	8.91	27.00	415,391	103,400	569,810	267,340	401,757	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	42	37	34	47	40	537.67	520.08	179.12	358.40	573.00	25,042,017	15,031,921	21,385,295	21,102,048	6,380,778	Lake Union
148	0	0	1	0	0	0.00	0.00	1.25	0.00	0.00	0	0	23,649	0	0	Lake Washington Ship Canal
150/151	29	22	9	21	31	159.87	152.14	22.17	111.01	236.11	4,695,385	2,916,004	2,349,832	2,056,525	1,422,363	Salmon Bay
152	50	45	33	49	41	879.15	777.04	291.33	589.37	733.78	56,062,735	22,660,613	19,992,281	27,157,824	33,277,406	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	2	1	1	1	2	4.60	0.73	0.17	13.42	1.33	31,973	732	1,754	127,525	1,806	Lake Washington
168	2	1	1	2	2	30.33	3.92	24.82	11.84	19.12	3,932,249	52,250	1,477,082	528,881	1,798,523	Longfellow Creek
169	3	0	1	2	2	22.10	0.00	27.38	20.70	35.18	1,783,155	0	1,335,434	1,253,119	2,416,798	Longfellow Creek

Outfall No.	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)					Receiving Water
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	
170	1	0	1	1	0	3.53	0.00	2.32	1.33	0.00	15,194	0	13,333	13,634	0	Longfellow Creek
171	3	1	3	2	5	9.90	3.77	18.90	8.73	55.00	481,749	266,958	1,759,209	844,280	2,673,547	Lake Washington
174	7	6	2	6	11	50.67	27.17	43.50	53.25	81.46	4,176,148	3,845,179	5,368,115	5,599,153	7,401,924	Lake Washington Ship Canal
175	0	1	0	1	0	0.00	3.08	0.00	1.55	0.00	0	366,058	0	327,474	0	Lake Union
Total	**275**	**164**	**141**	**221**	**207**	**3,037**	**1,721**	**1,292**	**1,679**	**2,490**	**147,236,290**	**53,021,226**	**95,664,745**	**85,635,340**	**78,583,685**	

Table 5-7. 2017-2021 Summary Comparison of CSOs by Receiving Water

Receiving Water	Frequency (Number per Year)					Duration (Hours per Year)					Volume (Gallons per Year)				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Duwamish River	2	1	1	1	2	6	3	8	5	5	317,148	56,370	1,401,251	292,182	309,788
East Waterway	6	2	1	1	1	63	4	39	5	2	947,028	29,605	176,732	90,815	14,358
Elliott Bay	15	3	6	9	3	11	4	61	14	2	580,189	85,138	1,688,230	1,767,570	28,642
Lake Union	42	39	34	54	43	538	523	179	364	574	25,042,017	15,397,980	21,385,295	21,969,739	6,450,012
Lake Washington	79	27	35	53	58	1,023	155	442	387	707	41,858,799	4,767,281	32,245,270	18,278,186	23,411,168
Lake Washington Ship Canal	7	6	3	6	11	51	27	45	53	81	4,176,148	3,845,179	5,391,764	5,599,153	7,401,924
Longfellow Creek	6	1	3	5	4	56	4	55	34	54	5,730,598	52,250	2,825,850	1,795,633	4,215,321
Portage Bay	13	8	8	8	7	69	29	64	43	60	1,197,199	612,719	2,419,373	1,031,654	995,830
Puget Sound	3	0	2	3	3	3	0	7	4	30	66,693	0	6,673	1,076,060	42,394
Salmon Bay	90	64	45	71	72	1,073	950	318	701	970	61,033,640	26,167,731	22,562,763	29,333,633	34,699,769
Union Bay	7	4	2	7	3	70	20	65	57	5	1,738,052	923,143	4,821,211	3,255,942	1,014,479
West Waterway	5	3	1	2	0	74	13	10	12	0	4,548,780	1,083,831	740,333	1,144,773	0
TOTAL:	275	158	141	220	207	3,037	1,732	1,292	1,679	2,490	147,236,290	53,021,226	95,664,745	85,635,340	78,583,685

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? [2]	Long-Term Simulation Source	Notes
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021				
12	0	0	0	0	0	0	0	0	0	1	0	1	1	2	0	0	0	0	0	0	0.3	Yes	N/A	3
13	1	2	2	1	2	1	0	2	1	0	1	1	4	5	2	4	1	2	5	4	2.1	No	Mike URBAN results, March 2017	4
14						1	0	1	0	0	0	0	0	1	1	1	0	0	1	0	0.4	Yes	N/A	5
15	1	2	1	1	3	1	0	2	1	1	1	2	6	7	3	4	2	1	1	2	2.1	No	Mike URBAN results, March 2017	4
16	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0.2	Yes	N/A	3
18	0	0	2	1	0	3	1	0	0	1	0	1	0	1	1	0	1	1	2	2	0.9	Yes	Mike URBAN results, October 2019	6
19	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0.2	Yes	N/A	3
20	0	0	2	1	0	3	1	0	3	3	3	2	2	5	8	4	6	3	1	3	2.5	No	LTCP Long Term Simulation Results February 2013	7
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0.2	Yes	EPA-SWMM results, February 2019	8
24	0	0	2	2	0	4	1	0	1	1	0	1	1	0	0	1	1	0	1	1	0.9	Yes	LTCP Long Term Simulation Results February 2013	7
25	0	0	2	1	0	3	1	1	2	1	0	1	1	0	0	1	1	0	1	1	0.9	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	10
28	2	1	2	0	1	1	1	0	0	0	0	2	2	2	2	3	1	5	4	7	1.8	No	Mike URBAN results, January 2019	10
29	1	0	1	0	1	0	0	0	0	0	0	0	0	1	1	2	1	2	2	2	0.7	Yes	Mike URBAN results, January 2019	10
30	1	2	2	1	4	1	1	2	1	1	3	3	5	5	3	4	1	1	3	2	2.3	No	Mike URBAN results, January 2019	10
31	2	2	3	2	4	1	1	5	2	2	4	3	9	9	6	7	3	1	6	3	3.8	No	Mike URBAN results, January 2019	10
32	1	1	1	0	1	1	1	0	0	0	1	2	2	2	2	1	3	1	3	2	1.3	No	Mike URBAN results, January 2019	10
33																				0	NA	NA	NA	11
34	1	2	1	0	2	1	1	0	1	1	1	1	2	1	1	1	1	1	1	1	1.1	No	Mike URBAN results, January 2019	10
35	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.2	Yes	Mike URBAN results, January 2019	10

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																				Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021				
36	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	Mike URBAN results, January 2019	10
38	0	0	0	0	2	1	0	0	1	0	1	0	0	0	0	2	0	1	1	2	0.6	Yes	Mike URBAN results, June 2021	12
40	0	2	1	0	4	1	0	2	2	1	2	1	2	3	1	3	1	2	2	2	1.6	No	Mike URBAN results, June 2021	12
41	0	2	1	0	4	1	0	2	2	1	2	1	2	3	1	3	1	2	2	2	1.6	No	Mike URBAN results, June 2021	12
42	0	2	0	0	2	1	1	1	1	1	1	0	0	3	1	2	0	1	1	3	1.1	No	Mike URBAN results, June 2021	12
43	1	2	1	1	7	2	1	5	4	2	6	2	6	4	4	6	2	2	4	3	3.3	No	Mike URBAN results, June 2021	12
44	0	2	0	0	5	1	0	4	3	1	5	2	2	4	2	2	1	1	1	3	2.0	No	Mike URBAN results, Dec 2021	13,27
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0.2	Yes	M Mike URBAN results, Dec 2021	13,27
46	0	3	1	0	1	1	0	3	1	1	2	0	1	2	0	0	0	0	2	0	0.9	Yes	InfoWorks results, December 2016	14
47	2	3	0	4	5	3	2	6	4	2	5	3	4	6	4	2	1	3	2	5	3.3	No	Mike URBAN results, December 2018	15
48								0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	Yes	N/A	7
49	5	3	1	3	8	3	1	4	5	4	7	3	6	5	4	5	3	2	4	6	4.1	No	Mike URBAN results, February 2018	7
57	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	3
59	0	1	0	0	0	1	0	0	0	1	2	1	0	0	1	8	4	1	1	0	1.1	No	N/A	3, 16
60	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0.1	Yes	Long Term Simulation Results February 2021	7
61	0	0	0	1	1	1	0	0	0	1	2	1	0	2	0	0	0	1	2	1	0.7	Yes	N/A	7
62	0	0	0	1	1	1	0	0	0	0	1	1	0	2	0	0	0	0	2	0	0.5	Yes	EPA-SWMM results, February 2021	17
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	7
68	0	2	0	1	1	1	0	1	1	0	1	1	2	4	1	2	1	2	2	1	1.2	No	LTCP Long Term Simulation Results February 2013	7, 18
69	1	2	1	1	2	1	1	3	1	2	2	3	3	4	4	2	0	1	2	1	1.9	No	LTCP Long Term Simulation Results February 2013	7
70	0	0	1	0	1	1	0	1	0	0	0	1	0	1	0	0	0	0	0	NA	0.3	Yes	AWVSRP Modeling Support Alternative	7,26

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																			Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021				
																						Modeling Report May 2012, Appendix D	
71	0	3	1	1	2	1	2	9	7	3	5	3	2	5	2	5	2	2	1	0	2.8	No	AWVSRP Modeling Support Alternative Modeling Report May 2012, Appendix D	7,26
72	0	2	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	NA	0.3	Yes	AWVSRP Modeling Support Alternative Modeling Report May 2012, Appendix D	7,26
78	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	Yes	N/A	3
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	3
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	3
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	3
88	0	0	1	0	0	2	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0.3	Yes	N/A	3
90	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	3
91	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	3
94	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	3
95	0	1	0	0	2	1	1	2	1	0	1	1	0	0	0	2	0	2	2	3	1.0	Yes	EPA-SWMM results, February 2019	19
99	0	1	1	2	1	1	0	1	2	3	5	1	6	4	5	5	3	1	2	0	2.2	No	LTCP Long Term Simulation Results February 2013	7
107					9	3	1	9	11	4	4	2	4	5	5	5	2	1	1	1	4.2	No	EPA-SWMM results, February 2019	20
111	0	3	0	2	2	1	0	1	1	0	1	3	2	3	0	2	1	1	1	2	1.3	No	EPA-SWMM results, February 2019	21
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	3
121	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1	Yes	N/A	3
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	3
127	0	0	1	0	3	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0.4	Yes	N/A	3
129	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	Yes	N/A	3
130							0	0	0	0	0	0	0	3	0	0	0	0	1	0	0.3	Yes	N/A	5
131	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	3
132							0	0	0	1	0	2	0	3	0	0	0	0	2	2	0.7	Yes	N/A	5
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	3
135							0	1	0	0	0	0	0	2	0	0	0	0	3	1	0.5	Yes	N/A	5
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	3

Outfall Number	Number of Combined Sewer Overflows Per Year [1]																			Average Annual Overflow Frequency	Meets Performance Standard? [2]	Long-Term Simulation Source	Notes
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021				
138	0	2	3	0	3	1	1	2	1	3	2	2	3	7	3	3	1	0	3	2	2.1	No	LTCP Long Term Simulation Results February 2013	7
139	0	1	3	1	1	1	0	1	1	0	1	4	0	3	0	3	3	3	2	3	1.6	No	EPA-SWMM results, February 2019	22
140	3	5	5	3	4	1	0	6	6	4	4	4	8	8	8	4	4	5	5	2	4.5	No	Long Term Simulation Results February 2022	25
141	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	3
144	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	Yes	N/A	3
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	3
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	3
147	29	31	29	37	45	35	50	45	63	40	47	27	49	32	58	42	37	34	47	40	40.9	No	LTCP Long Term Simulation Results February 2013	7
148	0	0	0	0	0	0	0	0	1	2	0	0	0	1	0	0	0	1	0	0	0.3	Yes	N/A	3
150/151	10	14	6	15	23	11	2	22	29	25	31	14	34	28	31	29	22	9	21	31	20.4	No	LTCP Long Term Simulation Results February 2013	7, 23
152	39	53	44	46	42	43	11	29	63	48	57	44	53	34	63	50	45	33	49	41	44.4	No	LTCP Long Term Simulation Results February 2013	7
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	3
165	0	1	0	0	1	1	1	0	1	0	2	2	0	2	0	0	0	1	1	2	0.8	Yes	Mike URBAN results, December 2021	12
168	1	2	1	2	5	2	0	1	1	0	2	0	2	2	0	2	1	1	2	2	1.5	No	EPA-SWMM results, February 2019	24
169	1	3	1	3	5	2	1	1	2	2	3	0	2	3	1	3	0	1	2	2	1.9	No	EPA-SWMM results, February 2019	24
170							0	2	1	0	1	0	0	0	0	1	0	1	1	0	0.5	Yes	N/A	6
171	1	2	0	3	5	2	1	6	4	2	4	2	4	6	3	1	1	3	2	5	2.9	No	Mike URBAN results, December 2018	15
174	3	5	6	10	21	6	6	14	13	10	17	7	20	15	12	7	6	2	6	11	9.9	No	LTCP Long Term Simulation Results February 2013	7
175							0	1	0	0	0	2	0	4	0	0	1	0	1	0	0.6	Yes	N/A	7

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 flow monitoring configuration prior to 2001 cannot be confirmed and the pre-2001 data accuracy is questionable, so the calculated Average Annual Overflow Frequency uses data from flow monitoring conducted between 2001 and 2021.
4. 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.
5. 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 2021.
6. 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.
7. 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 2021.
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 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.
11. The CSO overflow pipe to Outfall 33 was sealed and the outfall was removed from CSO service on July 22, 2016.
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. During repair of the WWPS 43 force main, flows were temporarily bypassed around WWPS 43. Because of unavoidable bypass system constraints, there were six exacerbated CSOs at Outfall 59 in 2017, four exacerbated CSOs at Outfall 59 in 2018, and one exacerbated CSO at Outfall 59 in 2019. The bypass was removed in September 2019.
17. 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.
18. In 2015 and 2016, Basin 68 CSOs were likely exacerbated by a partially clogged HydroBrake.
19. The Basin 95 retrofit project was substantially complete on April 4, 2013. Flow modeling is used prior to this date.
20. 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.
21. The last hydraulic modification in Basin 111 was performed on December 1, 2014. Flow modeling data is used prior to this date.
22. 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.
23. SPU removed Outfall 150 from service on February 27, 2019. Any Basin 150/151 CSOs now discharge from Outfall 151.
24. SPU completed the valve retrofit on November 5, 2015. Flow modeling data is used prior to this date.
25. The Montlake NPDES 140 CSO retrofit was completed in July 2020. The 2020 CSOs consist of 2 modeled events prior to July and 3 monitored events after July.
26. Outfalls 70 and 72 were removed from service as part of the Central Waterfront 70,71,72 project therefore no overflows can occur at them, explaining the NA designation in the 2021 data.
27. In 2021 SPU learned that wastewater pump station 10 (located immediately downstream of Hen 44 and 45) was not operating per design. The updated model used to estimate the overflows for Henderson 44 and 45 includes the current pump rates of the station. In 2022 SPU will change the impellers of the pumps so that the station produces the intended design flows. The model will be updated in 2023 when the pump station is operating at the design flowrates.

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. 2021 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**	**Secondary Cause, if any**
21001	702874	5817 18TH AVE S	1/2/21 11:28 PM	Unknown			Capacity-gravity main	
21002	702856	714 HARVARD AVE E	1/3/21 12:12 AM	5,000			Roots	
21003	702847	WWPS045 - 7609 PERIMETER RD S	1/2/21 11:00 PM	21,000	21,000	Duwamish River	Pump Station-capacity	
21004	702955	WWPS056 - 10334 BEDFORD CT NW	1/2/21 8:48 PM	590	590	Puget Sound	Pump Station-capacity	
21005	702844	1044 S ROSE ST	1/3/21 12:28 AM	100			Capacity-King County[1]	
21006	702846	9855 RAINIER AVE S	1/3/21 1:29 PM	1			Capacity-gravity main	
21007	703099	333 BOREN AVE N	1/11/21 11:31 AM	500			Debris	
21008	703093	WWPS056 - 10334 Bedford Ct NW	1/12/21 3:00 AM	41,974	41,974	Puget Sound	Pump Station-capacity	
21009	703243	216 32ND AVE S	1/12/21 5:03 PM	30	30	Lake Washington	Private Side Sewer Issue	
21010	703185	1314 6TH AVE W	1/12/21 9:36 AM	150			Roots	
21011	703190	740 S KENYON ST	1/12/21 10:30 PM	480			Capacity-King County	
21012	703376	5821 18TH AVE S	1/13/21 3:24 AM	Unknown			Capacity-gravity main	
21013	703377	2803 3RD AVE W	1/13/21 1:01 AM	Unknown			Debris	
21014	703378	6830 21ST AVE NE	1/13/21 12:37 AM	Unknown			Capacity-gravity main	
21015	703191	11423 CRESTWOOD DR S	1/13/21 10:40 AM	500			FOG	
21016	703313	2022 3RD AVE N	1/13/21 12:26 AM	500			Capacity-gravity main	
21017	703202	821 NW 106TH ST	1/13/21 3:45 PM	25			FOG	
21018	703360	WWPS057 - 3600 SUNNYSIDE AVE N	1/20/21 11:59 AM	1,000,000	200,000 - 500,000	Lake Union	Debris	FOG
21019	703444	6558 34TH AVE SW	1/23/21 7:01 PM	50			Debris	
21020	703580	5204 15TH AVE NE	1/29/21 10:24 AM	500			Structural Failure-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	Secondary Cause, if any
21021	703670	WWPS039 - 5080 Beach Dr SW	1/13/21 3:49 PM	44,000	44,000	Puget Sound	Pump Station-mechanical	
21022	703766	808 NE 64TH ST	2/7/21 10:10 AM	18,000			FOG	
21023	704325	2137 HARBOR AVE SW	3/5/21 1:24 PM	1,200	1,200	Elliot Bay	Structural Failure-gravity	
21024	704331	5204 15TH AVE NE	3/7/21 4:08 PM	1,500			Vandalism	
21025	704334	1028 NE 96TH ST	3/7/21 7:17 PM	100			FOG	
21026	704459	AURORA AVE N/DEXTER WAY N	3/12/21 6:01 PM	50			Roots	
21027	704624	2025 TERRY AVE	3/20/21 7:19 PM	3,150			Private Construction	
21028	705778	2139 BONAIR DR SW	3/28/21 12:00 AM	6,000			Private Construction	
21029	706414	2139 BONAIR DR SW	4/27/21 12:00 AM	1,665	1,665	Puget Sound	Structural Failure-gravity	
21030	706982	619 NW MARKET ST	5/22/21 12:00 AM	Unknown			City Construction	
21031	707486	1906 PIKE PL	6/21/21 3:58 PM	10,000			Structural Failure-gravity	Debris
21032	707521	1900 PIKE PL	6/22/21 8:52 AM	1,400			FOG	
21033	708055	7340 50TH AVE NE	7/16/21 10:55 AM	95			Roots	
21034	708066	1718 BROADWAY	7/16/21 2:54 PM	Unknown			Roots	
21035	708227	7760 57TH AVE NE	7/21/21 8:28 PM	Unknown			Structural Failure-gravity	
21036	708357	10521 MERIDIAN AVE N	7/31/21 12:27 PM	4,900			FOG	
21037	708605	1300 N ALLEN PL	8/11/21 8:51 AM	20			Roots	
21038	709400	1212 5TH AVE N	9/18/21 2:11 AM	Unknown			Roots	
21039	709401	4218 2ND AVE NE	9/19/21 5:44 PM	20			Roots	
21040	709466	3212 24TH AVE W	9/20/21 10:08 AM	10			Capacity-gravity main	
21041	709551	7706 25TH AVE NW	9/26/21 8:40 PM	20			Roots	
21042	709554	8008 33RD AVE NW	9/26/21 9:27 PM	1,000			Vandalism	
21043	709991	9526 25th Ave NW	10/18/21 11:00 AM	Unknown	Unknown	Puget Sound	Structural Failure-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	Secondary Cause, if any
21044	710245	401 E PIKE ST	10/28/21 2:22 PM	1,300	50	Lake Union	FOG	
21045	710258	1721 1ST AVE S	10/28/21 11:11 PM	Unknown			Capacity-King County[1]	
21046	710416	3RD AVE NW/NW HOLMAN RD	11/4/21 11:15 PM	2,400	2,400	Puget Sound	Private Construction	
21047	710476	15TH AVE NE/NE 65TH ST	11/6/21 7:35 PM	Unknown	Unknown		Debris	
21048	710605	9401 23RD AVE NE	11/11/21 10:42 AM	Unknown			Roots	
21049	710881	10841 44TH AVE SW	11/20/21 6:59 PM	6,000			Roots	
21050	711110	900 2ND AVE N	12/2/21 10:58 PM	1,200			Roots	Debris
21051	711619	1129 23RD AVE S	12/31/21 10:27 AM	9,000	9,000	Duwamish West Waterway	Debris	FOG

Notes:

1. Post event evaluation of this backup conducted by King County indicates that their facilities were operating per design and causes of the backup are uncertain or due to issues with private side sewers

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. 2021 Pump Station Work Order Summary

WWPS Number	Inspection	Maintenance	Total Work Orders
WWPS001	23	8	31
WWPS002	26	20	46
WWPS004	30	10	40
WWPS005	35	7	42
WWPS006	20	8	28
WWPS007	38	9	47
WWPS009	25	6	31
WWPS010	41	14	55
WWPS011	15	21	36
WWPS013	25	29	54
WWPS017	34	38	72
WWPS018	24	14	38
WWPS019	23	40	63
WWPS020	15	19	34
WWPS021	30	22	52
WWPS022	19	21	40
WWPS025	43	15	58
WWPS028	21	17	38
WWPS030	24	25	49
WWPS031	42	20	62
WWPS035	33	33	66
WWPS036	23	14	37
WWPS037	19	23	42
WWPS038	57	11	68
WWPS039	35	18	53
WWPS042	21	10	31
WWPS043	34	19	53
WWPS044	46	20	66
WWPS045	33	25	58
WWPS046	28	9	37
WWPS047	21	5	26
WWPS048	33	17	50
WWPS049	23	41	64
WWPS050	17	9	26
WWPS051	32	41	73
WWPS053	6	6	12
WWPS054	62	9	71
WWPS055	38	6	44

WWPS Number	Inspection	Maintenance	Total Work Orders
WWPS056	69	9	78
WWPS057	22	38	60
WWPS058	19	8	27
WWPS059	21	10	31
WWPS060	19	3	22
WWPS061	24	1	25
WWPS062	27	61	88
WWPS063	22	10	32
WWPS064	18	6	24
WWPS065	21	9	30
WWPS066	10	3	13
WWPS067	7	4	11
WWPS069	30	23	53
WWPS070	31	10	41
WWPS071	22	7	29
WWPS072	22	11	33
WWPS073	21	8	29
WWPS074	18	23	41
WWPS075	18	4	22
WWPS076	15	28	43
WWPS077	20	11	31
WWPS078	19	4	23
WWPS080	20	15	35
WWPS081	20	3	23
WWPS082	17	5	22
WWPS083	22	6	28
WWPS084	17	6	23
WWPS114	22	19	41
WWPS118	16	14	30
Grand Total	**1,743**	**1,038**	**2,781**