Seattle Public Utilities

Protecting Seattle's Waterways

# Wastewater Collection System: 2019 Annual Report

March 19, 2020

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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 84 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.

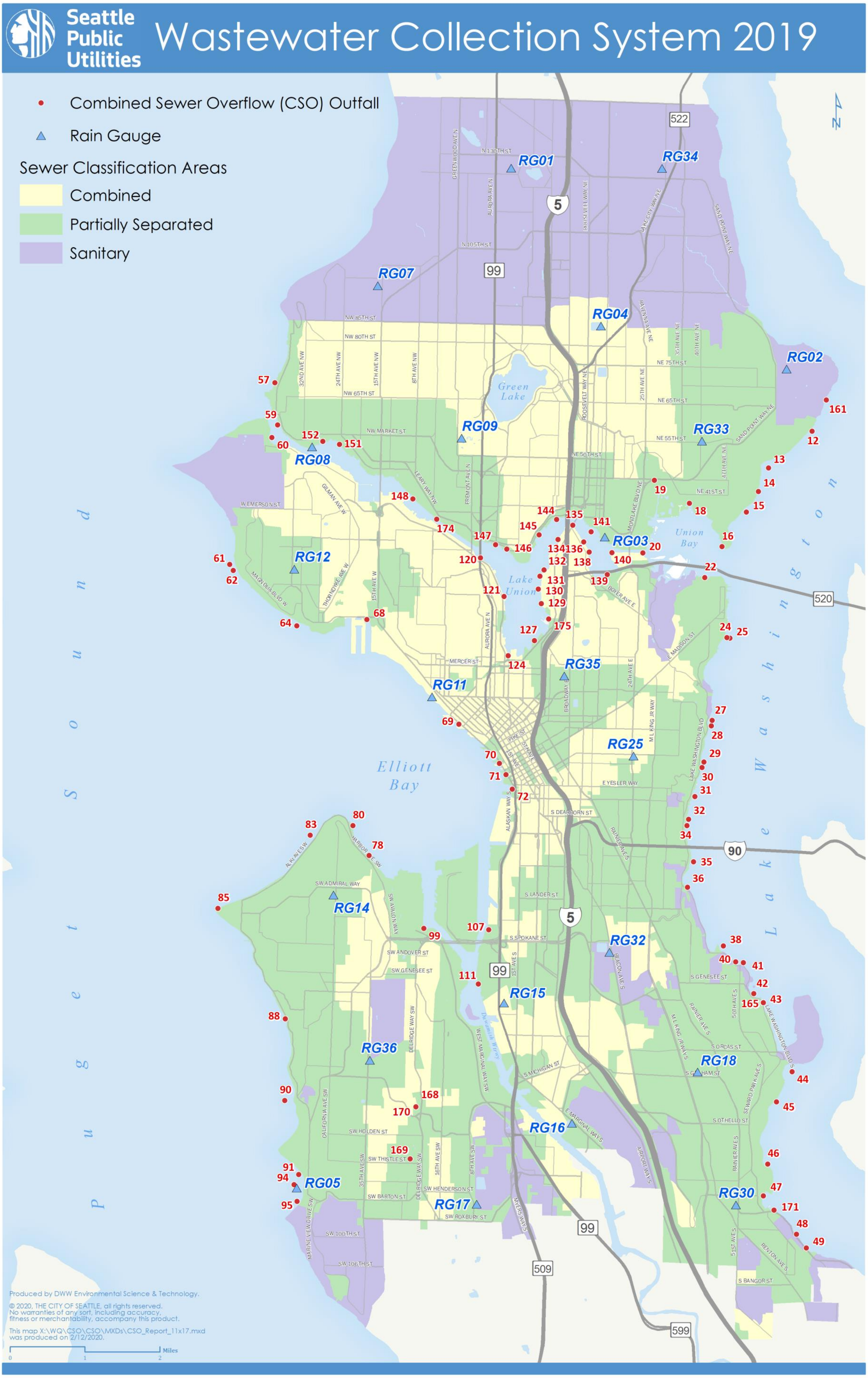



Figure 1-1. City of Seattle Sewer Classification Areas

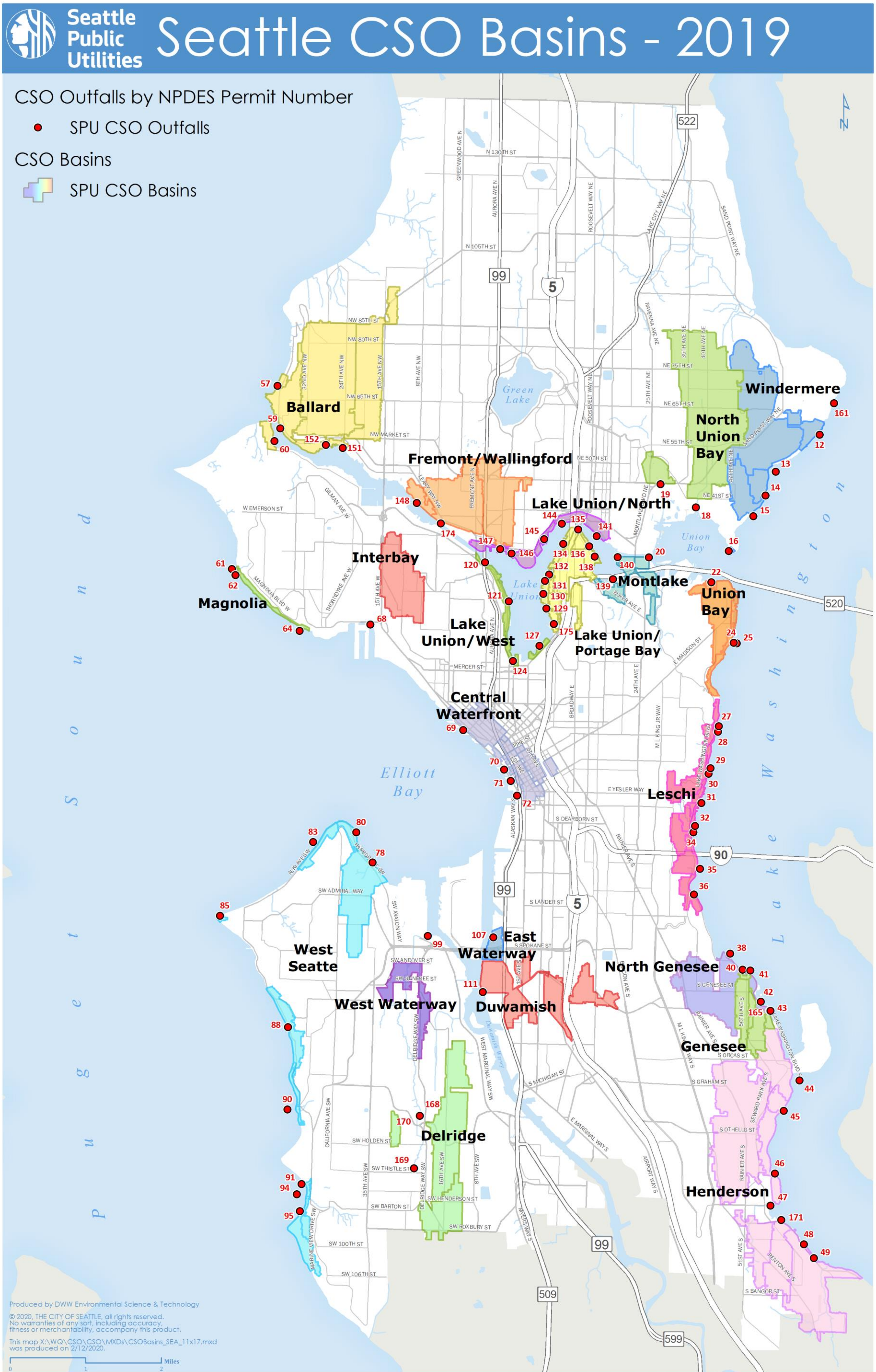



Figure 1-2. City of Seattle Combined Sewer Basins

## 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 expires on April 30, 2021. SPU plans to apply for permit renewal by October 30, 2020.

The NPDES Permit:

- Authorizes CSOs at the 84 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.
- 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 twenty-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.
- Requires 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.

## 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 2019 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. 2019 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,<br>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):<br>a. SSO performance;<br>b. Number of miles of sewer that were cleaned, inspected, and repaired/replaced/rehabilitated;<br>c. Number of pump station inspections and the capacity of each pump station;<br>d. Number of maintenance holes and force mains inspected and repaired/replaced/rehabilitated;<br>e. Number and type of CSO regulators inspected;<br>f. Summaries of inspections and cleanings of each CSO control structure; and<br>g. Summaries of Fats Oil and Grease (FOG) inspections and enforcement actions taken the preceding year. | <br>a. Tables 3-3, 3-4, A-1<br>b. Table 3-1<br>c. Tables 3-1, A-2, A-3<br>d. Table 3-1<br>e. Table 3-1<br>f. Section 3.1.1<br>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. 2019 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:<br>a. The CSO control measures for the Early Action CSO Control Program (Henderson Basins 44, 45, 46, and 47/171);<br>b. The Long-Term Control Plan;<br>c. The Post-Construction Monitoring Program Plan;<br>e. The CMOM Performance Program Plan;<br>e. The FOG Control Program Plan; and<br>f. The Joint Operations and System Optimization Plan between the City of Seattle and King County | a. Sections 4.2 and 4.7.3<br>b. No changes<br>c. Sections 5.4 and 5.5<br>d. Section 3.2<br>e. Section 3.3<br>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, 4.1.2, 4.1.3, 4.1.4, 4.4.1, 4.6, 4.7, 4.9, and 5.3 |
| VII.43.a.vi | Describe the status of any wastewater collection system permit applications | Section 1.2 |
| VII.43.a.vii | Describe any wastewater collection system reports submitted to state or local agencies | Section 1.4 |
| VII.43.a.viii | Describe any anticipated or ongoing collection system O&M activities | Section 3 |
| VII.43.a.ix | Describe any remedial activities that will be performed in the upcoming year to comply with the Consent Decree | Sections 4.7 and 5.3 |
| VII.43.b | Describe any non-compliance with the requirements of the Consent Decree and include an explanation of the likely cause, the duration of the violation, and any remedial steps taken (or to be taken) to prevent or minimize the violation | Potential non-compliance: Sections 4.4.1, 4.6, and 5.3. Supplemental Compliance Plans: Section 4.7 |
| 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 2019, 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 SPU and DNRP made in 2019:

- The Joint System Event Debrief Committee commitment to prepare for the wet season and debrief after major storm events to exchange information, review and update emergency communication protocols between the agencies, discuss meteorological data, evaluate CSO performance, and assess operational decision impacts on the combined system. To coordinate for the 2019/2020 wet season, a meeting was held in October 2019 to discuss pre-season maintenance activities, system changes, meteorological information, and emergency communication protocols.
- The Data Sharing commitment is supported by the following: activities of the Joint Operations Information Sharing Team (JOIST), implementation of a pilot project for sharing real-time SCADA data, development of data sharing protocols, and the improvement of regional ability to forecast storms and rainfall intensities.
    - JOIST held four meetings during which SPU and DNRP staff conducted tours of both SPU and DNRP facilities and shared information on the operation of existing facilities, progress of capital projects, and coordination of Joint Plan commitments.
    - The SPU and DNRP data sharing committee established standard operating procedures for sharing information and to facilitate data transfer as requested. An annual data review workshop was held in June to review flow monitoring data collected by each agency and provide recommendations for future monitoring.

- A Real-Time Data Sharing Pilot established a framework for real-time data sharing and resulted in development of a secure connection between DNRP's and SPU's Supervisory Control and Data Acquisition (SCADA) systems for the Windermere/ University basin where both DNRP and SPU have pump stations and CSO control facilities. A joint project team completed an options analysis of a permanent data sharing platform in 2018. SPU and DNRP are coordinating on the timing for the design and implementation of the permanent platform.
- SPU and DNRP staff have developed an online mapping tool identifying the location of flow monitoring equipment deployed in the collection system. The map is currently hosted on a DNRP data sharing extranet site shared with SPU.
- DNRP and SPU exchanged internal operational weather forecasts and impacts information. Both agencies worked together to incorporate climate change model output, including new projections of changing heavy precipitation, to better understand future impacts of intense rainfall on the wastewater systems. SPU and DNRP continued to engage the research community and co-develop predictive tools to enable operational adjustments to mitigate CSO and flooding events.

- The Joint Modeling Coordination Committee commitment is to share modeling tools and increase understanding of modeling analyses and system operation 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 2019 to review modeling results and coordinate model developments between each agency. Work activity continued to focus on development and application of the MIKE URBAN model of the North Interceptor system incorporating the planned joint Ship Canal Water Quality Project Facility. The joint modeling work plan, initially developed by the Joint Modeling Coordination Committee 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 is to conduct document review, attend commissioning meetings, and implement data sharing for SPU and DNRP CSO control facilities. In 2019, SPU commissioned the Delridge Basin 99 CSO sewer system improvement project and provided an overview to DNRP during a JOIST meeting.
- The Real Time CSO Notification commitment is to improve both onsite signs and website information to improve notification of CSO events and communication with customers. 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 will serve as a single point of contact for both SPU and DNRP CSO outfalls located in the City of Seattle. Installation at DNRP CSO locations was completed in 2019 and is expected to be completed at SPU's CSO outfalls in 2020.
- The Reduce Saltwater Intrusion commitment involves continuing to work together on studies, data, and solutions for reducing intrusion. In 2019, DNRP presented findings of recent saltwater

monitoring at a JOIST meeting. DNRP will continue to monitor saltwater in the conveyance system to monitor progress and identify any new sources of saltwater intrusion.

## 2.2 Integrated System Planning

The purpose of SPU's Drainage and Wastewater (DWW) Integrated System Planning effort 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.

The Integrated System Planning effort is made up of four interrelated program elements, described below and shown graphically in Figure 2-1:

- ***Analysis:*** In the data collection and analysis stage, we are identifying drainage and wastewater system and receiving water body challenges and opportunities and prioritizing the challenges based on risk. Two major comprehensive analysis projects are included in this stage: the Wastewater System Analysis – which was completed in 2019 - and the Drainage System Analysis – which will be completed in 2020.
- ***Visioning:*** In the Visioning stage, we will set the vision, goals, objectives, and measures of success for SPU's Drainage and Wastewater line of business that will be used to plan development. The vision will be developed through collaboration with our community, City departments, and partner agencies and organizations. SPU will use innovative approaches to engagement and emphasize two-way communication and relationship building to achieve meaningful participation with these diverse stakeholders. SPU is launching the Vision Plan in 2020.
- ***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 also launching the Integrated System Plan (ISP) in 2020 and anticipates substantial completion in 2022.
- ***Implementation:*** Implementation will begin in 2023 when the ISP is complete. In order to stay accountable to stakeholders, SPU will monitor and adaptively manage implementation, tracking against identified measures of success. SPU is also piloting near-term integrated projects in Seattle's neighborhoods while the planning effort is under way. This is an opportunity for SPU and our partners to explore innovative approaches and learn as we develop the plan.

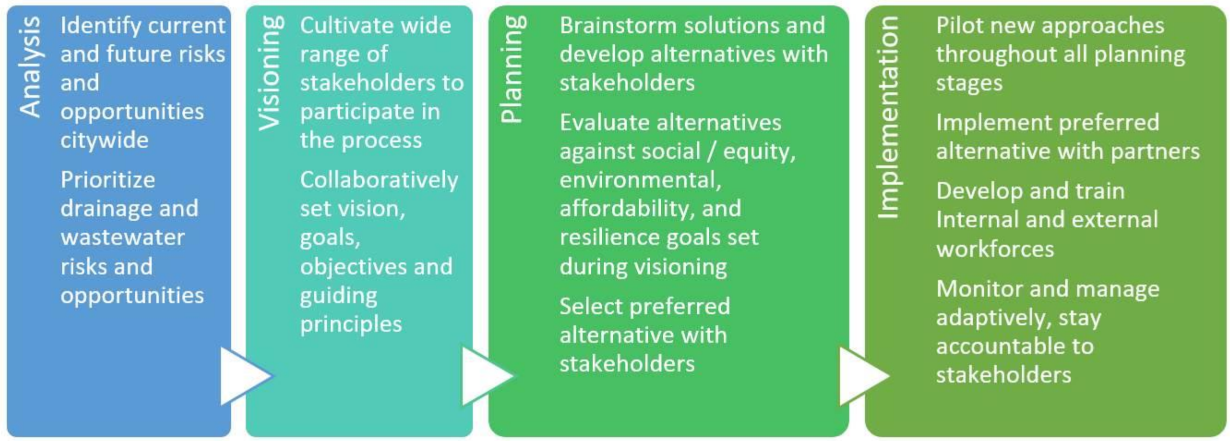



**Figure 2-1. Integrated System Planning Process**

## 2.3 CSO Reduction Plan Amendment

SPU's NPDES Permit requires submittal of an amendment to the 2015 Plan to Protect Seattle's Waterways by October 30, 2020. The purpose of the update is to summarize CSO reduction projects completed in the five year period from 2015 to 2020, provide an assessment of the control status of all CSO outfalls, document any changes and updates from this period, and list the projects that SPU intends to construct in the next 5-year permit term. SPU plans to submit the update by October 30, 2020.

## 2.4 Outfall Rehabilitation Plan

SPU's NPDES Permit also requires submittal of a 2020-2025 outfall rehabilitation plan by October 30, 2020. The plan will describe outfall rehabilitation activities that SPU plans to accomplish in the next permit cycle and will be based on information collected in 2019 from an underwater assessment of several CSO Outfalls. The plan will also include a desktop evaluation identifying which outfalls share a hydraulic connection to a common control structure.

**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 2019 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 and 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 84 CSO control structures 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 2019 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.

SPU's 2019 O&M accomplishments are summarized in Table 3-1.

### 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;
- 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 2019, 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 of this report. SPU is also working to optimize the operation of recently constructed storage facilities, as described in Sections 4.2, 4.6 and 4.7.

| Table 3-1. 2019 O&M Accomplishments | |
|---|---|
| **Activity** | **Quantity** |
| Miles of mainline pipe cleaned | 337 |
| Miles of mainline pipe inspected via CCTV | 213 |
| Miles of mainline pipe repaired/replaced/rehabilitated | 2 |
| Number of pump station inspections [1] | 1,496 |
| Number of maintenance holes inspected | 221 |
| Number of force mains inspected | 61 |
| Number of force mains repaired/replaced/rehabilitated | 1 |
| Number of CSO structure inspections | 289 |
| Number of CSO structure cleanings | 42 |
| Number of CSO HydroBrake inspections | 239 |
| Number of CSO HydroBrake cleanings | 19 |
| Linear feet of pipe receiving chemical treatment to inhibit root growth | 136,044 |
| Number of catch basins inspected | 839 |
| Number of catch basins cleaned | 2,975 |
| Number of catch basins repaired | 29 |
| Number of catch basins replaced | 0 |
| Number of catch basin traps replaced | 69 |

*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 help control nondomestic discharges into the Seattle sewer system: the Fats, Oils, and Grease (FOG) Control Program and the Industrial Pretreatment Program.

SPU's Wastewater Source Control Section administers the City's FOG Control Program. This program enforces Seattle Municipal Code (SMC) requirements 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. During saponification, FOG chemically reacts with calcium in the wastewater to form hardened deposits similar to soap. As shown in Figure 3-1, these deposits adhere to the inside of sewers and decrease capacity, which can lead to sewer overflows. SPU enforces SMC requirements for nondomestic sources through a regulatory education, inspection, and enforcement program focused on commercial and institutional kitchen facilities. Completed 2019 inspection and enforcement activities and planned 2020 activities are summarized in Section 3.3.


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

The Industrial Pretreatment Program is administered by King County Wastewater Treatment Division – Industrial Waste Program (KCIW). KCIW issues industrial waste pretreatment permits that include appropriate discharge limits and conducts regular site inspections and periodic permit reviews. SPU reviews these permits and CCTV tapes of lines to which these industries discharge to assess impacts to the collection system. SPU refers industrial discharges that have negatively impacted the collection system to KCIW for potential enforcement and/or permit modification.

### 3.1.4 Control 4: Deliver Flows to the Treatment Plant

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

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

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

In 2019, SPU completed upgrading Wastewater Pump Station 2 in the Leschi Area (Basin 34) and repair of the broken force main at Wastewater Pump Station 43 (Basin 59). Construction kicked off at Wastewater Pump Station 22 in the Magnolia Area (Basin 60) and Wastewater Pump Station 73 on Harbor Island.

Delridge Basin 99 Retrofit began stabilization phase in 2019. Stabilization includes monitoring and analysis to ensure a facility is functioning as intended. Stabilization of this facility is expected to be complete in 2020.

In 2020, SPU will complete work upgrading Wastewater Pump Stations 73 and 72 on Harbor Island. Retrofit work will begin at Wastewater Pump Station 20 in the Portage Bay Area (Basin 138) and Wastewater Pump Station 13 in the Montlake Area (Basin 20).

### 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 three DWOs in 2019, as follows:

1. On January 24, a private side sewer in a houseboat community on Lake Union became disconnected, allowing lake water to flow into the sewer system. Consequently, approximately 13,322 gallons of combined sewage overflowed from Outfall 129 into Lake Union. To prevent recurrence, SPU is working with the houseboat community to upgrade their side sewer system.
2. On March 14, a HydroBrake flow management device in Basin 18 became obstructed with debris. Approximately 32,637 gallons of combined sewage overflowed from Outfall 18 into North Union Bay. To prevent recurrence, SPU reviewed the preventive maintenance of the HydroBrake and provided additional crew training.
3. On July 14, grease blocked the sewer and approximately 6,246 gallons of combined sewage overflowed from Outfall 127 into Lake Union. An error in the overflow alarm programming delayed SPU’s response. To prevent recurrence, SPU's FOG Program staff followed up with nearby customers, and our flow monitoring vendor corrected the overflow alarm programing error and reviewed overflow alarm programming at other SPU facilities to make sure they are appropriately configured.

There were two exacerbated CSOs in 2019, as follows:

1. During normal operations, Wastewater Pump Station (WWPS) 43 pumps sewage from Basin 59 through a 12-inch diameter force main under Shilshole Bay. The force main failed in late 2017 and, until it was replaced, SPU bypassed flows to an adjacent basin. The bypass had unavoidable downstream constraints, so large rain events caused exacerbated CSOs. In 2019, during a rain event on September 10, approximately 195,533 gallons of combined sewage overflowed from Outfall 59 into Salmon Bay. The new force main was placed in service on

September 23, the bypass was removed the same day, and WWPS 43 returned to normal operations on September 25.

2. During a rain event on September 7, Outfall 95 overflowed. A review of the flow monitoring data indicates there was a partial obstruction in the downstream sewer starting on August 21. The obstruction increased the flow depth at the monitoring station until September 7, when the runoff from an intense storm event (25-year 30 minute recurrence interval) increased the depth above the overflow weir before flushing the obstructing materials downstream.

A summary of the DWOs and exacerbated CSOs from 2015-2019 is included in Table 3-2.

**Table 3-2. Dry Weather Overflows (DWOs) and Combined Sewer Overflows (CSOs) Exacerbated by System Maintenance Issues 2015 – 2019**

| Year | DWOs[1] | | CSOs Exacerbated by System Maintenance Issues[1] | |
|---|---|---|---|---|
| | No. of Overflows | Volume (gallons) | No. of Overflows | Volume (gallons) |
| 2015 | 3[2] | 77,598 | 3 | 10,825 |
| 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 |

1 *DWOs and 'exacerbated CSOs' are included in the table listing all 2019 overflows (Table 5-4). Exacerbated CSOs are also included in the table comparing 2019 CSOs with 2010 baseline (Table 5-5), the tables comparing 2015-2019 discharges (Tables 5-6 and 5-7). and the table assessing whether outfalls meet the CSO performance standard (Table 5-8).*

2 *One of these DWOs was caused by a non-City entity.*

### 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:

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.

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. Using a Community Based Social Marketing approach, in 2018 SPU did initial research to look at potential audiences including college-age women, childcare providers, gastroenterology clinics, and retirement facilities/communities. That research identified the college-age population as the audience with the most potential for behavior change. In 2019 SPU conducted a targeted outreach pilot campaign focused on University of Washington students. Survey results after the pilot campaign suggested that while students remembered the information that was distributed to them, their behavior did not change. SPU conducted follow-up focus groups late in 2019 to research what might be more effective in eliciting behavior change. Students indicated they would like to see more direct, visual connection between flushing behavior and environmental harm. They wanted visual proof that wipes do not break down, and to indicate they are made of microplastics. They also wanted more statistical information about cost, weight and volume of wipes in the sewer system. All participants said they would prefer social media outreach and posters over in-person or phone outreach.



**Figure 3-2. Updated Flushables Outreach Campaign Posters**

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.*

***Description of the 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.

In addition, SPU conducts the following pollution prevention activities:

- Public Education Programs: SPU supports a variety of public education programs that help prevent pollution, including Spring Clean, Green Cleaning, Adopt-a-Street, Adopt-a-Drain, Storm Drain Stenciling, Surface Water Pollution Report Line, Pet Waste Disposal, Natural Yard Care, Car Tips (to decrease leaks from automobiles), event recycling, and Reduce, Reuse, and Recycle tips.

- Street Sweeping: The Seattle Department of Transportation (SDOT) performs street sweeping, including street sweeping downtown streets every night and cleaning alleys three nights per week. In 2019, SDOT street sweeping crews swept 10,016 miles in the SPU combined sewer system area.
- 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 2019, SPU received 25,315 illegal dumping complaints from customers. More than 2 million pounds of debris were removed from Seattle's public property. 100 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 2019.
- Other Pollution Prevention Programs: SPU conducts multiple pollution prevention programs to keep contaminants from entering the sewer system. Programs conducted by SPU in 2019 include: solid waste collection and recycling, product ban/substitution, control of product use such as cleaning and yard care recommendations, illegal dumping response, bulk refuse disposal, hazardous waste collection, and commercial/industrial pollution prevention.

***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 overflow 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 effective January 1, 2016, including revisions.

***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.

***Future Actions***

- Revisions to the Stormwater Code: The City is in the process of updating the Stormwater Code to meet the requirements of the 2019 NPDES Phase I Stormwater Permit. As part of this update, SPU intends to evaluate possible revisions to SMC 22.800.040.A.4 to require installation of source control BMPs during site development, if the site discharges to a combined sewer in one of the City's combined sewer basins.
- Coordination with DNRP: To meet its own NPDES Permit obligations, DNRP relies upon SPU to implement pollution prevention actions (e.g., spill response, water quality complaint response and street sweeping) in areas of the City served by DNRP CSO facilities. SPU currently provides these pollution prevention actions in areas served by DNRP CSO facilities but is not responsible for DNRP's NPDES Permit compliance. At DNRP's request, SPU tracks and reports to DNRP on the limited set of BMPs that are implemented each year, so that DNRP can report to EPA and Ecology in DRNP's annual report. SPU and DNRP will explore whether to continue this arrangement and, if so, how to document costs and responsibilities.

### 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 2018 SPU and DNRP developed a new CSO outfall sign design with more languages, a link to the CSO overflow website, and a new phone number that is staffed 24 hours a day. SPU will complete installation of the new signs at its CSO locations in 2020. Figure 3-3 shows the existing and new outfall signs.


**Figure 3-3. Outfall Signage: Existing (Left) and New (Right)**

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 shots that comprise Figure 3-4 show the simplified website language and the zoomable map the public sees when they access the website.

### 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.

Home » Services » Environment » Wastewater services » Combined sewer overflow status

# Combined sewer overflow status

Check the map below to see if a combined sewer overflow, or CSO, is occurring before going swimming, wading, fishing, or boating near a CSO warning sign. These overflows take place within the City of Seattle.

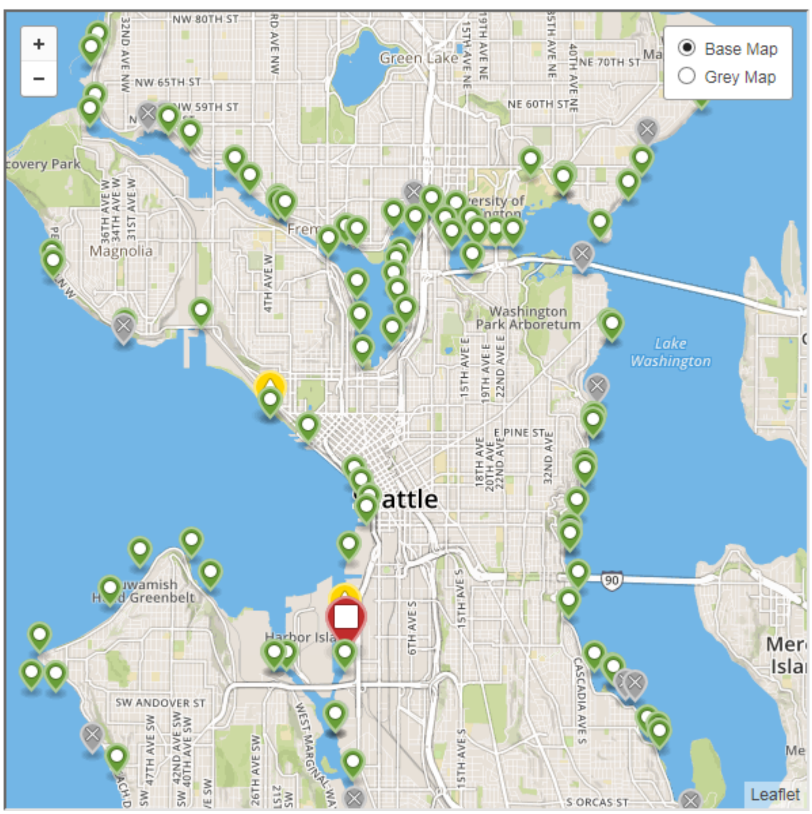
**Warning**

Stay out of the water for 48 hours after a combined sewer overflow; contact with polluted water can make you sick.

**Learn more**
**Más información**
**進一步瞭解**
**Hãy tìm hiểu thêm**


Example of a posted warning sign

Click on each CSO outfall symbol to learn more. Click on the [+] or [-] symbols to zoom in or out.




## Legend

- Overflowing now
- Overflowed in the last 48 hrs
- No recent overflow
- Data not available

**Health Questions?**

Public Health Seattle & King County answers questions about CSOs

206-205-1151

Frequently asked questions about public health and CSOs

**Figure 3-4. DNRP/SPU Real-Time Overflow Website Screen Shots**

## 3.2 CMOM Performance Program Activities

SPU follows program roadmaps (2011-2016 and 2016-2020) that identify program work and improvements. The current roadmap has initiatives in the following program areas:

- 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 the procedures, providing ongoing crew training, measuring and tracking the quality of cleaning efforts, providing feedback to the crews, and using technology to help identify where changes in cleaning frequency should be considered. Work completed in 2019 and planned for 2020 includes:

- Chemical Root Control – Since 2018, SPU has significantly increased the annual application of chemical root control agents. In 2019, that increased level of investment continued, with SPU treating 27.7 miles of pipes with known root intrusion. SPU also began a comprehensive review of the pipes selected for treatment. This effort will continue into 2020 to ensure chemical root control is most effectively and efficiently applied.
- Preventive Maintenance – 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 paused in 2019 but will restart in 2020.

### 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 efficient and effective decisions about the maintenance and rehabilitation of its components. Work completed in 2019 and planned for 2020 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. SPU continued at this increased level in 2018 and 2019 and plans to maintain this level of condition assessment activity in 2020.
- Management Areas – In 2017, an approach was developed to enable SPU to conduct inspections and condition assessment of its entire wastewater collection system every ten years. The system was divided into 100 Management Areas according to the hydraulics of the wastewater collection system, 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. SPU will continue implementing the first cycle of the Management Areas approach and plans to complete inspection the wastewater collection system by 2023.

### 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 2019 and planned for 2020 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 adopted and configured in 2019. SPU also completed a process improvement project to gain efficiencies in contracted rehabilitation project delivery. Additional strategy development work, including completion of a rehabilitation financial investment analysis and development of a long-term investment forecast, is expected to be completed in 2020.
- Increased Budget for Rehabilitation Projects – SPU has been increasing annual sewer rehabilitation funding each year since 2013 (see Figure 3-5, below). Note that, in 2019, the focus was on completing challenging point repairs, which have a higher average unit cost. Increased investment levels are planned to continue.

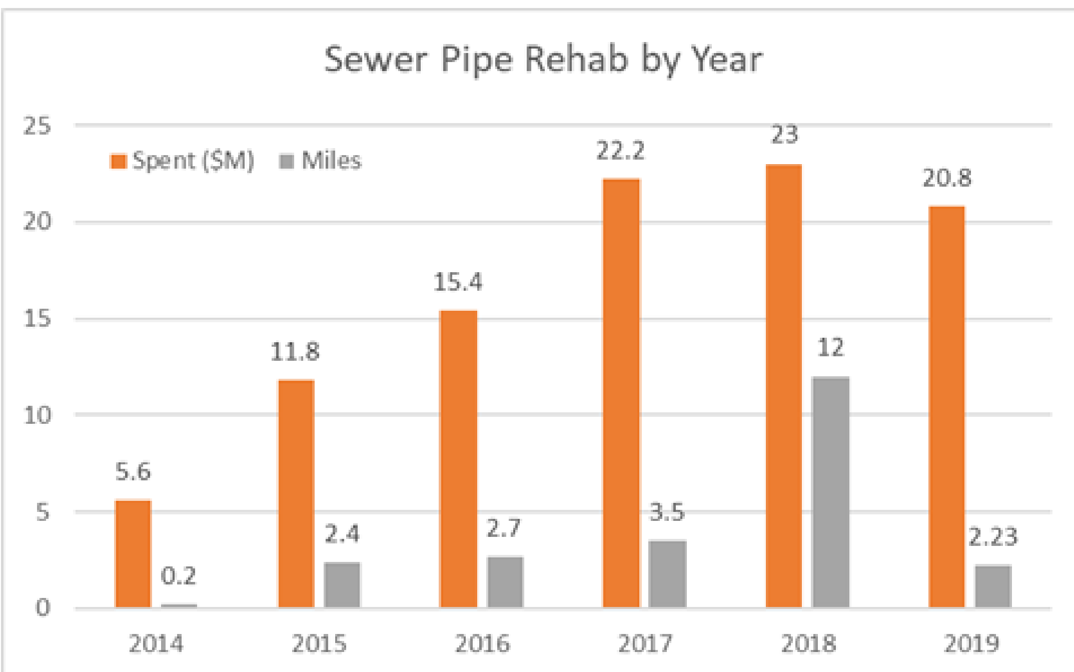



**Figure 3-5. Sewer Rehabilitation Funding and Accomplishment by Year**

### 3.2.4 SSO Performance

There were 38 sewer overflows in 2019, and they are summarized by cause in Table 3-3. The greatest number of sewer overflows were caused by roots (9 events) and extreme weather (11 events).

SSO performance for the years 2013 through 2019 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 3-3. 2019 Sewer Overflows by Category**

| Category | Primary Cause | Number of 2019 Sewer Overflows |
|---|---|---|
| 1 | Roots | 9 |
| 2 | FOG | 4 |
| 3 | Debris | 3 |
| 4 | Structural Failure – Gravity | 1 |
| 5 | Structural Failure – Force Main | 0 |
| 6 | Capacity – Gravity | 1 |
| 7 | Pump Station – Mechanical | 0 |
| 8 | Pump Station - Capacity | 0 |
| 9 | Power Outage | 0 |
| 10 | Operator Error | 0 |
| 11 | Maintenance Error | 0 |
| 12 | Pressure Release | 1 |
| 13 | City Construction | 0 |
| 14 | New Facility Startup | 0 |
| 15 | Private Side Sewer Issue | 3 |
| 16 | Capacity – King County | 1 |
| 17 | Private Construction | 3 |
| 18 | Other Agency Construction | 0 |
| 19 | Vandalism | 1 |
| 20 | Extreme Weather Event (≥25year) | 11 |
| | Total for Categories 1 – 20 | 38 |
| | Total for Categories 1 – 15 | 22 |

| Table 3-4. 2013-2019 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 |

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

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

## 3.3 FOG Control Program Activities

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

- Implement the FOG Management Plan;
- Implement the Food Service Establishment (FSE) Inventory Management Plan;
- Update and implement Standardized Operating Procedures (SOPs) and Outreach Plan; and
- Conduct FOG Inspector Training.

Work completed in 2019 and planned for 2020 is described in the following sections.

### 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 education and outreach; and commercial education and outreach, site assessments, inspections, and enforcement. Each of these areas of focus is described in the following sections.

#### *3.3.1.1 Residential – Education and Outreach*

In residential areas SPU utilizes an education and outreach-based program to increase awareness of the deleterious impacts of FOG discharges from homes. SPU has updated and developed new outreach materials (see Figure 3-5) and utilized social media to greatly increase the scope of our outreach. Following are highlights of SPU's 2019 efforts.

- Attended and distributed FOG reduction outreach materials at multiple community events including events at cultural and community centers, grocery stores at seven locations near "hot spot" areas, joint outreach at multi-family buildings, and the TRENDS Rental Property Management conference and tradeshow, attended by more than 900 rental property owners and managers.
- Conducted in-person outreach to more than 500 single-family residential customers and more than 550 multi-family residential customers across 14 properties located in or near FOG "hot spot" areas. Delivered 275 labeled sink strainers during door-to-door outreach and presentations.
- Posted new outreach materials on SPU website, SPU's @ Your Service Blog, and issued a pre-holiday news release that resulted in two local news stories.
- Produced two new videos to remind residents how to properly dispose of FOG to prevent sewer backups. Videos were sent to the Seattle Channel and shared with Seattle residents via SPU social media channels, Next Door, Facebook ads, and YouTube ads. The Facebook ad video received over 32,000 views on Facebook in November. The YouTube video ads received more than 169,000 views between December 20-29, 2019.
- Translated new outreach materials into Spanish, Chinese, and Vietnamese.
- Through our customer service web portal and individual inquires, distributed 5,946 FOG educational flyers (primarily to multi-family property owners and managers).
- As a member of the Seattle Multi-Family Conservation Initiative team, distributed conservation and environmental messaging to property managers through several City of Seattle programs.



**Figure 3-6. Updated Residential Outreach Messaging and Sink Strainer**

#### *3.3.1.2 Commercial – Regulatory FOG Program*

Per the Fats, Oils, and Grease Control Program Plan, SPU focuses its resources to provide the greatest impact in reducing FOG from commercial sources. We accomplish this by utilizing a risk-based system for prioritizing inspections and enforcement. The assessment matrix and inspection frequency criteria are summarized in Table 3-5. As depicted in the table, enforcement focus and inspections are scheduled based on the overall priority assigned to each individual FSE. SPU uses a matrix system which combines the FOG hotspot mainline CCTV, assessment and maintenance data and combines this with a grease production assessment from each FSE. This allows SPU to focus more energy and resources on the highest grease producers connected to the most highly impacted mainlines. For example, a heavy grease-producing restaurant connected to a Category 1 hotspot mainline is considered a Priority 1 FSE and inspected every year, while a minimal grease-producing FSE on the same Category 1 line would be classified as a Priority 4 and receive only biannual inspections. FSEs identified as Priority 1, 2, and 3 are considered high priority facilities and inspected on an annual basis. Lower priority facilities are assigned inspections per the frequency designation in Table 3-5.

The commercial program includes education and outreach, site assessment, inspections, and enforcement. In 2019, Wastewater Source Control Inspectors completed 1320 FSE FOG discharge risk assessments and regulatory compliance inspections. This number included 477 high priority facility inspections, 751 periodic inspections, and 92 initial assessments. Inspections include FOG education, data collection, an evaluation of FOG discharge risk, and an assessment of compliance with Seattle Municipal Code.

**Table 3-5. FOG Risk Assessment and Inspection Frequency Criteria**

**FOG Hotspot Category & FSE Discharge Risk Assessment Matrix**

| | FSE Discharge Risk | | | |
|---|---|---|---|---|
| **Hotspot Category** | **High** | **Medium** | **Low** | **Minimal** |
| **Category 1** | 1 | 2 | 3 | 4 |
| **Category 2** | 2 | 3 | 4 | 5 |
| **Category 3** | 3 | 4 | 5 | 6 |
| **Category 4,5,6** | 4 | 5 | 6 | 7 |

**Inspection Frequency Assignments**

| Assigned Priority | Inspection Frequency |
|---|---|
| **Priority 1** | Annual |
| **Priority 2** | Annual |
| **Priority 3** | Annual |
| **Priority 4** | Biennial |
| **Priority 5** | Triennial |
| **Priority 6** | Quadrennial |
| **Priority 7** | Quinquennial |

Other 2019 highlights include:

- Completed a 2-year education and enforcement project with 74 FSEs within the historic Pike Place Market District (see Figure 3-1). The Market area is classified as a Priority 1 hotspot location with a high density of restaurants in a small geographic footprint. This project resulted in the installation of 42 new grease interceptors (including pretreatment in 19 FSEs with no existing pretreatment facilities and upgraded pretreatment in 23 FSEs which previously had inadequate and/or non-functional units). In addition, the Market hired a full-time staff position within their maintenance department to address FOG and other restaurant specific concerns, and there was a marked improvement in grease interceptor maintenance and the use of BMPs by the 74 restaurant facilities.
- Initiated a project to develop an online registration and maintenance reporting tool for FSEs.
- Continued collaboration with the King County Plumbing and Gas Piping Program, which has led to increased plan review for FSEs and a more thorough interpretation and enforcement of the Seattle/King County Plumbing Code as it pertains to FOG pretreatment.
- Continued collaboration with UA Local 32 Seattle Area Plumbers and Pipe Fitters Training Center. SPU provided 2 training sessions to apprentice plumbers during their initial training phase and journeymen plumbers for continuing education credits. This training will help plumbers understand the necessity and requirements for properly installing FOG pretreatment.
- Per customer feedback, updated commercial outreach materials to be more concise and consistent with other SPU programs (e.g. composting) in messaging and design.

SPU's contracted outreach firm (Cascadia) completed the following FOG related outreach tasks:

- Delivered in-language FOG messaging, maintenance logs, kitchen posters, or sink strainers to 108 facilities, including 76 FSEs.
- Delivered free spill kits to 201 facilities, including 102 FSEs, as part of a Seattle EnviroStars Program multi-faceted conservation, pollution prevention, and recycling campaign.
- Reached businesses through attendance at local 2019 events including the Heart of Seattle Awards, Restaurant After Hours, EnviroStars Application Party, Washington Hospitality Association Summit, and the All Chamber After Hours.

2020 efforts will include the following activities:

- Conduct regulatory compliance inspections on a minimum of 90% of all 504 Priority 1, 2, and 3 facilities as described in Table 3-5.
- Conduct regulatory compliance inspections on 90% of previously assessed facilities scheduled in 2020 per the periodicity outlined in Table 3-5.
- 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.
- Complete and pilot an online FSE registration and maintenance reporting project.
- Craft and implement a "Preferred Service Provider" Program for companies who install, repair, and maintain grease interceptors.

### 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 LinkoFOG software to manage FSE related data. In 2019, SPU updated the FSE database periodically by uploading an updated listing of FSEs permitted through Public Health - 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 2020 SPU will shift from the Access based LinkoFOG program to the LinkoFOG Online data management system. This shift will provide 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 has developed and maintains the following Standard Operating Procedures (SOPs) relating to the FOG Management Plan:

- FOG Regulatory Inspection SOP
- LinkoFOG Database User's Manual and Data Entry SOP
- FOG Enforcement SOP
- FOG GIS & Hotspot SOP
- FOG Violation and Enforcement SOP
- FOG Characterization and Risk Assignment SOP
- FOG Remote Inspector User's Manual and SOP

SPU FOG Inspectors reviewed all FOG SOPs in 2019. As a result of this review, the Linko Database SOP and Regulatory Inspection SOP 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 SOP development.

### 3.3.4 FOG Inspector Training

Continued education and training of FOG Inspectors is a fundamental component of the SPU FOG Program. FOG Inspector training in 2019 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.
- Monthly online webinar training sessions were offered by the FOG program software provider, Linko Technologies, and attended by FOG inspectors as appropriate.
- FOG Team Members traveled to several conferences and training opportunities including:
  - Western States Alliance FOG Forum Workshop, Hood River OR, April 2019
  - NACWA Pretreatment and Pollution Prevention Workshop, Tacoma WA., May 2019
  - NACWA All Day Training Session "Improving Your Fats Oils and Greases Program," Tacoma WA., May 2019
  - Aquatics Insider 2019 – Linko User Group, Los Angeles CA., July 2019
- FOG Team members actively participated in periodic meetings of the APWA PREFOG Sub-Committee.

In 2020, 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

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.

**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 2019 and work that SPU plans to complete in 2020. During 2019, 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. 2019 project spending is summarized in Table 4-1.

**Table 4-1. 2019 Plan Implementation Spending**

| Project Name | Amount Spent |
|---|---|
| Ship Canal Water Quality Project | 20,402,498 |
| North Henderson CSO Reduction Project | 72,737 |
| Central Waterfront CSO Reduction Projects | 1,528,694 |
| Delridge 168/169 CSO Control | 1,079,290 |
| South Henderson 49 CSO Reduction Project | 52,578 |
| Sewer System Improvement Projects (Retrofits) | 4,292,544 |
| Pump Station Rehabilitation | 12,787,504 |
| Outfall Rehabilitation | 2,084,599 |
| Sewer Renewal | 20,780,835 |
| Windermere Supplemental Compliance | 18,000 |
| Genesee Supplemental Compliance | 95,000 |
| South Henderson 47/171 Supplemental Compliance | 44,000 |
| Magnolia 62 Supplemental Compliance | 87,500 |
| Roadside Raingardens | 77,901 |
| RainWise | 1,378,705 |
| NDS Partnering | 2,626,000 |
| South Park Water Quality Facility | 235,503 |
| Expanded Street Arterial Sweeping | 1,874,224 |
| Total | $69,518,113 |

## 4.1 Sewer System Improvement Projects

SPU made significant progress on a variety of combined sewer system improvement projects in 2019, 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, SPU will monitor the facility and use the monitoring data to make operational improvements to ensure the facility achieves its design intent.

**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, rehabilitating other station assets, and replacing the aging force main with a larger diameter main and a new connection to King County's trunk sewer line.

In 2019, SPU completed detailed design and solicited bids for construction. Construction began in September 2019 and is currently ongoing. As of January 2020, temporary bypass pumps have been installed and are pumping flows around the pump station to the existing force main, in order to enable pump station rehabilitation to proceed. In addition, a portion of the new force main has been constructed. In 2020, the contractor will finish pump station rehabilitation and will build the remaining section of new force main and the new connection to King County's trunk sewer. The project is currently expected to be complete by the end of September 2020.

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

Montlake Basin 20 is located in central Seattle, just south of the Ship Canal cut. The sewer system improvement for this basin, similar to the project in Magnolia Basin 60, includes increasing the pumping capacity of Pump Station 13, rehabilitating other assets of the station, and replacing the aging force main with a larger diameter main.

In November 2019, SPU completed detailed design of the project and solicited construction bids. Construction is estimated to begin April 2020 to accommodate an eagle breeding window, as specified by the Washington Department of Fish and Wildlife construction permit. Based on a detailed design schedule, the project is expected to be complete in late December 2020, very close to the regulatory deadline of December 31, 2020. SPU is pre-procuring long lead-time items (the motor control center and the pumps) to minimize schedule delays from these items which have the potential to elongate the construction schedule. SPU will keep Ecology and EPA apprised of project health as schedules are furnished by the contractor and progress is made during construction. Following construction, SPU will monitor the facility to assess its performance against the design intent.

### 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 has two components. SPU will remove the HydroBrake at the existing offline storage tank and replace it with an automated sluice gate. Additionally, SPU will rehabilitate the downstream Pump Station 20 and increase the pumping capacity from 1.1 MGD to 1.5 MGD. 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.

In 2019, SPU completed detailed design and solicited construction bids in December. Based on a detailed design schedule, construction is anticipated to begin in March 2020 and is estimated to be complete in November 2020, one month before the regulatory deadline. Similar to the Montlake Basin 20 project, SPU is pre-procuring long lead-time items to reduce the risk of a schedule delay. SPU will keep Ecology and EPA apprised of project health as schedules are furnished by the contractor and progress is made during construction. Following construction, SPU will monitor the facility to assess its performance against the design intent.

### 4.1.5 Montlake (Basin 140) Sewer System Improvement Project

The 2017 Annual Report indicated that SPU would raise the Outfall 140 CSO weir to better utilize the existing offline storage tank. In 2018, SPU recalibrated the Basin 140 hydraulic model to better replicate observed overflow frequencies and volumes. In 2019, SPU conducted finished floor basement surveys, researched to identify any historical sewer backups, and performed technical modeling analysis to identify acceptable weir elevation modifications. The analysis found that lowering the transfer weir (offloading high flows to the offline storage tank) would be a more optimal way to reduce CSOs and, unlike weir raising, would not increase any risks related to an elevated hydraulic grade line. SPU will submit a Scope Report to Ecology by March 31, 2020 detailing the analysis and modeling results. SPU plans to complete the transfer weir elevation modifications by December 31, 2020.

### 4.1.6 North Union Bay (Basin 18) Sewer System Improvement Project

North Union Bay Basin 18 is located in the University District near the Burke-Gilman Trail. Retrofit work in this area has occurred in two different sub-basins: 18A and 18B. Retrofit work in Sub-Basin18A was completed in October 2012. Retrofit work in Sub-Basin 18B was initially completed in 2016, but an operational set point adjustment was made to adjust the hydraulic behavior of the 18B active control gate in April 2017. Based on monitoring data collected since completion of the sewer system improvements and updated modeling conducted in 2019, it has been determined that the North Union Bay sewer system improvement projects were successful in controlling Outfall 18 to the State CSO performance standard. The 20-year moving average for the period 2000-2019 was 0.7 CSOs/year.

## 4.2 North Henderson Storage Project (Basins 44, 45)

The North Henderson CSO Reduction Project has reduced the number and volume of combined sewage overflows from Outfalls 44 and 45. The project includes a new 2.65 MG storage facility in Seward Park and more modest improvements adjacent to Martha Washington Park. The storage facility includes diversion structures with motor-operated gates to control flow into the storage tank, a mechanical and electrical facility vault, and a pump and force main system to return stored flow back into the sewer system.


**Figure 4-2. Completed North Henderson CSO Storage Facility**

The new facilities were placed in operation in May 2017. Following SPU's "stabilization" phase, in December 2018 SPU placed the facilities in full operation and submitted notification of construction complete. Hydraulic modeling performed in 2019 determined that the project was successful in controlling Outfalls 44 and 45 to the State CSO performance standard. The 2000-2019 20-year moving average was 1.0 CSOs/year for Outfall 44 and 0.1 CSOs/year for Outfall 45.

## 4.3 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, 150, 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 Ship Canal Project. 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 2019, SPU and DNRP completed updates in the hydraulic model for DNRP's 3rd Avenue West (DSN 008) basin and revised the previously completed Facility Plan Addendum accordingly. The Revised Facility Plan Addendum was submitted to Ecology and EPA in March 2019 for review and approval.

In 2019, the project team made significant progress on project design and construction:

- The project team finalized the Storage Tunnel work package design and permitting, received Ecology approval of the final design, completed the public works bidding process, and executed a construction contract with the Lane Construction Company. Construction bids came in higher than anticipated; the Ship Canal Program is using reserves to cover the additional cost. This will impact the reserves available to complete the rest of the work packages. SPU issued construction Notice to Proceed on December 26, 2019.
- Construction continued on the Ballard Early work package and was substantially complete in late December 2019. 2019 accomplishments included site remediation near the western tunnel portal, replacement of the pedestrian pier at the 24th Ave NW street end, replacement of existing CSO Outfalls 150 and 151 with a single outfall (Outfall 151) under the pedestrian pier, installation of temporary power facilities for the future Storage Tunnel contract, and utility relocations at the Ballard site. The 24th Ave NW pier was reconstructed to enable barging of tunneling spoils.

**Figure 4-3. Ballard Early Work Construction – Pier Replacement**

**Figure 4-4. Ballard Early Work Construction – Site Remediation**

- The Tunnel Effluent Pump Station (TEPS) work package team conducted public outreach, permitting, and coordination with the Seattle Design Commission and developed a revised site plan and layout. Work also progressed on the 60% Design package for review in 2020.
- The Wallingford Conveyance work package team completed 30% and 60% design milestones. Construction of this work package will begin following tunneling completion.
- The Ballard Conveyance work package team completed 30% design. Construction of this work package will begin following tunneling completion.
- In addition, the Ship Canal Water Quality Project completed acquisition of property easements along the tunnel alignment, received final approval of an overall Construction Quality Assurance Plan from Ecology, both SPU and King County executed 2019 State Revolving Fund (SRF) loans with Ecology, SPU submitted a Water Infrastructure Finance and Innovation and Act (WIFIA) loan application, and King County is preparing a corresponding WIFIA application to qualify for loans for their cost share.

SPU continued with community outreach for the Ship Canal Project during 2019, as summarized below:

- Staffed information booths at the Fremont Fair and Ballard Seafood Fest, in June and July, resulting in approximately 183 contacts and 14 listserv signups.
- Delivered project briefings to SPU's Customer Review Panel (a group established to provide input and review progress on SPU's Strategic Business Plan), community groups and business associations (Groundswell Northwest, Friends of Street Ends, Central Ballard Residents Association, and North Seattle Industrial Association).

- Delivered presentations to Seattle City Council, the King County Regional Water Quality Committee, and Seattle Mayor's Office.
- Held a pre-construction kick-off meeting in Ballard for business owners and residents.
- Launched a new project website and online survey to collect feedback on the 24$^{th}$ Ave NW right of way and street end design.
- Conducted numerous stakeholder briefings with property owners and businesses along the proposed project sites and tunnel alignment (22 one-on-one briefings).
- Contacted businesses and residents with flyers and phone calls about noise monitoring, soil investigations and utility location work (11,000+ residents and businesses received flyers).
- Contacted property owners and property managers along the tunnel alignment to obtain rights-of-entry to support the settlement monitoring program for tunneling operations (169 contacts; 82 right of entries collected).
- Sent 10 project updates to approximately 818 residents and business owners using the Ship Canal Project listserv.

In 2020, the project team anticipates continued progress on project design and construction:

- Construction of the Storage Tunnel work package will include site preparation at each of the shaft sites, including construction of the shoring system for most of the shafts. The Contractor will submit an order for the new tunnel boring machine and fabrication of the machine will begin. The 24$^{th}$ Ave Pier will also be revised for barging operations during the permitted fish window.
- The TEPS work package team anticipates completing 60 percent design in the 1$^{st}$ quarter of 2020 and submitting the 90% design to Ecology for review in late 3$^{rd}$ quarter 2020.
- The Ballard Conveyance work package team plans to complete 60% design and both the Ballard and Wallingford Conveyance work package teams anticipate completing 90% design in 3$^{rd}$ quarter 2020.
- SPU plans to execute a WIFIA low-interest loan with EPA by June 2020 and King County plans to submit a WIFIA loan application in the first half of 2020.

SPU's planned 2020 outreach activities include:

- Deliver project briefings at organizations, boards and/or associations focused on potential project impacts to trees, bicycles, pedestrians, and industry.
- Deliver notices and mailers along the tunnel alignment, as necessary.
- Continue stakeholder briefings and attending community meetings.
- Provide project information via fact sheets, website, listserv and other materials.
- Conduct pre-construction community outreach prior to the start of tunnel construction at each of the five shaft sites in the Ballard, East Ballard, Fremont, Queen Anne, and Wallingford neighborhoods. The shafts facilitate construction of the storage tunnel and will ultimately connect flows from the combined sewer system into the storage tunnel.

- Conduct site design outreach with parties interested in the Ballard project site and the Wallingford project site.

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

## 4.4 Central Waterfront CSO Reduction Projects

### 4.4.1 South Central Waterfront (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 limit CSOs from Outfalls 70 (University Street), 71 (Madison Street) and 72 (Washington 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 2020, 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 already discharge less than once per year on average, and the discharge from Outfall 71 is a relatively small portion of the City's CSO volume.

**Figure 4-5. Central Waterfront Construction – Dewatering System**

**Figure 4-6. Central Waterfront Construction – Maintenance Hole Installation**

### 4.4.2 North Central Waterfront (Basin 69)

Basin 69 is the most northern CSO basin along the Central Waterfront. Basin 69 is approximately 150 acres in size and the wastewater collection system is fully combined. Combined sewage flows north from Basin 69 into DNRP's Elliott Bay Interceptor.

In 2019, SPU completed an evaluation of alternatives to control the basin, submitted a Draft Engineering Report on June 26, 2019, and submitted a Final Engineering Report on December 20, 2019. The preferred alternative includes installation of 1,800 feet of 24-inch diameter gravity combined sewer pipe to transfer peak flows from Basin 69 to DNRP's Elliott Bay Interceptor. The pipe would be located under Elliott Avenue and run from Vine Street to Bay St.

## 4.5 Longfellow Creek Water Quality Project (Basins 168, 169)

The Longfellow Creek Water Quality Improvement Project (LCWQIP) is the long-term plan to control CSOs from Delridge Basins 168 and 169 through equitable approaches, strategic partnerships, and technical means that benefit SPU's systems and the surrounding community. The ultimate goal of this project is to identify how best to steward the quality of the water flowing in Longfellow Creek through both CSO reduction and stormwater discharge quality improvements. In 2019, the first of two options analysis phases (Phase A) began. This initial phase is focused on community engagement to identify community priorities that could be addressed through CSO reduction and stormwater improvement work and building the mapping and tools that will help SPU identify how to address those priorities through a series of options. SPU anticipates that options could include both capital work as well as programmatic improvements to address acute and long-term system needs. SPU is concurrently engaging other stakeholders within the City of Seattle to identify areas of potential co-investment partnership to leverage partner funds for an expanded set of outcomes for the community in Delridge as we work to reduce CSOs and improve water quality in Longfellow Creek.

In 2020, SPU will continue to advance Phase A of the options analysis to identify a set of 12 high-level options, and anticipates wrapping up Phase A around the end of the year. Phase B will screen those high-level options down to six options and further develop that set of options through additional community engagement, technical engineering refinements, and further partnership coordination and formation. SPU will provide status updates on this project to Ecology and EPA during regular update meetings, so that SPU can share project level learning and discuss proposed approaches to improving water quality across both the CSO and MS4 systems.

## 4.6 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. The improvements were divided into 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 in the Leschi area. Modeling conducted in 2018, together with flow monitoring in 2019, show that Outfalls 27, 29, 34, 35, and 36 meet the CSO performance standard and Outfalls 28, 30, 31, and 32 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.

## 4.7 CSO Control Supplemental Compliance Plans

### 4.7.1 Windermere Supplemental Compliance Plan

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

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

In 2018 SPU implemented the recommended gate programming changes. Throughout 2019 and continuing into 2020, SPU is monitoring their effectiveness. SPU will continue to work with DNRP to identify other short-term system operational improvements.

**Figure 4-7. Completed Windermere CSO Storage Facility**

### 4.7.2 Genesee Supplemental Compliance Plan

In 2015 SPU completed the construction of a 380,000-gallon storage tank and a 120,000-gallon storage tank to reduce overflows from Outfalls 40, 41, and 43. The project was constructed in two parking lots along Lake Washington Boulevard S at 49th Avenue S and at 53rd Avenue S. Each has a facility vault, diversion sewer, and a force main with motor-operated gates to control the flow of wastewater similar to 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, and modeling indicates they have 1.7, 1.7, 1.1, and 2.75 overflows per year, respectively. 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. In 2020, SPU will continue to monitor their effectiveness.

**Figure 4-8. Completed Genesee CSO Storage Facility 9A**

**Figure 4-9. Completed Genesee CSO Storage Facility 11A**

### 4.7.3 South Henderson Supplemental Compliance Plan

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

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

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

**Figure 4-10. Completed 52nd Ave S Combined Sewage Conveyance Project**

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 will continue to make operational adjustments. If modeling indicates that adjustments will not be successful, SPU will begin to evaluate options for future capital improvements.

### 4.7.4 Magnolia 62 Supplemental Compliance Plan

In the 2016 Annual Report, SPU noted that the 20-year CSO frequency at Magnolia Outfall 62 had increased in recent years to an average of 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, 2019, 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. If the model shows that Outfall 62 exceeds the CSO performance standard, SPU will initiate additional steps.

## 4.8 Outfall Rehabilitation Projects

In 2019 SPU completed the replacement of CSO Outfalls 151 and 171. Outfall 151, which discharges into the Ship Canal at 24th Ave NW, consists of a new 48-inch diameter high density polyethylene (HDPE) pipeline that replaces the previous Outfalls 150 and 151. This replacement outfall was completed as part of the Ship Canal Water Quality Facility. The outfall was placed in service on February 27, 2019.

Outfall 171 discharges to Lake Washington in the Henderson Area. SPU replaced the outfall pipe and the bulkhead and added a new vault and tideflex valve to provide for fish exclusion. The outfall was placed in service on December 30, 2019.

Figure 4-11. Completed Outfall 171 Rehabilitation Project – viewed from Lake Washington

Figure 4-12. Completed Outfall 171 Rehabilitation Project – viewed from land

## 4.9 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 would work in conjunction with the proposed South Park Pump Station, which would 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. Much of the technical work on the Water Quality Facility is on hold pending property acquisition. In 2020, SPU plans to complete the siting evaluation and plans to confirm which property will be acquired.

## 4.10 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 2019 included:

- Upgrading the joint www.700milliongallons.org website, including improving user access to RainWise materials. The platform is continuing to become more mobile friendly and RainWise information will be easier to access and understand.
- Finalizing Volume III (Design Phase), issuing a draft final of Volume II (Options Analysis), issuing a draft of Volume IV (Construction and Commissioning) to document procedures and practices and help ensure the quality of projects based on lessons learned from recent projects, and issuing a draft final of Volume V (Operations & Maintenance) to address issues identified during finalization of Volume III of the joint SPU/DNRP Green Stormwater Infrastructure (GSI) Manuals.

- Holding a series of six workshops with SPU and DNRP representatives and subject matter experts to develop and document guidance for design, construction and maintenance of underground injection control (UIC) facilities that may be included as part of bioretention projects to help achieve volume reduction.

In 2020, planned collaborative work includes:

- Finalizing Volume II (Options Analysis), Volume IV (Construction and Commissioning), and Volume V (Operations & Maintenance) of the joint GSI Manuals, including incorporating the UIC guidance.

### 4.10.1 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 750 contractors, landscape designers and similar professionals have been trained in the program since 2009. Each year, the program offers two training opportunities for interested contractors. There are currently 35 active contractors listed on the RainWise website that are available to bid and install systems for RainWise customers. In 2019, we tightened up 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 consider RainWise as part of much larger installations.

In 2019, contractor fairs were offered to connect interested participants with participating contractors. Additionally, SPU and its community partners held several information workshops for potential RainWise customers to learn about the program, talk with satisfied participants, and meet contractors. Workshops have been expanded to included webinars that enable interested customer participation from their homes

Upon completion, installations are inspected by a RainWise inspector and property owners apply for the rebate. RainWise rebates for rain gardens are currently 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. In some instances, the rebate for a cistern is nearly 100% of the rain garden rate, but that is rare. The average 2019 installation now controls the runoff from nearly 1,400 square feet of roof area, on par with historic trends.

Typical RainWise installations are shown in Figure 4-13.


**Figure 4-13. Raingarden (left) and Cistern (right)**

In 2019, the RainWise Program completed 120 projects in the Ballard, North Union Bay, Delridge, Fremont, Genesee, Henderson, Leschi, Montlake, and Windermere basins. Since program inception, 1,005 installations have been completed in combined sewer basins managed by SPU. These installations control approximately 31.6 acres of impervious roof area and an estimated 15 million gallons (MG) per year of stormwater, and they provide an estimated 247,500 gallons of CSO control volume.

In an effort to reach historically underserved communities, SPU continues to undertake equity inclusion initiatives, particularly in the Delridge, Genesee, and Henderson basins, to explore and implement best practices for involving these communities in RainWise. In 2019, the initiative provided outreach to Vietnamese, Filipino and Chinese homeowners. Additionally, two Vietnamese and two Chinese contractors were recruited and trained.

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 completed 90 installations in 2019, for a total of 888 installations since 2013. DNRP's installations control approximately 25.5 acres of impervious roof area and 13 MG per year of stormwater.

SPU will continue to offer its RainWise Program in 2020.

### 4.10.2 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 SDOT, meeting the NDS Partnering regulatory milestone of issuing construction NTP by July 2019. Construction was completed in early 2019.

**Figure 4-14. Completed 30th Ave NE Sidewalk and NDS Project**

In late 2019, SPU initiated options analysis for North Thorton Creek NDS Project. Work to date has included assessing local flooding issues, coordinating with SDOT to identify upcoming sidewalk projects, assessing the basin for technically feasible blocks, and initiating geotechnical evaluation.

SPU also initiated design of the Longfellow and South Thornton Creek NDS Projects. Work to date has included outreach to the communities, working with an artist for one site in the Longfellow NDS Project, and continued design collaboration with SDOT on joint project sites.

An NDS opportunity was identified in the Piper's Creek basin – the Broadview Project – and concepts and early design were developed and shared with the community. Final design was completed for a joint project with SDOT along 12$^{th}$ Ave NE in the Thornton Creek basin.

In 2020, the NDS Partnering Program will continue options analysis for the North Thornton Creek NDS Project, including identifying potential project blocks with potential partnership opportunities (such as with SDOT), conducting geotechnical analysis, developing concept plans, implementing the basin outreach plans and stategies for reaching underserved communities, incorporating community feedback into the concept plans, and finalizing the selection of preferred blocks for design. Design will continue for the Longfellow and South Thornton Creek NDS Projects and the Broadview Project. Construction of the 12th Ave NE project will also be completed.

## 4.11 Expanded Arterial Street Sweeping Program

This program expands the City's arterial street sweeping program, per commitments in the Plan to Protect Seattle's Waterways.

During 2019, the team continued implementing the expanded program. SDOT street sweeping crews swept 14,188 miles in the municipal separate stormwater system area, capturing 173 dry tons of total suspended solids (TSS) equivalent (42 percent positive variance from 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;
- Replaced sweepers that have met the end of their useful life; and
- Submitted the final PCMP report for review on March 27, 2019.

During 2020, 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;
- Commission the new sweepers;
- 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 total suspended solids (TSS) equivalent in 2020.

**SECTION 5**

# Monitoring Programs and Results

This section provides a brief overview of SPU's precipitation and flow monitoring programs and presents 2019 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. SPU made no changes to the network of permanent rain gauges in 2019.

Two tables summarizing 2019 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.

For the first time in six years, Seattle experienced a drier than normal year. Across the city, as well as at the National Weather Service's official Sea-Tac rain gauge, only about 87% of the long-term average was recorded.

Normal annual rainfall, averaged citywide, is 34.94 inches. In 2019, not a single SPU rain gauge reached that amount. Totals ranged from 28.11 inches to 34.18 inches, and the average was 30.43 inches. In addition to exhibiting a relatively narrow range, the spatial distribution of the rainfall was also more uniform than usual.

Oddly, despite low annual totals, seven months of the year ended up wetter than normal. Two months, September and December, featured extreme events (i.e. rainfall in exceedance of 25-year recurrence intervals). Had it not been for a year-end storm in which up to 5.63 inches of rain fell over a three-day period, 2019 would have ended among Seattle's driest years on record.

## 5.2 Flow Monitoring Program

For most of 2019, SPU's flow monitoring consultant operated and maintained 72 monitoring points. An additional 24 monitoring points were operated and maintained by SPU staff, for a total of 96 continuous monitoring sites. In December, responsibility for 3 monitoring points was transferred from the flow monitoring consultant to SPU staff. By year-end, SPU's flow monitoring consultant operated and maintained 69 monitoring points and SPU staff operated and maintained 27 monitoring points.

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 2019 Monitoring Results

Several tables summarizing 2019 flow monitoring and flow monitor performance are included in the following pages of this report:

- Table 5-3 show the 2019 flow monitor performance by outfall and month;
- Table 5-4 provides the details of all 2019 discharges by outfall and date;
- Table 5-5 includes the most recent 5-year overflow frequency for each outfall and compares 2019 and baseline CSO conditions;
- Table 5-6 compares 2015-2019 CSOs by outfall;
- Table 5-7 compares 2015-2019 CSOs by receiving water body;
- Table 5-8 shows which outfalls met the CSO performance standard for controlled outfalls in 2019.

Exacerbated CSOs and DWOs are included in the table listing all 2019 overflows (Table 5-4). Exacerbated CSOs (and not DWOs) are also included in Tables 5-5, 5-6, 5-7, and 5-8.

Observations and conclusions from these tables include:

- System-wide, flow monitors were in service an average of 99.9%. With the exception of the Outfall 68 flow monitoring station, each SPU flow monitoring station was in service over 99% of the time. The Outfall 68 monitoring station was in service 97.9% of the time.
- There were 141 CSOs in 2019, totaling 95.7 million gallons (MG). 41 of these CSOs, totaling approximately 83 MG, occurred as a result of the single major storm event on December 19 and 20 that caused an average of 4 inches of rain in Seattle. As noted in Section 3.1.5, there were also 3 DWOs and 2 exacerbated CSOs.
- Over 20 percent of the 2019 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 55 percent of the 2019 CSOs (78 of the 141 CSOs) and 51 percent of the 2019 CSO volume (49.1 of the 95.7 MG).
- The three water bodies that received the greatest 2019 CSO volumes were Lake Washington (32.2 MG), Salmon Bay (22.6 MG), and Lake Union (21.4 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 2000-2019 20-year moving average number of CSOS per year at three outfalls identified as controlled in SPU's NPDES Permit exceeded the State CSO performance standard: Outfalls 59, 62, 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 also reported that SPU was replacing the force main using emergency contracting procedures and was bypassing WWPS 43 in the meantime, that there were unavoidable flow constraints downstream of the bypass system, and that SPU expected Outfall 59 to return to controlled status once the force main was replaced. Prior to the force main break, Outfall 59 averaged 0.4 CSOs/year. For the period 2001-2019, Outfall 59 averaged 1.1 CSOs/year, including 11 exacerbated CSOs that occurred while WWPS 43 was bypassed in 2017-2019 (see Section 3.1.5). Now that the WWPS 43 force main has been replaced, SPU believes that Outfall 59 is once again controlled.

SPU notified Ecology and EPA in 2017 that Outfall 62 no longer met the CSO performance standard and submitted a Supplemental Compliance Plan. For the period 2001-2019, Outfall 62 averaged 1.1 CSOs/year. A description of the issues and steps taken to date to address Outfall 62 is provided in Section 4.7.4.

SPU hereby notifies Ecology and EPA of the Outfall 68 noncompliance. As noted in Table 5-8, some of the 5 CSOs that occurred in 2015-2016 and contributed to the 2000-2019 average of 1.1 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.

## 5.4 CSO Control Post-Construction Monitoring

Post-Construction Monitoring Program (PCMP) sediment sampling was completed at Outfall 95 on September 13, 2018. The sampling was performed by King County DNRP staff, overseen by SPU. Seven sediment samples and one duplicate sample were collected in the vicinity of Outfall 95, in accordance with the approved Quality Assurance Project Plan/Sediment Analysis Plan (QAPP/SAP). On June 28, 2019, SPU submitted the Outfall 95 PCMP report. As shown in Table 5-8, the 2000-2019 20-year average overflow frequency for Outfall 95 is 0.70 CSOs per year, confirming that Outfall 95 is controlled. All in-situ sediment sample concentrations were below the lowest relevant marine sediment management standards. The Outfall 95 post construction monitoring results indicate that CSOs from Outfall 95 are neither causing nor contributing to violations of water quality standards. Because Outfall 95 is a designated PCMP surrogate for Outfalls 78, 80, 83, 85, 88, 90, 91, and 94, this means all nine of these outfalls meet the conditions of WAC 173-201A-400(11). Per the requirements of its NPDES Permit, SPU will continue to monitor for flow of CSOs at each of these outfalls, but all other post-construction monitoring at these outfalls is considered complete.

In 2018, SPU prepared a QAPP/SAP for Outfall 44, which was submitted to Ecology for review on November 29, 2018. SPU plans to conduct sediment sampling in 2020. SPU performed two rounds of aesthetic monitoring of the Lake Washington shoreline and water surface adjacent to Outfall 44 during a large CSO event that occurred December 20-22, 2019. The first round of aesthetic monitoring occurred approximately 90 minutes after the CSO event started on December 20, 2019 and the second round occurred on December 21, 2019, approximately 25 hours into this 40.8-hour overflow event. No sewage-like odors were detected along the shoreline and no toilet paper, sanitary products, or other items typically associated with sanitary overflows were observed. Digital photographs were taken to document the condition of the shoreline and water surface during the two rounds of monitoring and 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 NDS Partnering and South Park Water Quality stormwater facilities have not been constructed so no post-construction monitoring was conducted during 2019.

**Table 5-1. 2019 Precipitation by Gauge and by Month (inches)**

| Rain Gauge | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RG01** | 3.02 | 4.01 | 1.67 | 2.55 | 1.39 | 0.66 | 1.46 | 1.18 | 3.47 | 2.60 | 1.69 | 6.93 |
| **RG02** | 3.08 | 4.30 | 1.60 | 2.19 | 1.44 | 0.76 | 1.56 | 1.32 | 4.09 | 2.70 | 1.78 | 7.38 |
| **RG03** | 3.16 | 4.55 | 1.74 | 2.30 | 1.28 | 0.73 | 1.79 | 1.37 | 3.26 | 2.63 | 1.96 | 7.17 |
| **RG04** | 3.12 | 4.62 | 1.88 | 2.30 | 1.55 | 0.82 | 1.81 | 1.41 | 3.43 | 2.64 | 1.83 | 7.37 |
| **RG05** | 3.13 | 3.72 | 1.24 | 2.45 | 0.73 | 0.52 | 0.88 | 0.91 | 2.61 | 2.50 | 1.58 | 6.88 |
| **RG07** | 2.89 | 3.71 | 1.51 | 2.60 | 1.24 | 0.77 | 1.44 | 1.33 | 2.78 | 1.98 | 1.57 | 6.75 |
| **RG08** | 3.17 | 4.57 | 1.45 | 2.23 | 1.07 | 0.98 | 1.23 | 1.47 | 3.70 | 2.03 | 1.73 | 7.07 |
| **RG09** | 3.32 | 3.95 | 1.74 | 2.33 | 1.25 | 0.77 | 1.58 | 1.40 | 2.94 | 2.11 | 1.71 | 7.85 |
| **RG11** | 2.92 | 3.82 | 1.38 | 2.19 | 0.96 | 0.66 | 1.37 | 1.26 | 2.54 | 2.08 | 1.67 | 6.67 |
| **RG12** | 3.32 | 4.13 | 1.33 | 2.15 | 1.25 | 0.72 | 1.37 | 1.46 | 3.01 | 2.15 | 1.67 | 7.15 |
| **RG14** | 3.87 | 3.75 | 1.40 | 3.01 | 1.07 | 0.47 | 1.21 | 1.10 | 2.71 | 2.85 | 1.83 | 7.18 |
| **RG15** | 3.47 | 4.04 | 1.47 | 3.00 | 0.85 | 0.66 | 0.89 | 0.96 | 2.27 | 3.20 | 1.62 | 7.16 |
| **RG16** | 3.28 | 4.51 | 1.37 | 2.71 | 0.76 | 0.55 | 0.75 | 0.80 | 2.43 | 2.87 | 1.72 | 7.30 |
| **RG17** | 3.37 | 3.87 | 1.37 | 2.88 | 0.75 | 0.71 | 0.82 | 0.85 | 2.57 | 2.96 | 1.81 | 7.29 |
| **RG18** | 3.53 | 4.23 | 1.41 | 2.91 | 0.97 | 0.57 | 1.16 | 0.90 | 2.95 | 3.61 | 1.61 | 7.57 |
| **RG25** | 3.41 | 3.91 | 1.51 | 2.68 | 1.46 | 0.77 | 1.84 | 1.35 | 3.12 | 3.09 | 1.92 | 7.28 |
| **RG30** | 3.70 | 5.08 | 1.44 | 3.13 | 0.80 | 0.59 | 1.05 | 1.01 | 3.27 | 3.90 | 1.57 | 7.59 |
| **Monthly Average** | 3.28 | 4.16 | 1.50 | 2.57 | 1.11 | 0.69 | 1.31 | 1.18 | 3.01 | 2.70 | 1.72 | 7.21 |

| Table 5-2. 2015-2019 Average Precipitation by Month (inches) | | | | | |
|---|---|---|---|---|---|
| **Month/Year** | 2015 | 2016 | 2017 | 2018 | 2019 |
| **January** | 2.63 | 7.53 | 4.00 | 8.11 | 3.28 |
| **February** | 4.51 | 4.42 | 8.61 | 2.75 | 4.16 |
| **March** | 4.61 | 5.57 | 6.80 | 2.12 | 1.50 |
| **April** | 1.60 | 1.46 | 4.09 | 5.34 | 2.57 |
| **May** | 0.58 | 1.18 | 2.55 | 0.21 | 1.11 |
| **June** | 0.17 | 1.50 | 1.16 | 1.26 | 0.69 |
| **July** | 0.25 | 0.59 | 0.01 | 0.01 | 1.31 |
| **August** | 2.88 | 0.09 | 0.09 | 0.21 | 1.18 |
| **September** | 1.46 | 1.17 | 0.93 | 1.18 | 3.01 |
| **October** | 3.67 | 10.57 | 3.39 | 3.42 | 2.70 |
| **November** | 6.83 | 7.44 | 8.39 | 4.72 | 1.72 |
| **December** | 10.41 | 3.91 | 4.80 | 6.02 | 7.21 |
| **Annual Total** | 39.59 | 45.43 | 44.82 | 35.35 | 30.43 |

## Table 5-3. 2019 Flow Monitor Performance by Outfall and Month

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2019 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) |
| **12** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **13** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **14** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **15** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.6 | 100.0 | 0.0 | 100.0 | 4.1 | 99.5 | 0.0 | 100.0 | 5.7 | 100.0 |
| **16** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **18** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.8 | 99.8 | 1.8 | 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 | 0.0 | 100.0 | 0.0 | 100.0 |
| **20** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **22** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.7 | 99.9 | 0.0 | 100.0 | 1.8 | 99.8 | 0.0 | 100.0 | 0.0 | 100.0 | 1.0 | 99.9 | 0.0 | 100.0 | 3.4 | 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 | 25.7 | 96.5 | 25.7 | 99.7 |
| **30** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **31** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **32** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **33** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 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 | 4.5 | 99.4 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 4.5 | 99.9 |
| **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 | 54.3 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 54.3 | 100.0 |

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2019 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 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **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 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **42** | 0.0 | 100.0 | 0.0 | 100.0 | 57.7 | 92.2 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 3.2 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 60.9 | 99.4 |
| **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** | 0.0 | 100.0 | 0.0 | 100.0 | 41.9 | 94.4 | 0.0 | 100.0 | 0.6 | 99.9 | 2.9 | 99.6 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 1.4 | 99.8 | 0.0 | 100.0 | 5.9 | 99.2 | 52.7 | 99.4 |
| **45** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **46** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 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** | 0.0 | 100.0 | 0.0 | 100.0 | 40.8 | 94.5 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 21.2 | 97.2 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 61.9 | 99.3 |
| **48** | 11.0 | 98.5 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 11.0 | 99.9 |
| **49** | 14.2 | 98.1 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 14.2 | 99.8 |
| **57** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **59** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **60** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **61** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **62** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **64** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **68** | 1.9 | 99.7 | 0.0 | 100.0 | 0.0 | 100.0 | 47.4 | 93.6 | 62.4 | 91.6 | 44.9 | 94.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 29.3 | 96.1 | 0.0 | 100.0 | 185.9 | 97.9 |
| **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 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **71** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **72** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **78** | 50.3 | 93.2 | 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 | 0.0 | 100.0 | 50.3 | 99.4 |

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2019 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) | Downtime (hrs) | Uptime (%) |
| **80** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **83** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.9 | 99.9 | 0.0 | 100.0 | 6.3 | 99.2 | 7.2 | 99.9 |
| **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 | 0.7 | 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 | 0.7 | 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 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **91** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 35.7 | 95.2 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 35.7 | 99.6 |
| **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 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **107** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **111** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 46.8 | 93.7 | 1.4 | 99.8 | 0.0 | 100.0 | 48.3 | 99.5 |
| **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 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **134** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 99.9 | 0.0 | 100.0 | 0.0 | 100.0 | 1.0 | 99.9 | 1.0 | 100.0 |
| **135** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **136** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 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** | 45.2 | 93.9 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 38.0 | 94.9 | 83.2 | 99.1 |

| Outfall Number | Jan | | Feb | | Mar | | Apr | | May | | Jun | | Jul | | Aug | | Sept | | Oct | | Nov | | Dec | | 2019 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** | 25.6 | 96.6 | 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 | 25.6 | 99.7 |
| **145** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **146** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **147** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 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 | 1.0 | 99.9 | 1.0 | 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 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **165** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **168** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **169** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **170** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| **171** | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 | 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 | 68.3 | 90.8 | 68.3 | 99.2 |
| **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:** | 148.1 | 99.8 | 4.5 | 100.0 | 140.3 | 99.8 | 47.4 | 99.9 | 63.0 | 99.9 | 49.1 | 99.9 | 35.7 | 99.9 | 22.9 | 100.0 | 59.1 | 100.0 | 49.1 | 99.9 | 35.8 | 99.9 | 147.9 | 99.8 | 803.1 | 99.9 |

| Table 5-4. 2019 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 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **13** | City of Seattle | Lake Washington | 09/08/2019 | 39,508 | 1.67 | 20.43 | 1.17 |
| | | | | 12/20/2019 | 10,485,874 | 29.20 | 68.87 | 5.23 |
| | | | | Total | 10,525,382 | 30.87 | 89.30 | 6.40 |
| | | | | Average | 5,262,691 | 15.44 | 44.65 | 3.20 |
| | | | | | | | | |
| WA0031682 | **14** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **15** | City of Seattle | Lake Washington | 12/19/19 | 162,483 | 20.17 | 47.80 | 3.90 |
| | | | | Total | 162,483 | 20.17 | 47.80 | 3.90 |
| | | | | Average | 162,483 | 20.17 | 47.80 | 3.90 |
| | | | | | | | | |
| WA0031682 | **16** | City of Seattle | Union Bay | 07/15/19 | 1,269 | 0.18 | 13.18 | 0.19 |
| | | | | Total | 1,269 | 0.18 | 13.18 | 0.19 |
| | | | | Average | 1,269 | 0.18 | 13.18 | 0.19 |
| | | | | | | | | |
| WA0031682 | **18** | City of Seattle | Union Bay | 03/01/19 | 32,637[1] | 5.33 | 0.00 | 0.00 |
| | | | | 12/20/19 | 3,225,836 | 26.10 | 65.80 | 4.96 |
| | | | | Total | 3,258,473 | 31.43 | 65.80 | 4.96 |
| | | | | Average | 1,629,237 | 15.72 | 32.90 | 2.48 |
| | | | | | | | | |
| WA0031682 | **19** | City of Seattle | Union Bay | *No combined sewer overflows during 2019* | | | | |

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| WA0031682 | **20** | City of Seattle | Union Bay | 12/19/19 | 1,595,375 | 39.00 | 66.73 | 4.97 |
| | | | | Total | 1,595,375 | 39.00 | 66.73 | 4.97 |
| | | | | Average | 1,595,375 | 39.00 | 66.73 | 4.97 |
| | | | | | | | | |
| WA0031682 | **22** | City of Seattle | Union Bay | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **24** | City of Seattle | Lake Washington | 12/20/19 | 41,198 | 2.13 | 44.10 | 3.66 |
| | | | | Total | 41,198 | 2.13 | 44.10 | 3.66 |
| | | | | Average | 41,198 | 2.13 | 44.10 | 3.66 |
| | | | | | | | | |
| | | | | | | | | |
| WA0031682 | **25** | City of Seattle | Lake Washington | 12/20/19 | 116,115 | 2.33 | 44.17 | 3.66 |
| | | | | Total | 116,115 | 2.33 | 44.17 | 3.66 |
| | | | | Average | 116,115 | 2.33 | 44.17 | 3.66 |
| | | | | | | | | |
| | | | | | | | | |
| WA0031682 | **27** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **28** | City of Seattle | Lake Washington | 9/7/2019 | 12,266 | 0.25 | 0.48 | 0.44 |
| | | | | 10/18/2019 | 1,584 | 0.10 | 67.37 | 0.89 |
| | | | | 10/25/2019 | 4,080 | 0.17 | 9.67 | 0.35 |
| | | | | 11/25/2019 | 707 | 0.23 | 35.35 | 0.16 |
| | | | | 12/19/2019 | 3,134 | 13.27 | 41.07 | 3.06 |
| | | | | Total | 21,771 | 14.02 | 153.93 | 4.90 |
| | | | | Average | 4,354 | 2.80 | 30.79 | 0.98 |
| | | | | | | | | |
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| WA0031682 | **29** | City of Seattle | Lake Washington | 9/7/19 | 4,697 | 0.25 | 0.48 | 0.44 |
| | | | | 12/20/19 | 152,892 | 7.47 | 46.10 | 3.92 |
| | | | | Total | 157,589 | 7.72 | 46.58 | 4.36 |
| | | | | Average | 78,795 | 3.86 | 23.29 | 2.18 |
| | | | | | | | | |
| WA0031682 | **30** | City of Seattle | Lake Washington | 12/20/19 | 39,810 | 7.30 | 45.87 | 3.90 |
| | | | | Total | 39,810 | 7.30 | 45.87 | 3.90 |
| | | | | Average | 39,810 | 7.30 | 45.87 | 3.90 |
| | | | | | | | | |
| WA0031682 | **31** | City of Seattle | Lake Washington | 12/20/19 | 547,576 | 28.67 | 64.52 | 5.00 |
| | | | | Total | 547,576 | 28.67 | 64.52 | 5.00 |
| | | | | Average | 547,576 | 28.67 | 64.52 | 5.00 |
| | | | | | | | | |
| WA0031682 | **32** | City of Seattle | Lake Washington | 12/20/19 | 232,294 | 11.23 | 49.87 | 4.12 |
| | | | | Total | 232,294 | 11.23 | 49.87 | 4.12 |
| | | | | Average | 232,294 | 11.23 | 49.87 | 4.12 |
| | | | | | | | | |
| WA0031682 | **33** | City of Seattle | Lake Washington | *Sealed and removed from service on July 22, 2016* | | | | |
| | | | | | | | | |
| WA0031682 | **34** | City of Seattle | Lake Washington | 12/20/19 | 27,359 | 3.23 | 44.30 | 3.67 |
| | | | | Total | 27,359 | 3.23 | 44.30 | 3.67 |
| | | | | Average | 27,359 | 3.23 | 44.30 | 3.67 |
| | | | | | | | | |
| WA0031682 | **35** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **36** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **38** | City of Seattle | Lake Washington | 12/20/19 | 409,725 | 9.60 | 47.47 | 4.17 |
| | | | | Total | 409,725 | 9.60 | 47.47 | 4.17 |
| | | | | Average | 409,725 | 9.60 | 47.47 | 4.17 |
| | | | | | | | | |
| WA0031682 | **40** | City of Seattle | Lake Washington | 12/20/2019 | 915,369 | 38.23 | 67.50 | 5.21 |
| | | | | Total | 915,369 | 38.23 | 67.50 | 5.21 |
| | | | | Average | 915,369 | 38.23 | 67.50 | 5.21 |
| | | | | | | | | |
| WA0031682 | **41** | City of Seattle | Lake Washington | 12/20/2019 | 915,369 | 38.23 | 67.50 | 5.21 |
| | | | | Total | 915,369 | 38.23 | 67.50 | 5.21 |
| | | | | Average | 915,369 | 38.23 | 67.50 | 5.21 |
| | | | | | | | | |
| WA0031682 | **42** | City of Seattle | Lake Washington | 12/20/19 | 258,181 | 14.00 | 49.10 | 4.22 |
| | | | | Total | 258,181 | 14.00 | 49.10 | 4.22 |
| | | | | Average | 258,181 | 14.00 | 49.10 | 4.22 |
| | | | | | | | | |
| WA0031682 | **43** | City of Seattle | Lake Washington | 2/12/19 | 14,098 | 4.00 | 103.87 | 2.31 |
| | | | | 10/20/19 | 979 | 0.42 | 109.93 | 2.36 |
| | | | | 12/19/19 | 1,202,115 | 63.00 | 67.50 | 5.21 |
| | | | | Total | 1,217,192 | 67.42 | 281.30 | 9.88 |
| | | | | Average | 405,731 | 22.47 | 93.77 | 3.29 |
| | | | | | | | | |
| WA0031682 | **44** | City of Seattle | Lake Washington | 12/20/19 | 5,435,510 | 57.67 | 67.50 | 5.21 |
| | | | | Total | 5,435,510 | 57.67 | 67.50 | 5.21 |
| | | | | Average | 5,435,510 | 57.67 | 67.50 | 5.21 |
| | | | | | | | | |
| WA0031682 | **45** | City of Seattle | Lake Washington | 12/20/19 | 52,700 | 9.70 | 42.35 | 3.71 |
| | | | | Total | 52,700 | 9.70 | 42.35 | 3.71 |

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|---|---|---|---|---|---|---|---|---|
| | | | | Average | 52,700 | 9.70 | 42.35 | 3.71 |
| | | | | | | | | |
| WA0031682 | **46** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **47** | City of Seattle | Lake Washington | 9/7/2019 | 35,734 | 0.45 | 0.70 | 0.52 |
| | | | | 10/18/2019 | 12,185 | 0.30 | 60.38 | 1.49 |
| | | | | 12/20/2019 | 2,429,423 | 18.67 | 47.97 | 4.38 |
| | | | | Total | 2,477,342 | 19.42 | 109.05 | 6.39 |
| | | | | Average | 825,781 | 6.47 | 36.35 | 2.13 |
| | | | | | | | | |
| WA0031682 | **48** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **49** | City of Seattle | Lake Washington | 10/19/19 | 32,562 | 0.83 | 73.02 | 2.47 |
| | | | | 12/19/19 | 6,897,512 | 39.87 | 68.90 | 5.41 |
| | | | | Total | 6,930,074 | 40.70 | 141.92 | 7.88 |
| | | | | Average | 3,465,037 | 20.35 | 70.96 | 3.94 |
| | | | | | | | | |
| WA0031682 | **57** | City of Seattle | Puget Sound - Central | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **59** | City of Seattle | Salmon Bay | 9/10/19 | 195,533[2] | 0.75 | 59.47 | 1.30 |
| | | | | Total | 195,533 | 0.75 | 59.47 | 1.30 |
| | | | | Average | 195,533 | 0.75 | 59.47 | 1.30 |
| | | | | | | | | |
| WA0031682 | **60** | City of Seattle | Salmon Bay | 09/10/19 | 1,603.00 | 0.20 | 59.37 | 1.27 |
| | | | | 12/20/19 | 23,514.00 | 3.17 | 43.17 | 3.50 |
| | | | | Total | 25,117 | 3.37 | 102.53 | 4.77 |
| | | | | Average | 12,559 | 1.69 | 51.27 | 2.39 |
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| WA0031682 | **61** | City of Seattle | Elliott Bay | 12/20/19 | 37,629 | 0.67 | 40.72 | 3.13 |
| | | | | Total | 37,629 | 0.67 | 194.52 | 3.13 |
| | | | | Average | 25,102 | 1.91 | 64.84 | 3.13 |
| | | | | | | | | |
| WA0031682 | **62** | City of Seattle | Elliott Bay | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **64** | City of Seattle | Elliott Bay | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **68** | City of Seattle | Elliott Bay | 09/07/19 | 4,705 | 1.87 | 2.10 | 0.46 |
| | | | | 12/19/19 | 978,313 | 25.07 | 46.70 | 4.19 |
| | | | | Total | 983,018 | 26.94 | 48.80 | 4.65 |
| | | | | Average | 491,509 | 13.47 | 24.40 | 2.33 |
| | | | | | | | | |
| WA0031682 | **69** | City of Seattle | Elliott Bay | 12/19/19 | 47,509 | 13.43 | 41.17 | 2.90 |
| | | | | Total | 47,509 | 13.43 | 41.17 | 2.90 |
| | | | | Average | 47,509 | 13.43 | 41.17 | 2.90 |
| | | | | | | | | |
| WA0031682 | **70** | City of Seattle | Elliott Bay | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **71** | City of Seattle | Elliott Bay | 09/07/19 | 16,971 | 0.23 | 0.48 | 0.14 |
| | | | | 12/19/19 | 603,103 | 19.80 | 47.57 | 3.81 |
| | | | | Total | 620,074 | 20.03 | 48.05 | 3.95 |
| | | | | Average | 310,037 | 10.02 | 24.02 | 1.98 |
| | | | | | | | | |
| WA0031682 | **72** | City of Seattle | Elliott Bay | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **78** | City of Seattle | Elliott Bay | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **80** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **83** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **85** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **88** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **90** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **91** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **94** | City of Seattle | Puget Sound | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **95** | City of Seattle | Puget Sound | 9/7/19 | 2,353[2] | 0.15 | 1.37 | 0.72 |
| | | | | 12/20/19 | 4,320 | 6.58 | 45.65 | 3.90 |
| | | | | Total | 6,673 | 6.73 | 47.02 | 4.62 |
| | | | | Average | 3,337 | 3.37 | 23.51 | 2.31 |
| | | | | | | | | |
| WA0031682 | **99** | City of Seattle | West Waterway - Duwamish River | 12/20/19 | 740,333 | 10.20 | 50.52 | 4.33 |
| | | | | Total | 740,333 | 10.20 | 50.52 | 4.33 |
| | | | | Average | 740,333 | 10.20 | 50.52 | 4.33 |
| | | | | | | | | |
| WA0031682 | **107** | City of Seattle | East Waterway - Duwamish River | 12/19/19 | 176,732 | 39.03 | 66.93 | 5.07 |
| | | | | Total | 176,732 | 39.03 | 66.93 | 5.07 |
| | | | | Average | 176,732 | 39.03 | 66.93 | 5.07 |

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| WA0031682 | **111** | City of Seattle | Duwamish River | 12/20/19 | 1,401,251 | 7.97 | 48.17 | 4.11 |
| | | | | Total | 1,401,251 | 7.97 | 48.17 | 4.11 |
| | | | | Average | 1,401,251 | 7.97 | 48.17 | 4.11 |
| | | | | | | | | |
| WA0031682 | **120** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **121** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **124** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **127** | City of Seattle | Lake Union | 07/14/19 | 6,246[1] | 18.43 | 0.00 | 0.00 |
| | | | | Total | 6,246 | 18.43 | 0.00 | 0.00 |
| | | | | Average | 6,246 | 18.43 | 0.00 | 0.00 |
| | | | | | | | | |
| WA0031682 | **129** | City of Seattle | Lake Union | 01/24/19 | 13,322[1] | 3.17 | 0.00 | 0.00 |
| | | | | Total | 13,322 | 3.17 | 0.00 | 0.00 |
| | | | | Average | 13,322 | 3.17 | 0.00 | 0.00 |
| | | | | | | | | |
| WA0031682 | **130** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **131** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **132** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **134** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **135** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **136** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **138** | City of Seattle | Portage Bay | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **139** | City of Seattle | Portage Bay | 1/22/19 | 27,934 | 0.87 | 8.20 | 0.45 |
| | | | | 9/7/2019 | 9,165 | 0.27 | 0.60 | 0.31 |
| | | | | 12/19/2019 | 1,812,464 | 35.97 | 63.63 | 4.85 |
| | | | | Total | 1,849,563 | 37.11 | 72.43 | 5.61 |
| | | | | Average | 616,521 | 12.37 | 24.14 | 1.87 |
| | | | | | | | | |
| | | | | | | | | |
| WA0031682 | **140** | City of Seattle | Portage Bay | 07/15/19 | 905 | 0.17 | 13.18 | 0.19 |
| | | | | 9/7/2019 | 5,497 | 0.33 | 0.47 | 0.30 |
| | | | | 9/10/2019 | 4,890 | 0.53 | 58.57 | 1.21 |
| | | | | 10/25/2019 | 150 | 0.07 | 9.47 | 0.33 |
| | | | | 12/20/2019 | 558,368 | 25.57 | 64.07 | 4.87 |
| | | | | Total | 569,810 | 26.67 | 145.75 | 6.90 |
| | | | | Average | 113,962 | 5.33 | 29.15 | 1.38 |
| | | | | | | | | |
| | | | | | | | | |
| WA0031682 | **141** | City of Seattle | Portage Bay | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **144** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **145** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **146** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
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| WA0031682 | **147** | City of Seattle | Lake Union | 01/03/19 | 326,465 | 8.42 | 23.92 | 0.78 |
| | | | | 01/06/19 | 100,221 | 19.42 | 27.72 | 0.59 |
| | | | | 01/18/19 | 22,095 | 0.25 | 42.22 | 0.28 |
| | | | | 01/22/19 | 379,228 | 11.42 | 17.43 | 0.63 |
| | | | | 02/12/19 | 2,434 | 0.75 | 47.20 | 1.16 |
| | | | | 02/14/19 | 17,833 | 0.42 | 96.53 | 1.89 |
| | | | | 02/16/19 | 114,546 | 9.50 | 11.02 | 0.41 |
| | | | | 02/19/19 | 150,541 | 0.75 | 9.23 | 0.03 |
| | | | | 02/23/19 | 572 | 0.08 | 32.38 | 0.24 |
| | | | | 03/12/19 | 493014 | 20.33 | 25.73 | 0.96 |
| | | | | 04/05/19 | 67850 | 23.92 | 41.47 | 0.76 |
| | | | | 04/11/19 | 5978 | 0.17 | 31.32 | 0.23 |
| | | | | 05/16/19 | 242712 | 2.92 | 32.30 | 0.59 |
| | | | | 06/19/19 | 344240 | 5.17 | 5.75 | 0.57 |
| | | | | 07/10/19 | 6108 | 0.08 | 8.55 | 0.25 |
| | | | | 07/18/19 | 86076 | 4.42 | 40.72 | 0.30 |
| | | | | 08/02/19 | 268,179 | 1.17 | 1.40 | 0.35 |
| | | | | 08/10/19 | 729770 | 2.67 | 4.73 | 0.65 |
| | | | | 08/21/19 | 7382 | 0.17 | 1.87 | 0.14 |
| | | | | 09/07/19 | 114647 | 1.92 | 2.00 | 0.59 |
| | | | | 09/10/19 | 13921 | 0.58 | 59.17 | 0.93 |
| | | | | 09/12/19 | 1902 | 0.08 | 0.40 | 0.07 |
| | | | | 09/15/19 | 12594 | 0.75 | 5.40 | 0.30 |
| | | | | 09/18/19 | 4705 | 0.17 | 17.37 | 0.27 |
| | | | | 09/28/19 | 22668 | 0.25 | 7.02 | 0.15 |
| | | | | 09/29/19 | 12464 | 0.25 | 35.43 | 0.32 |
| | | | | 10/08/19 | 38840 | 0.42 | 8.98 | 0.08 |
| | | | | 10/16/19 | 44584 | 0.42 | 13.25 | 0.25 |

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| | | | | 10/18/19 | 222283 | 9.25 | 69.83 | 0.76 |
| | | | | 11/18/19 | 61558 | 0.67 | 51.70 | 0.74 |
| | | | | 11/25/19 | 4296 | 0.08 | 52.03 | 0.10 |
| | | | | 12/14/19 | 52901 | 2.42 | 15.67 | 0.46 |
| | | | | 12/19/19 | 17379774 | 49.25 | 68.02 | 5.60 |
| | | | | 12/23/19 | 32914 | 0.58 | 105.27 | 5.89 |
| | | | | Total | 21,385,295 | 179.12 | 1013.02 | 27.32 |
| | | | | Average | 628,979 | 5.27 | 29.79 | 0.80 |
| | | | | | | | | |
| WA0031682 | **148** | City of Seattle | Lake Washington - Ship Canal | 08/02/19 | 23,649 | 1.25 | 1.40 | 0.35 |
| | | | | Total | 23,649 | 1.25 | 1.40 | 0.35 |
| | | | | Average | 23,649 | 1.25 | 1.40 | 0.35 |
| | | | | | | | | |
| WA0031682 | **150** | City of Seattle | Salmon Bay | 01/22/19 | 124 | 0.50 | 8.55 | 0.44 |
| | **151** | | | 02/16/19 | 3,135 | 0.53 | 9.53 | 0.47 |
| | | | | 02/19/19 | 9,196 | 0.40 | 19.18 | 0.11 |
| | | | | 08/02/19 | 212,949 | 0.67 | 1.10 | 0.33 |
| | | | | 09/07/19 | 332,348 | 0.47 | 0.83 | 0.30 |
| | | | | 09/10/19 | 633,471 | 0.80 | 59.47 | 1.30 |
| | | | | 09/15/19 | 171,504 | 0.50 | 5.68 | 0.33 |
| | | | | 09/28/19 | 52,352 | 0.30 | 45.35 | 0.62 |
| | | | | 12/20/19 | 934,753 | 18.00 | 56.37 | 4.82 |
| | | | | Total | 2,349,832 | 22.17 | 206.07 | 8.72 |
| | | | | Average | 261,092 | 2.46 | 22.90 | 0.97 |
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| WA0031682 | **152** | City of Seattle | Salmon Bay | 1/3/19 | 169,223 | 9.22 | 24.83 | 0.8 |
| | | | | 1/6/19 | 151,992 | 21.17 | 28.18 | 0.62 |
| | | | | 1/9/19 | 21,291 | 10.03 | 33.05 | 0.49 |
| | | | | 1/18/19 | 23,894 | 2.17 | 44.37 | 0.36 |
| | | | | 1/22/19 | 373,505 | 2.08 | 8.88 | 0.45 |
| | | | | 2/1/19 | 69,685 | 5.13 | 7.70 | 0.46 |
| | | | | 2/12/19 | 643,447 | 60.00 | 149.87 | 2.65 |
| | | | | 2/16/19 | 525,040 | 11.17 | 11.92 | 0.53 |
| | | | | 2/19/19 | 114,730 | 0.83 | 19.52 | 0.12 |
| | | | | 2/22/19 | 48,263 | 0.63 | 1.07 | 0.12 |
| | | | | 2/23/19 | 25,045 | 4.43 | 37.03 | 0.33 |
| | | | | 3/12/19 | 456,865 | 20.27 | 24.48 | 0.77 |
| | | | | 4/5/19 | 65,340 | 24.70 | 42.37 | 0.73 |
| | | | | 4/9/19 | 18,740 | 0.77 | 20.55 | 0.19 |
| | | | | 5/17/19 | 60,855 | 1.80 | 33.33 | 0.49 |
| | | | | 6/19/2019 | 534,607 | 5.45 | 44.43 | 0.80 |
| | | | | 7/10/2019 | 59,531 | 0.43 | 9.28 | 0.27 |
| | | | | 07/18/19 | 5,948 | 0.95 | 42.37 | 0.37 |
| | | | | 08/02/19 | 262,443 | 0.83 | 1.33 | 0.34 |
| | | | | 08/10/19 | 512,031 | 2.55 | 4.42 | 0.66 |
| | | | | 08/21/19 | 56,049 | 0.52 | 1.93 | 0.22 |
| | | | | 09/07/19 | 310,209 | 2.05 | 2.33 | 0.42 |
| | | | | 09/10/19 | 1,295,669 | 1.82 | 59.47 | 1.30 |
| | | | | 09/12/19 | 2,056 | 0.35 | 0.67 | 0.11 |
| | | | | 9/15/2019 | 226,166 | 0.88 | 5.95 | 0.34 |
| | | | | 9/28/2019 | 548,676 | 4.00 | 45.62 | 0.62 |
| | | | | 10/18/2019 | 147,160 | 2.25 | 70.63 | 0.75 |
| | | | | 10/21/2019 | 9,143 | 11.75 | 145.80 | 1.67 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 11/15/2019 | 1,624 | 0.32 | 1.25 | 0.14 |
| | | | | 11/18/2019 | 197,561 | 3.83 | 52.13 | 0.67 |
| | | | | 12/11/2019 | 12,614 | 0.80 | 32.48 | 0.47 |
| | | | | 12/18/2019 | 13,006,380 | 65.58 | 66.65 | 5.42 |
| | | | | 12/23/2019 | 36,499 | 12.57 | 23.85 | 0.31 |
| | | | | Total | 19,992,281 | 291.33 | 1097.74 | 23.99 |
| | | | | Average | 605,827 | 8.83 | 33.26 | 0.73 |
| | | | | | | | | |
| WA0031682 | **161** | City of Seattle | Lake Washington | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| WA0031682 | **165** | City of Seattle | Lake Washington | 12/20/19 | 1754 | 0.17 | 41.53 | 3.63 |
| | | | | Total | 1,754 | 0.17 | 41.53 | 3.63 |
| | | | | Average | 1,754 | 0.17 | 41.53 | 3.63 |
| | | | | | | | | |
| WA0031682 | **168** | City of Seattle | Lake Washington | 12/20/2019 | 1,477,082 | 24.82 | 66.83 | 4.86 |
| | | | | Total | 1,477,082 | 24.82 | 66.83 | 4.86 |
| | | | | Average | 1,477,082 | 24.82 | 66.83 | 4.86 |
| | | | | | | | | |
| WA0031682 | **169** | City of Seattle | Lake Washington | 12/20/2019 | 1,335,434 | 27.38 | 62.88 | 4.70 |
| | | | | Total | 1,335,434 | 27.38 | 62.88 | 4.70 |
| | | | | Average | 1,335,434 | 27.38 | 62.88 | 4.70 |
| | | | | | | | | |
| WA0031682 | **170** | City of Seattle | Lake Washington | 12/20/2019 | 13,333 | 2.32 | 46.70 | 3.85 |
| | | | | Total | 13,333 | 2.32 | 46.70 | 3.85 |
| | | | | Average | 13,333 | 2.32 | 46.70 | 3.85 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| WA0031682 | **171** | City of Seattle | Lake Washington | 9/7/2019 | 23,632 | 0.23 | 0.70 | 0.52 |
| | | | | 10/18/2019 | 24,558 | 0.27 | 60.45 | 1.49 |
| | | | | 12/20/2019 | 1,711,019 | 18.40 | 47.73 | 4.38 |
| | | | | Total | 1,759,209 | 18.90 | 108.88 | 6.39 |
| | | | | Average | 586,403 | 6.30 | 36.29 | 2.13 |
| | | | | | | | | |
| WA0031682 | **174** | City of Seattle | Lake Washington Canal | 09/07/19 | 7,358 | 0.17 | 0.33 | 0.39 |
| | | | | 12/19/19 | 5,360,757 | 43.33 | 66.93 | 5.60 |
| | | | | Total | 5,368,115 | 43.50 | 67.27 | 5.99 |
| | | | | Average | 2,684,058 | 21.75 | 33.63 | 3.00 |
| | | | | | | | | |
| WA0031682 | **175** | City of Seattle | Lake Union | *No combined sewer overflows during 2019* | | | | |
| | | | | | | | | |
| Notes: | | | | | | | | |
| 1. Dry Weather Overflow | | | | | | | | |
| 2. Exacerbated CSO | | | | | | | | |

**Table 5-5. Comparison of 2019 and Baseline CSOs by Outfall**

| Outfall Number | 2015 - 2019 Average CSO Frequency (No./year) | 2019 CSO Discharge Events | | | Receiving Water | 2010 Baseline CSO | | 2019 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 | 2 | 30.87 | 10,525,382 | Lake Washington | 12 | 6.7 | Frequency Below, Volume Above |
| **14** | 0.6 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **15** | 3.4 | 1 | 20.17 | 162,483 | Lake Washington | 1.2 | 0.3 | Below |
| **16** | 0.2 | 1 | 0.18 | 1,269 | Lake Washington | 0 | 0 | Above |
| **18** | 1.6 | 1 | 26.10 | 3,225,836 | Union Bay | 6.6 | 0.5 | Frequency Below, Volume Above |
| **19** | 0 | 0 | 0.00 | 0 | Union Bay | 0.2 | 0 | Frequency Below, Volume Equals |
| **20** | 4.4 | 1 | 39.00 | 1,595,375 | Union Bay | 2.6 | 0.1 | Frequency Below, Volume Above |
| **22** | 0.8 | 0 | 0.00 | 0 | Union Bay | 0.7 | 0.1 | Below |
| **24** | 0.6 | 1 | 2.13 | 41,198 | Lake Washington | 0.2 | 0 | Above |
| **25** | 0.6 | 1 | 2.33 | 116,115 | Lake Washington | 2.8 | 1.6 | Below |
| **27** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **28** | 3.8 | 5 | 14.02 | 21,771 | Lake Washington | 15 | 0.4 | Below |
| **29** | 5.4 | 2 | 7.72 | 157,589 | Lake Washington | 4.7 | 0.3 | Below |
| **30** | 2.8 | 1 | 7.30 | 39,810 | Lake Washington | 5.4 | 0.7 | Below |
| **31** | 5.2 | 1 | 28.67 | 547,576 | Lake Washington | 9.3 | 0.5 | Frequency Below, Volume Above |
| **32** | 2.4 | 1 | 11.23 | 232,294 | Lake Washington | 8.4 | 0.3 | Below |
| **33** | 0 | 0 | 0.00 | 0 | Lake Washington | 0.2 | 0 | NA (Removed from service) |
| **34** | 0.8 | 1 | 3.23 | 27,359 | Lake Washington | 1.4 | 0.5 | Below |
| **35** | 1 | 0 | 0.00 | 0 | Lake Washington | 2 | 0.3 | Below |
| **36** | 1.2 | 0 | 0.00 | 0 | Lake Washington | 2.7 | 0.1 | Below |
| **38** | 1.4 | 1 | 9.60 | 409,725 | Lake Washington | 0.7 | 0.4 | Frequency Above, Volume Above |
| **40** | 2.2 | 1 | 38.23 | 915,369 | Lake Washington | 6 | 0.8 | Below |
| **41** | 3.4 | 1 | 38.23 | 915,369 | Lake Washington | 7.5 | 0.9 | Frequency Below, Volume Above |
| **42** | 1.4 | 1 | 14.00 | 258,181 | Lake Washington | 0.6 | 0.02 | Above |
| **43** | 4.6 | 3 | 67.42 | 1,217,192 | Lake Washington | 7 | 0.7 | Frequency Below, Volume Above |
| **44** | 13 | 1 | 57.67 | 5,435,510 | Lake Washington | 13 | 9.3 | Below |
| **45** | 5.6 | 1 | 9.70 | 52,700 | Lake Washington | 5.9 | 1.1 | Below |
| **46** | 0.2 | 0 | 0.00 | 0 | Lake Washington | 6.5 | 0.9 | Below |

| Outfall Number | 2015 - 2019 Average CSO Frequency (No./year) | 2019 CSO Discharge Events | | | Receiving Water | 2010 Baseline CSO | | 2019 CSOs Compared to 2010 Baseline CSOs |
|---|---|---|---|---|---|---|---|---|
| | | Frequency (No./year) | Duration (hours) | Volume (gallons) | | Frequency (No./year) | Volume (MG/year) | |
| **47** | 2.4 | 3 | 19.42 | 2,477,342 | Lake Washington | 5.6 | 1.8 | Frequency Below, Volume Above |
| **48** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **49** | 3.8 | 2 | 40.70 | 6,930,074 | Lake Washington | 1.6 | 0.8 | Above |
| **57** | 0 | 0 | 0.00 | 0 | Puget Sound | 0 | 0 | Equals |
| **59** | 2.8 | 1 | 0.75 | 195,533 | Salmon Bay | 0.2 | 0.4 | Frequency Above, Volume Below |
| **60** | 2.2 | 2 | 3.37 | 25,117 | Salmon Bay | 1.7 | 0.8 | Frequency Above, Volume Below |
| **61** | 0.6 | 1 | 0.67 | 37,629 | Elliott Bay | 0 | 0 | Above |
| **62** | 1.8 | 0 | 0.00 | 0 | Elliott Bay | 0.7 | 0 | Frequency above, Volume Equals |
| **64** | 0 | 0 | 0.00 | 0 | Elliott Bay | 0.1 | 0 | Frequency Below, Volume Equals |
| **68** | 2.2 | 2 | 26.94 | 983,018 | Elliott Bay | 1.4 | 1.3 | Below |
| **69** | 2.2 | 1 | 13.43 | 47,509 | Elliott Bay | 4.4 | 1.4 | Below |
| **70** | 0.2 | 0 | 0.00 | 0 | Elliott Bay | 0.9 | 0.2 | Below |
| **71** | 3.4 | 2 | 20.03 | 620,074 | Elliott Bay | 4.3 | 1.3 | Below |
| **72** | 0 | 0 | 0.00 | 0 | Elliott Bay | 1.2 | 0.3 | Below |
| **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** | 0.2 | 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** | 0.8 | 2 | 6.73 | 6,673 | Puget Sound | 3 | 0.4 | Below |
| **99** | 3.6 | 1 | 10.20 | 740,333 | W Waterway - Duwamish River | 0.5 | 2.8 | Frequency Above, Volume Below |
| **107** | 4.6 | 1 | 39.03 | 176,732 | E Waterway - Duwamish River | 3.8 | 1.9 | Below |
| **111** | 1.4 | 1 | 7.97 | 1,401,251 | Duwamish River | 3 | 7.9 | Below |
| **120** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **121** | 0 | 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 | 2015 - 2019 Average CSO Frequency (No./year) | 2019 CSO Discharge Events | | | Receiving Water | 2010 Baseline CSO | | 2019 CSOs Compared to 2010 Baseline CSOs |
|---|---|---|---|---|---|---|---|---|
| | | Frequency (No./year) | Duration (hours) | Volume (gallons) | | Frequency (No./year) | Volume (MG/year) | |
| **127** | 0.4 | 0 | 18.43 | 0 | Lake Union | 0.7 | 0.1 | Below |
| **129** | 0.2 | 0 | 3.17 | 0 | Lake Union | 0.1 | 0 | Frequency Below, Volume Equals |
| **130** | 0.6 | 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** | 0.6 | 0 | 0.00 | 0 | Lake Union | 0.7 | 0 | Frequency Below, Volume Equals |
| **134** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **135** | 0.4 | 0 | 0.00 | 0 | Lake Union | 0.3 | 0 | Frequency Below, Volume Equals |
| **136** | 0 | 0 | 0.00 | 0 | Lake Union | 0 | 0 | Equals |
| **138** | 2.8 | 0 | 0.00 | 0 | Portage Bay | 2.3 | 2 | Below |
| **139** | 3 | 3 | 37.11 | 1,849,563 | Portage Bay | 0.7 | 1.4 | Above |
| **140** | 7.2 | 5 | 26.67 | 569,810 | Portage Bay | 4.1 | 0.3 | 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** | 40.6 | 34 | 179.12 | 21,385,295 | Lake Union | 33 | 19 | Above |
| **148** | 0.4 | 1 | 1.25 | 23,649 | Lake Washington Ship Canal | 0 | 0 | Above |
| **150/151** | 23.8 | 9 | 22.17 | 2,349,832 | Salmon Bay | 15 | 2 | Frequency Below, Volume Above |
| **152** | 45 | 33 | 291.33 | 19,992,281 | Salmon Bay | 15 | 9.7 | Above |
| **161** | 0 | 0 | 0.00 | 0 | Lake Washington | 0 | 0 | Equals |
| **165** | 1 | 1 | 0.17 | 1,754 | Lake Washington | 1.1 | 0.02 | Below |
| **168** | 1.2 | 1 | 24.82 | 1,477,082 | Longfellow Creek | 3.9 | 1.6 | Below |
| **169** | 1.4 | 1 | 27.38 | 1,335,434 | Longfellow Creek | 2.2 | 49 | Below |
| **170** | 0.4 | 1 | 2.32 | 13,333 | Longfellow Creek | 0.4 | 0.1 | Frequency Above, Volume Below |
| **171** | 2.4 | 3 | 18.90 | 1,759,209 | Lake Washington | 4.1 | 0.75 | Frequency Below, Volume Above |
| **174** | 8.4 | 2 | 43.50 | 5,368,115 | Lake Washington Ship Canal | 11 | 5.9 | Below |
| **175** | 1 | 0 | 0.00 | 0 | Lake Union | 0.7 | 0 | Frequency Below, Volume Equals |
| **Total** | **243** | **141** | **1,292** | **95,664,745** | | **252** | **140** | |

## Table 5-6. 2015-2019 Summary Comparison of CSOs by Outfall

| Outfall No. | Frequency (Number per Year) | | | | | Duration (Hours per Year) | | | | | Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| **12** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| **13** | 7 | 2 | 4 | 1 | 2 | 80.15 | 22.93 | 35.90 | 4.17 | 30.87 | 10,406,831 | 389,145 | 4,106,126 | 360,187 | 10,525,382 | Lake Washington |
| **14** | 1 | 1 | 1 | 0 | 0 | 0.03 | 0.42 | 0.08 | 0.00 | 0.00 | 136 | 14 | 1 | 0 | 0 | Lake Washington |
| **15** | 7 | 3 | 4 | 2 | 1 | 5.69 | 5.30 | 5.00 | 1.97 | 20.17 | 130,433 | 43,665 | 135,288 | 19,287 | 162,483 | Lake Washington |
| **16** | 0 | 0 | 0 | 0 | 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.18 | 0 | 0 | 0 | 0 | 1,269 | Lake Washington |
| **18** | 2 | 3 | 1 | 1 | 1 | 12.53 | 79.17 | 1.47 | 4.97 | 26.10 | 2,821,975 | 1,703,725 | 44,582 | 392,952 | 3,225,836 | Union Bay |
| **19** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Union Bay |
| **20** | 8 | 4 | 6 | 3 | 1 | 28.73 | 18.50 | 68.47 | 14.80 | 39.00 | 939,125 | 277,377 | 1,693,470 | 530,191 | 1,595,375 | Union Bay |
| **22** | 3 | 1 | 0 | 0 | 0 | 6.75 | 0.73 | 0.00 | 0.00 | 0.00 | 10,825 | 1,002 | 0 | 0 | 0 | Union Bay |
| **24** | 0 | 1 | 1 | 0 | 1 | 0.00 | 0.67 | 6.50 | 0.00 | 2.13 | 0 | 39,762 | 877,185 | 0 | 41,198 | Lake Washington |
| **25** | 0 | 1 | 1 | 0 | 1 | 0.00 | 0.60 | 5.67 | 0.00 | 2.33 | 0 | 48,394 | 459,487 | 0 | 116,115 | Lake Washington |
| **27** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| **28** | 5 | 4 | 4 | 1 | 5 | 10.68 | 0.53 | 5.37 | 1.87 | 14.02 | 15,141 | 4,174 | 24,045 | 6,611 | 21,771 | Lake Washington |
| **29** | 9 | 9 | 5 | 1 | 2 | 79.00 | 13.33 | 75.60 | 3.40 | 7.72 | 163,604 | 23,043 | 297,430 | 53,616 | 157,589 | Lake Washington |
| **30** | 4 | 5 | 3 | 1 | 1 | 47.70 | 3.85 | 14.38 | 3.12 | 7.30 | 68,875 | 2,380 | 24,363 | 14,492 | 39,810 | Lake Washington |
| **31** | 5 | 10 | 7 | 3 | 1 | 108.95 | 63.26 | 86.10 | 3.00 | 28.67 | 1,292,158 | 689,411 | 1,271,673 | 213,963 | 547,576 | Lake Washington |
| **32** | 1 | 4 | 3 | 3 | 1 | 1.40 | 3.07 | 50.10 | 3.80 | 11.23 | 21,463 | 20,455 | 251,033 | 54,332 | 232,294 | Lake Washington |
| **33** | 0 | 0 | NA | NA | NA | 0.00 | 0.00 | NA | NA | NA | 0 | 0 | NA | NA | NA | Lake Washington |
| **34** | 1 | 0 | 1 | 1 | 1 | 1.70 | 0.00 | 4.23 | 6.90 | 3.23 | 36,871 | 0 | 98,569 | 347,045 | 27,359 | Lake Washington |
| **35** | 5 | 0 | 0 | 0 | 0 | 2.82 | 0.00 | 0.00 | 0.00 | 0.00 | 26,232 | 0 | 0 | 0 | 0 | Lake Washington |
| **36** | 4 | 2 | 0 | 0 | 0 | 92.02 | 2.70 | 0.00 | 0.00 | 0.00 | 129,992 | 8,215 | 0 | 0 | 0 | Lake Washington |
| **38** | 2 | 0 | 3 | 1 | 1 | 8.08 | 0.00 | 12.53 | 6.43 | 9.60 | 424,286 | 0 | 587,079 | 113,752 | 409,725 | Lake Washington |
| **40** | 5 | 1 | 3 | 1 | 1 | 133.60 | 67.22 | 73.92 | 15.42 | 38.23 | 2,079,022 | 455,337 | 2,052,156 | 232,494 | 915,369 | Lake Washington |
| **41** | 9 | 3 | 3 | 1 | 1 | 233.73 | 67.22 | 73.92 | 15.42 | 38.23 | 6,552,815 | 455,337 | 2,052,156 | 232,494 | 915,369 | Lake Washington |
| **42** | 3 | 0 | 2 | 1 | 1 | 10.67 | 0.00 | 12.20 | 9.10 | 14.00 | 161,845 | 0 | 250,946 | 199,773 | 258,181 | Lake Washington |

| Outfall No. | Frequency (Number per Year) | | | | | Duration (Hours per Year) | | | | | Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| **43** | 6 | 5 | 5 | 3 | 3 | 111.38 | 57.17 | 71.00 | 26.25 | 67.42 | 3,225,203 | 1,687,465 | 2,837,201 | 173,312 | 1,217,192 | Lake Washington |
| **44** | 18 | 34 | 11 | 1 | 1 | 419.69 | 452.47 | 302.23 | 13.75 | 57.67 | 17,584,437 | 9,129,326 | 16,067,339 | 566,412 | 5,435,510 | Lake Washington |
| **45** | 10 | 12 | 5 | 0 | 1 | 188.83 | 68.85 | 85.27 | 0.00 | 9.70 | 1,047,926 | 322,189 | 1,131,582 | 0 | 52,700 | Lake Washington |
| **46** | 1 | 0 | 0 | 0 | 0 | 1.33 | 0.00 | 0.00 | 0.00 | 0.00 | 16,053 | 0 | 0 | 0 | 0 | Lake Washington |
| **47** | 3 | 2 | 3 | 1 | 3 | 57.00 | 1.92 | 18.08 | 7.77 | 19.42 | 1,859,583 | 109,548 | 2,094,545 | 520,612 | 2,477,342 | 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 | 4 | 5 | 3 | 2 | 86.64 | 15.19 | 70.90 | 17.70 | 40.70 | 5,220,691 | 819,793 | 6,726,873 | 1,391,210 | 6,930,074 | 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** | 0 | 1 | 8 | 4 | 1 | 0.00 | 0.42 | 26.07 | 21.42 | 0.75 | 0 | 76,208 | 236,432 | 591,114 | 195,533 | Salmon Bay |
| **60** | 4 | 2 | 3 | 0 | 2 | 8.08 | 4.70 | 7.60 | 0.00 | 3.37 | 200,834 | 20,813 | 39,088 | 0 | 25,117 | Salmon Bay |
| **61** | 0 | 0 | 2 | 0 | 1 | 0.00 | 0.00 | 0.40 | 0.00 | 0.67 | 0 | 0 | 14,854 | 0 | 37,629 | Elliott Bay |
| **62** | 4 | 1 | 4 | 0 | 0 | 3.70 | 4.42 | 0.92 | 0.00 | 0.00 | 75,305 | 1,868 | 3,434 | 0 | 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** | 4 | 1 | 2 | 1 | 2 | 5.48 | 2.10 | 0.63 | 0.13 | 26.94 | 559,251 | 134,668 | 14,620 | 766 | 983,018 | Elliott Bay |
| **69** | 4 | 4 | 2 | 0 | 1 | 2.52 | 0.90 | 1.18 | 0.00 | 13.43 | 435,845 | 65,281 | 146,360 | 0 | 47,509 | Elliott Bay |
| **70** | 1 | 0 | 0 | 0 | 0 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 22,849 | 0 | 0 | 0 | 0 | Elliott Bay |
| **71** | 5 | 2 | 5 | 2 | 2 | 3.00 | 1.77 | 7.83 | 3.40 | 20.03 | 224,662 | 140,046 | 400,921 | 84,372 | 620,074 | Elliott Bay |
| **72** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| **78** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| **80** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Elliott Bay |
| **83** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| **85** | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Puget Sound |
| **88** | 0 | 0 | 1 | 0 | 0 | 0.00 | 0.00 | 1.43 | 0.00 | 0.00 | 0 | 0 | 51,735 | 0 | 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** | 0 | 0 | 2 | 0 | 2 | 0.00 | 0.00 | 1.14 | 0.00 | 6.73 | 0 | 0 | 14,958 | 0 | 6,673 | Puget Sound |
| **99** | 4 | 5 | 5 | 3 | 1 | 74.23 | 23.00 | 74.23 | 13.30 | 10.20 | 4,855,651 | 1,053,542 | 4,548,780 | 1,083,831 | 740,333 | W Waterway - Duwamish River |

| Outfall No. | Frequency (Number per Year) | | | | | Duration (Hours per Year) | | | | | Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| 107 | 9 | 5 | 6 | 2 | 1 | 82.20 | 42.58 | 63.15 | 3.77 | 39.03 | 673,362 | 427,231 | 947,028 | 29,605 | 176,732 | E Waterway - Duwamish River |
| 111 | 3 | 0 | 2 | 1 | 1 | 6.57 | 0.00 | 5.93 | 2.77 | 7.97 | 1,056,402 | 0 | 317,148 | 56,370 | 1,401,251 | 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 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 124 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 127 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 129 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Union |
| 130 | 3 | 0 | 0 | 0 | 0 | 0.82 | 0.00 | 0.00 | 0.00 | 0.00 | 268,332 | 0 | 0 | 0 | 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 | 3 | 0 | 0 | 0 | 0 | 1.58 | 0.00 | 0.00 | 0.00 | 0.00 | 1,014,884 | 0 | 0 | 0 | 0 | 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 | 2 | 0 | 0 | 0 | 0 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 9,889 | 0 | 0 | 0 | 0 | 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 | 7 | 3 | 3 | 1 | 0 | 17.48 | 3.23 | 22.00 | 6.83 | 0.00 | 721,977 | 85,056 | 392,526 | 65,996 | 0 | Portage Bay |
| 139 | 6 | 0 | 3 | 3 | 3 | 16.38 | 0.00 | 10.50 | 12.53 | 37.11 | 1,171,445 | 0 | 389,283 | 443,323 | 1,849,563 | Portage Bay |
| 140 | 10 | 10 | 7 | 4 | 5 | 28.25 | 3.29 | 36.90 | 9.28 | 26.67 | 695,688 | 48,134 | 415,391 | 103,400 | 569,810 | 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 | 32 | 58 | 42 | 37 | 34 | 495.17 | 531.66 | 537.67 | 520.08 | 179.12 | 16,682,352 | 13,068,417 | 25,042,017 | 15,031,921 | 21,385,295 | Lake Union |
| 148 | 1 | 0 | 0 | 0 | 1 | 1.30 | 0.00 | 0.00 | 0.00 | 1.25 | 1,400 | 0 | 0 | 0 | 23,649 | Lake Washington Ship Canal |
| 150/151 | 28 | 31 | 29 | 22 | 9 | 387.00 | 249.07 | 159.87 | 152.14 | 22.17 | 2,539,871 | 2,226,176 | 4,695,385 | 2,916,004 | 2,349,832 | Salmon Bay |
| 152 | 34 | 63 | 50 | 45 | 33 | 713.68 | 1052.89 | 879.15 | 777.04 | 291.33 | 36,195,281 | 42,062,058 | 56,062,735 | 22,660,613 | 19,992,281 | Salmon Bay |
| 161 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 | Lake Washington |
| 165 | 1 | 0 | 2 | 1 | 1 | 1.48 | 0.00 | 4.60 | 0.73 | 0.17 | 16,634 | 0 | 31,973 | 732 | 1,754 | Lake Washington |
| 168 | 2 | 0 | 2 | 1 | 1 | 84.33 | 0.00 | 30.33 | 3.92 | 24.82 | 7,718,986 | 0 | 3,932,249 | 52,250 | 1,477,082 | Longfellow Creek |
| 169 | 2 | 1 | 3 | 0 | 1 | 105.93 | 6.27 | 22.10 | 0.00 | 27.38 | 6,162,245 | 664,680 | 1,783,155 | 0 | 1,335,434 | Longfellow Creek |

| Outfall No. | Frequency (Number per Year) | | | | | Duration (Hours per Year) | | | | | Volume (Gallons per Year) | | | | | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| **170** | 0 | 0 | 1 | 0 | 1 | 0.00 | 0.00 | 3.53 | 0.00 | 2.32 | 0 | 0 | 15,194 | 0 | 13,333 | Longfellow Creek |
| **171** | 3 | 2 | 3 | 1 | 3 | 24.05 | 1.53 | 9.90 | 3.77 | 18.90 | 287,884 | 90,094 | 481,749 | 266,958 | 1,759,209 | Lake Washington |
| **174** | 15 | 12 | 7 | 6 | 2 | 113.37 | 83.34 | 50.67 | 27.17 | 43.50 | 13,555,680 | 9,106,686 | 4,176,148 | 3,845,179 | 5,368,115 | Lake Washington Ship Canal |
| **175** | 4 | 0 | 0 | 1 | 0 | 1.43 | 0.00 | 0.00 | 3.08 | 0.00 | 243,126 | 0 | 0 | 366,058 | 0 | Lake Union |
| **Total** | **315** | **312** | **275** | **163** | **141** | **3,908** | **2,956** | **3,037** | **1,716** | **1,292** | **149,625,357** | **85,500,716** | **147,236,290** | **53,021,226** | **95,664,745** | |

**Table 5-7. 2015-2019 Summary Comparison of CSOs by Receiving Water**

| Receiving Water | Frequency (Number per Year) | | | | | Duration (Hours per Year) | | | | | Volume (Gallons per Year) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Duwamish River | 3 | 0 | 2 | 1 | 1 | 7 | 0 | 6 | 3 | 8 | 1,056,402 | 0 | 317,148 | 56,370 | 1,401,251 |
| East Waterway | 9 | 5 | 6 | 2 | 1 | 82 | 43 | 63 | 4 | 39 | 673,362 | 427,231 | 947,028 | 29,605 | 176,732 |
| Elliott Bay | 18 | 8 | 15 | 3 | 6 | 15 | 9 | 11 | 4 | 61 | 1,317,912 | 341,862 | 580,189 | 85,138 | 1,688,230 |
| Lake Union | 44 | 58 | 42 | 39 | 34 | 500 | 532 | 538 | 523 | 179 | 18,218,583 | 13,068,417 | 25,042,017 | 15,397,980 | 21,385,295 |
| Lake Washington | 115 | 105 | 79 | 27 | 35 | 1,706 | 848 | 1,023 | 155 | 442 | 50,768,113 | 14,337,749 | 41,858,799 | 4,767,281 | 32,245,270 |
| Lake Washington - Ship Canal | 16 | 12 | 7 | 6 | 3 | 115 | 83 | 51 | 27 | 45 | 13,557,080 | 9,106,686 | 4,176,148 | 3,845,179 | 5,391,764 |
| Longfellow Creek | 4 | 1 | 6 | 1 | 3 | 190 | 6 | 56 | 4 | 55 | 13,881,231 | 664,680 | 5,730,598 | 52,250 | 2,825,850 |
| Portage Bay | 23 | 13 | 13 | 8 | 8 | 62 | 7 | 69 | 29 | 64 | 2,589,110 | 133,190 | 1,197,199 | 612,719 | 2,419,373 |
| Puget Sound | 0 | 0 | 3 | 0 | 2 | 0 | 0 | 3 | 0 | 7 | 0 | 0 | 66,693 | 0 | 6,673 |
| Salmon Bay | 66 | 97 | 90 | 64 | 45 | 1,108 | 1,307 | 1,073 | 950 | 318 | 38,935,987 | 44,385,255 | 61,033,640 | 26,167,731 | 22,562,763 |
| Union Bay | 13 | 8 | 7 | 4 | 2 | 48 | 98 | 70 | 20 | 65 | 3,771,925 | 1,982,104 | 1,738,052 | 923,143 | 4,821,211 |
| West Waterway | 4 | 5 | 5 | 3 | 1 | 74 | 23 | 74 | 13 | 10 | 4,855,651 | 1,053,542 | 4,548,780 | 1,083,831 | 740,333 |
| TOTAL: | 315 | 312 | 275 | 158 | 141 | 3,908 | 2,956 | 3,037 | 1,732 | 1,292 | 149,625,357 | 85,500,716 | 147,236,290 | 53,021,226 | 95,664,745 |

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | | | | |
| **12** | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0.3 | Yes | N/A | 3 |
| **13** | 0 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 0 | 2 | 1 | 0 | 1 | 1 | 4 | 5 | 2 | 4 | 1 | 2 | 1.7 | No | Mike URBAN results, March 2017 | 4 |
| **14** | | | | | | | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0.4 | Yes | N/A | 5 |
| **15** | 0 | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 0 | 2 | 1 | 1 | 1 | 2 | 6 | 7 | 3 | 4 | 2 | 1 | 2.0 | No | Mike URBAN results, March 2017 | 4 |
| **16** | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.2 | Yes | N/A | 3 |
| **18** | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0.7 | Yes | Mike URBAN results, October 2019 | 6 |
| **19** | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | Yes | N/A | 3 |
| **20** | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 0 | 3 | 3 | 3 | 2 | 2 | 5 | 8 | 4 | 6 | 3 | 1 | 2.4 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **22** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0.1 | Yes | EPA-SWMM results, February 2019 | 8 |
| **24** | 0 | 0 | 0 | 2 | 2 | 0 | 4 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0.8 | Yes | LTCP Long Term Simulation Results February 2013 | 7 |
| **25** | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0.8 | 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** | 0 | 0 | 2 | 1 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 2 | 3 | 1 | 5 | 1.3 | No | Mike URBAN results, January 2019 | 10 |
| **29** | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 0.5 | Yes | Mike URBAN results, January 2019 | 10 |
| **30** | 0 | 1 | 1 | 2 | 2 | 1 | 4 | 1 | 1 | 2 | 1 | 1 | 3 | 3 | 5 | 5 | 3 | 4 | 1 | 1 | 2.1 | No | Mike URBAN results, January 2019 | 10 |
| **31** | 0 | 2 | 2 | 2 | 3 | 2 | 4 | 1 | 1 | 5 | 2 | 2 | 4 | 3 | 9 | 9 | 6 | 7 | 3 | 1 | 3.4 | No | Mike URBAN results, January 2019 | 10 |
| **32** | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 2 | 2 | 2 | 1 | 3 | 1 | 1.1 | No | Mike URBAN results, January 2019 | 10 |
| **33** | | | | | | | | | | | | | | | | | | | | | NA | NA | No longer in service | 11 |
| **34** | 0 | 0 | 1 | 2 | 1 | 0 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1.0 | Yes | Mike URBAN results, January 2019 | 10 |
| **35** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | | | | |
| **36** | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | Mike URBAN results, January 2019 | 10 |
| **38** | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 3 | 1 | 1 | 0.8 | Yes | Mike URBAN results, June 2018 | 12 |
| **40** | 0 | 3 | 2 | 2 | 1 | 1 | 5 | 1 | 0 | 3 | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 3 | 1 | 1 | 1.8 | No | Mike URBAN results, June 2018 | 12 |
| **41** | 0 | 3 | 2 | 2 | 1 | 1 | 5 | 1 | 0 | 3 | 1 | 2 | 2 | 1 | 2 | 3 | 1 | 3 | 1 | 1 | 1.8 | No | Mike URBAN results, June 2018 | 12 |
| **42** | 0 | 3 | 0 | 2 | 0 | 0 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 3 | 0 | 2 | 1 | 1 | 1.1 | No | Mike URBAN results, June 2018 | 12 |
| **43** | 0 | 3 | 3 | 2 | 1 | 2 | 6 | 1 | 1 | 5 | 3 | 2 | 5 | 2 | 4 | 5 | 4 | 5 | 3 | 3 | 3.0 | No | Mike URBAN results, June 2018 | 12 |
| **44** | 0 | 2 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 1 | 3 | 0 | 0 | 3 | 0 | 2 | 1 | 1 | 1.0 | Yes | Mike URBAN results, July 2018 | 13 |
| **45** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.1 | Yes | Mike URBAN results, July 2018 | 13 |
| **46** | 0 | 2 | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 3 | 1 | 1 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0.9 | Yes | InfoWorks results, December 2016 | 14 |
| **47** | 0 | 2 | 2 | 3 | 0 | 4 | 5 | 3 | 2 | 6 | 4 | 2 | 5 | 3 | 4 | 6 | 4 | 2 | 1 | 3 | 3.1 | No | Mike URBAN results, December 2018 | 15 |
| **48** | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | Yes | N/A | 7 |
| **49** | 0 | 2 | 5 | 3 | 1 | 3 | 8 | 3 | 1 | 4 | 5 | 4 | 7 | 3 | 6 | 5 | 4 | 5 | 3 | 2 | 3.7 | 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 | Yes | N/A | 3 |
| **59** | | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 8 | 4 | 1 | 1.1 | No | N/A | 3, 16 |
| **60** | 1 | 2 | 0 | 2 | 1 | 4 | 4 | 3 | 0 | 3 | 4 | 2 | 6 | 1 | 2 | 4 | 2 | 3 | 0 | 2 | 2.3 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **61** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0.2 | Yes | N/A | 7 |
| **62** | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 3 | 1 | 2 | 2 | 4 | 1 | 4 | 0 | 0 | 1.1 | No | N/A | 7 |
| **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 | 1 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 4 | 1 | 2 | 1 | 2 | 1.1 | No | LTCP Long Term Simulation Results February 2013 | 7. 17 |
| **69** | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 3 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 2 | 0 | 1 | 1.8 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **70** | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0.4 | Yes | AWVSRP Modeling Support Alternative | 7 |

| Outfall Number | Number of Combined Sewer Overflows Per Year [1] | | | | | | | | | | | | | | | | | | | | Average Annual Overflow Frequency | Meets Performance Standard? [2] | Long-Term Simulation Source | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | Modeling Report May 2012, Appendix D | |
| **71** | 0 | 1 | 0 | 3 | 1 | 1 | 2 | 1 | 2 | 9 | 7 | 3 | 5 | 3 | 2 | 5 | 2 | 5 | 2 | 2 | 2.8 | No | AWVSRP Modeling Support Alternative Modeling Report May 2012, Appendix D | 7 |
| **72** | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | Yes | AWVSRP Modeling Support Alternative Modeling Report May 2012, Appendix D | 7 |
| **78** | | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 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 | 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 | 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 | Yes | N/A | 3 |
| **88** | | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.3 | Yes | N/A | 3 |
| **90** | | 0 | 0 | 0 | 0 | 1 | 1 | 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 | Yes | N/A | 3 |
| **94** | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | Yes | N/A | 3 |
| **95** | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 1 | 2 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 0.7 | Yes | EPA-SWMM results, February 2019 | 18 |
| **99** | 0 | 3 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 2 | 3 | 5 | 1 | 6 | 4 | 5 | 5 | 3 | 1 | 2.3 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **107** | | | | | | | 9 | 3 | 1 | 9 | 11 | 4 | 4 | 2 | 4 | 5 | 5 | 5 | 2 | 1 | 4.6 | No | EPA-SWMM results, February 2019 | 19 |
| **111** | 0 | 1 | 0 | 3 | 0 | 2 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 3 | 2 | 3 | 0 | 2 | 1 | 1 | 1.2 | No | EPA-SWMM results, February 2019 | 20 |
| **120** | | 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 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 | Yes | N/A | 3 |
| **127** | | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.4 | Yes | N/A | 3 |
| **129** | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.1 | Yes | N/A | 3 |
| **130** | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0.3 | Yes | N/A | 5 |
| **131** | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 0.5 | 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 | Yes | N/A | 3 |
| **135** | | | | | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0.3 | 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 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | | | | |
| **138** | 0 | 1 | 0 | 2 | 3 | 0 | 3 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 3 | 7 | 3 | 3 | 1 | 0 | 1.9 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **139** | 0 | 1 | 0 | 1 | 3 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 2 | 1 | 2 | 6 | 0 | 3 | 3 | 3 | 1.7 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **140** | 2 | 2 | 3 | 6 | 5 | 6 | 5 | 1 | 1 | 7 | 8 | 2 | 4 | 5 | 13 | 10 | 10 | 7 | 4 | 5 | 5.3 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **141** | | 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 |
| **144** | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 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 | 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 | Yes | N/A | 3 |
| **147** | 27 | 26 | 29 | 31 | 29 | 37 | 45 | 35 | 50 | 45 | 63 | 40 | 47 | 27 | 49 | 32 | 58 | 42 | 37 | 34 | 39.2 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **148** | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0.3 | Yes | N/A | 3 |
| **150/151** | 11 | 16 | 10 | 14 | 6 | 15 | 23 | 11 | 2 | 22 | 29 | 25 | 31 | 14 | 34 | 28 | 31 | 29 | 22 | 9 | 19.1 | No | LTCP Long Term Simulation Results February 2013 | 7, 21 |
| **152** | 57 | 47 | 39 | 53 | 44 | 46 | 42 | 43 | 11 | 29 | 63 | 48 | 57 | 44 | 53 | 34 | 63 | 50 | 45 | 33 | 45.1 | 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 | Yes | N/A | 3 |
| **165** | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 1 | 2 | 2 | 0 | 2 | 0 | 2 | 1 | 1 | 0.9 | Yes | Mike URBAN results, June 2018 | 12 |
| **168** | 0 | 3 | 1 | 2 | 1 | 2 | 5 | 2 | 0 | 1 | 1 | 0 | 2 | 0 | 2 | 2 | 0 | 2 | 1 | 1 | 1.4 | No | EPA-SWMM results, February 2019 | 22 |
| **169** | 1 | 3 | 1 | 3 | 1 | 3 | 5 | 2 | 1 | 1 | 2 | 2 | 3 | 0 | 2 | 3 | 1 | 3 | 0 | 1 | 1.9 | No | EPA-SWMM results, February 2019 | 22 |
| **170** | | | | | | | | | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0.5 | Yes | N/A | 6 |
| **171** | 0 | 1 | 1 | 2 | 0 | 3 | 5 | 2 | 1 | 6 | 4 | 2 | 4 | 2 | 4 | 6 | 3 | 1 | 1 | 3 | 2.6 | No | Mike URBAN results, December 2018 | 15 |
| **174** | 1 | 8 | 3 | 5 | 6 | 10 | 21 | 6 | 6 | 14 | 13 | 10 | 17 | 7 | 20 | 15 | 12 | 7 | 6 | 2 | 9.5 | No | LTCP Long Term Simulation Results February 2013 | 7 |
| **175** | | | | | | | | | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 1 | 0 | 0.7 | 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 2019.
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 2019.
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 2019.
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 July 2018 to reflect the constructed North Henderson CSO Reduction Project. Hydraulic modeling results are presented through this date.
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. In 2015 and 2016, Basin 68 CSOs were likely exacerbated by a partially clogged HydroBrake. Subsequent attention to inspection and maintenance seems to have reduced the frequency of CSOs.
18. The Basin 95 retrofit project was substantially complete on April 4, 2013. Flow modeling is used prior to this date.
19. 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.
20. The last hydraulic modification in Basin 111 was performed on December 1, 2014. Flow modeling data is used prior to this date.
21. SPU removed Outfall 150 from service on February 27, 2019. Any Basin 150/151 CSOs now discharge from Outfall 151.
22. SPU completed the valve retrofit on November 5, 2015. Flow modeling data is used prior to this date.

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

Notes:

1. These values represent the 95% lower confidence limits (LCL) from the Integrated Plan pollutant load model (PLM) results.
2. Volume of runoff from swept streets.
3. Data is only available for the Expanded Arterial Street Sweeping Program. Monitoring for NDS Partnering and South Park Water Quality Facility 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. 2019 Sewer Overflow (SSO) Details**

| 2018 SSO Number | ERTS Number | Date | Address | SSO Volume (gallons) | Volume to Surface Water (gallons) | Surface Water | Primary Cause |
|---|---|---|---|---|---|---|---|
| 19001 | 686605 | 1/10/19 | 8760 Sand Point Way NE | 50 | 50 | Lake Washington | FOG |
| 19002 | 686851 (Revised) & 686883 | 1/23/19 | 821 9th Ave | 1,080 | | | Debris |
| 19003 | 686953 | 1/28/19 | 2512 S Juneau St | 300 | 50 | Lake Washington | Private Side Sewer Issue |
| 19004 | 687088 | 2/1/19 | 10721 30th Ave NE | 7,500 | 7,500 | Thornton Creek | Debris |
| 19005 | 687260 | 2/12/19 | 1610 N 41st St | 2,000 | | | Roots |
| 19006 | 688055 | 3/24/19 | 322 W Ewing St | 250 | | | Private Side Sewer Issue |
| 19007 | 688679 | 4/22/19 | 523 NE 95th St | 12 | | | Roots |
| 19008 | 689385 | 5/17/19 | 722 S Portland St | 1 | | | Pressure Release |
| 19009 | 689711 | 6/5/19 | 5123 S Avon St | 50 | | | Roots |
| 19010 | 689720 | 6/5/19 | 10215 8th Ave NE | 30 | | | Roots |
| 19011 | 689956 | 6/15/19 | 9700 Ravenna Ave NE | 6,000 | 6,000 | Thornton Creek | Roots |
| 19012 | 690182, 690313 | 6/22/19 | 2851 NW 94th St | 165,000 | 165,000 | Puget Sound | Debris |
| 19013 | 692330 | 8/14/19 | 4004 13th Ave S | 5 | | | Private Side Sewer Issue |
| 19014 | 692397 | 8/17/19 | 2209 12TH AVE W | 39,600 | | | Private Construction |
| 19015 | 692779 | 9/3/19 | 8th Ave NW/NW 97th St | 55 | | | Structural Failure-gravity |
| 19016 | 692415 | 9/7/19 | 1511 E Alder St | Unknown | | | Roots |
| 19017 | 693126 | 9/8/19 | 4531 46th Ave NE | Unknown | | | Extreme Weather Event |
| 19018 | 693126 | 9/9/19 | 7118 58th Ave NE | Unknown | | | Extreme Weather Event |
| 19019 | 693126 | 9/9/19 | 4517 46th Ave NE | Unknown | | | Extreme Weather Event |
| 19020 | 693126 | 9/11/19 | 7108 58th Ave NE | Unknown | | | Extreme Weather Event |
| 19021 | 693194 | 9/8/19 | 801 NE 85th St | Unknown | | | Extreme Weather Event |

| 2018 SSO Number | ERTS Number | Date | Address | SSO Volume (gallons) | Volume to Surface Water (gallons) | Surface Water | Primary Cause |
|---|---|---|---|---|---|---|---|
| 19022 | 693235 | 9/19/19 | 7696 Perimeter Rd S | 320,000 | 317,000 | Duwamish River | Vandalism |
| 19023 | 693359 | 9/9/19 | 1041 Summit Ave E | Unknown | | | Extreme Weather Event |
| 19024 | 694254 | 11/7/19 | 300 9th Ave | 10 | | | Private Construction |
| 19025 | 694278 | 11/8/19 | 5425 Russell Ave NW | Unknown | | | FOG |
| 19026 | 694339 | 11/12/19 | 335 9th Ave | Unknown | | | Private Construction |
| 19027 | 694616 | 11/26/19 | 1728 E Madison St | 10 | | | FOG |
| 19028 | 695011 | 12/17/19 | 5217 California Ave SW | 50 | | | Roots |
| 19029 | 695103 | 12/20/19 | 4234 S Lucile St | 1,000 | | | FOG |
| 19030 | 695204 | 12/20/19 | 1707 N 45th St | 200 | | | Roots |
| 19031 | 695108 | 12/20/19 | 2649 W Viewmont Way W | Unknown | | | Extreme Weather Event |
| 19032 | 695108 | 12/20/19 | 1723 1st Ave S | 6,200 | | | Capacity-King County |
| 19033 | 695108 | 12/20/19 | 9233 Palatine Ave N | Unknown | | | Extreme Weather Event |
| 19034 | 695148 | 12/20/19 | 1202 NW Carkeek Park Rd | 9,000 | 9,000 | Pipers Creek | Capacity - gravity main |
| 19035 | 695199 | 12/20/19 | Lake Washington Blvd S/S Snoqualmie St | 81,000 | 81,000 | Lake Washington | Extreme Weather Event |
| 19036 | 695200 | 12/20/19 | Lake Washington Blvd S/53rd Ave S | 115 | 115 | Lake Washington | Extreme Weather Event |
| 19037 | 695235 | 12/20/19 | Lake Washington Blvd S/S Alaska St | 4,500 | 4,500 | Lake Washington | Extreme Weather Event |
| 19038 | 695364 | 12/27/19 | 2222 NE 92nd St | Unknown | | | Roots |

**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<br>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. 2019 Pump Station Work Order Summary | | | |
|---|---|---|---|
| WWPS Number | Inspection | Maintenance | Total Work Orders |
| WWPS001 | 19 | 15 | 34 |
| WWPS002 | 26 | 34 | 60 |
| WWPS004 | 22 | 7 | 29 |
| WWPS005 | 27 | 9 | 36 |
| WWPS006 | 22 | 13 | 35 |
| WWPS007 | 22 | 8 | 30 |
| WWPS009 | 28 | 11 | 39 |
| WWPS010 | 33 | 13 | 46 |
| WWPS011 | 17 | 18 | 35 |
| WWPS013 | 26 | 15 | 41 |
| WWPS017 | 20 | 49 | 69 |
| WWPS018 | 16 | 16 | 32 |
| WWPS019 | 30 | 100 | 130 |
| WWPS020 | 15 | 14 | 29 |
| WWPS021 | 22 | 20 | 42 |
| WWPS022 | 22 | 14 | 36 |
| WWPS025 | 38 | 14 | 52 |
| WWPS028 | 24 | 25 | 49 |
| WWPS030 | 28 | 19 | 47 |
| WWPS031 | 25 | 16 | 41 |
| WWPS035 | 37 | 65 | 102 |
| WWPS036 | 20 | 9 | 29 |
| WWPS037 | 20 | 24 | 44 |
| WWPS038 | 58 | 23 | 81 |
| WWPS039 | 21 | 12 | 33 |
| WWPS042 | 23 | 10 | 33 |
| WWPS043 | 46 | 34 | 80 |
| WWPS044 | 16 | 20 | 36 |
| WWPS045 | 27 | 28 | 55 |
| WWPS046 | 16 | 7 | 23 |
| WWPS047 | 14 | 8 | 22 |
| WWPS048 | 18 | 54 | 72 |
| WWPS049 | 28 | 73 | 101 |
| WWPS050 | 16 | 6 | 22 |
| WWPS051 | 16 | 33 | 49 |
| WWPS053 | 10 | 12 | 22 |
| WWPS054 | 34 | 22 | 56 |
| WWPS055 | 21 | 7 | 28 |
| WWPS056 | 32 | 7 | 39 |

| WWPS Number | Inspection | Maintenance | Total Work Orders |
|---|---|---|---|
| WWPS057 | 14 | 36 | 50 |
| WWPS058 | 18 | 16 | 34 |
| WWPS059 | 21 | 15 | 36 |
| WWPS060 | 23 | 21 | 44 |
| WWPS061 | 18 | 6 | 24 |
| WWPS062 | 30 | 85 | 115 |
| WWPS063 | 25 | 29 | 54 |
| WWPS064 | 14 | 12 | 26 |
| WWPS065 | 13 | 13 | 26 |
| WWPS066 | 13 | 9 | 22 |
| WWPS067 | 11 | 6 | 17 |
| WWPS069 | 21 | 14 | 35 |
| WWPS070 | 21 | 6 | 27 |
| WWPS071 | 19 | 19 | 38 |
| WWPS072 | 17 | 4 | 21 |
| WWPS073 | 9 | 8 | 17 |
| WWPS074 | 24 | 26 | 50 |
| WWPS075 | 9 | 6 | 15 |
| WWPS076 | 21 | 51 | 72 |
| WWPS077 | 25 | 19 | 44 |
| WWPS078 | 23 | 5 | 28 |
| WWPS080 | 17 | 14 | 31 |
| WWPS081 | 18 | 7 | 25 |
| WWPS082 | 21 | 7 | 28 |
| WWPS083 | 22 | 17 | 39 |
| WWPS084 | 21 | 34 | 55 |
| WWPS114 | 21 | 26 | 47 |
| WWPS118 | 32 | 11 | 43 |
| **Grand Total** | **1,496** | **1,406** | **2,902** |