

## 102a – Status of Implementation Actions Taken Pursuant to S4F.3.D

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On August 19, 2016, Ecology modified the Phase I Permit to include Appendix 13 – Adaptive Management Requirements. Appendix 13 requires adaptive management response plans for discharges from the City of Seattle’s (City) municipal separate stormwater system (MS4) to the Lower Duwamish Waterway (LDW). In accordance with S4.F.3 the City must comply with the specific requirements identified in Appendix 13. Per the requirement of S4.F.3.d, Seattle is providing the status of implementation and the results of any monitoring, assessment or evaluation efforts conducted during 2019 related to Appendix 13 Adaptive Management requirements.

This is the fourth Annual Report that combines the City’s required source control activities for the LDW and related information related to these Adaptive Management Response Plans into one report. SPU provided Ecology with a Source Control Implementation Plan (SCIP) in March of 2015, and SPU has implemented the actions contained in the SCIP through August 2016. Beginning August 19, 2016, SPU has been implementing actions that Ecology has approved as an S4.F.3.b Adaptive Management Response Plan.

The following sections describe the actions that the City has taken to implement the adaptive management plan as described in Appendix 13 of the August 19, 2016, Phase I Municipal Stormwater Permit.

### Background

An S4.F notification was submitted in 2007 to notify Ecology of potential water quality problems that may be related to discharges from the City’s MS4 for the LDW. Ecology determined that a report under S4.F.2.a was not necessary, with that determination conditioned on certain City actions. Ecology required the City, beginning with its Phase I Permit Annual Report for 2008, to include a summary of its stormwater management efforts in basins that discharge to the LDW. The City was to notify Ecology if Seattle’s involvement in federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and associated Source Control Strategy processes changed, or new information became available regarding phthalate recontamination in the LDW.

An S4F notification was submitted on December 5, 2013, to notify Ecology of potential sediment quality problems that may be related to discharges from the City’s MS4 for the LDW. Ecology accepted the notification (June 4, 2014) as a general notification for all MS4 discharges to the LDW for all LDW sediment chemicals of concern (COC). The City’s draft SCIP (November 2013) fulfilled the City’s requirement for submittal under S4.F.3.a of an expanded adaptive

management response. The City revised the SCIP, and a final draft of the SCIP was submitted to Ecology on March 31, 2015.

Though not for the LDW or adaptive management, a S4F notification was submitted on September 5, 2014 to notify Ecology of potential sediment quality problems that may be related to discharges from the City's MS4 for the East Waterway (EW) of the Duwamish Waterway. To satisfy the permit requirements, the City continues to engage in business inspections, source tracing, line cleaning, and other programs regarding the EW, as well as ongoing source control efforts to support the EW CERCLA cleanup.

## **Appendix 13 - Adaptive Management Requirements Reporting**

### **Source Tracing and Sampling Activities**

SPU collects samples of storm drain solids from with the City MS4 to characterize the quality of material discharged to and from the City's drainage system. Samples include 1) grabs from private onsite catch basins and catch basins located in the public right-of-way, 2) grabs from inline maintenance holes in the conveyance system, and 3) inline sediment trap samples. Data generated from these samples are used to identify potential contaminant sources and to prioritize source tracing/control activities. Between January and December 2019, SPU collected 127 samples of storm drain solids from the City's MS4.

#### ***Detection dog pilot test***

SPU received funding from Ecology under Agreement Nos. WQC-WQC-2018-SeaPUD-00233 to continue developing the detection dog program to assist in identifying sources of PCBs to the City's MS4. Work is funded through 2021. This next phase of the project involves developing protocols for incorporating detection dog services into SPU's source tracing efforts. In 2019, SPU developed a Memorandum of Agreement with the University of Washington Conservation Canine Program, completed the Work Plan for the project, and UWCC obtained and began training a new dog.<sup>1</sup>

PCBs monitoring is not a requirement of the City's NPDES MS4 permit but the detection dog aids in permit required activities such as source control. The detection dog can screen an area for PCBs in an afternoon and help pinpoint potential sources of PCBs so that SPU inspectors can work with private parties to implement best management practices to prevent the PCBs from continuing to enter the environment.

#### ***Sediment trap pilot test***

While not a specific requirement of Appendix 13, SPU has been testing a new sediment trap

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<sup>1</sup> Sadly, Sampson, the original PCB detection dog passed away in 2019 at the ripe old age of 15. He was a very good dog.

designed to provide more effective collection of storm drain solids to support source tracing efforts that are required by Appendix 13. Work was supported by Ecology grant No. WQC-2016-SeaPUD-00196 which ended in 2018. Field testing of two prototype designs was completed in 2018. In 2019, SPU submitted the final report describing test results (SPU 2019)<sup>2</sup>. SPU retrieved the traps in 2019 (results are provided along with other source tracing data in Attachment A) and re-installed for one final year.

### ***Effectiveness Monitoring Program***

SPU is on track to install or collect one sample per calendar year from each outfall and near-end-of-pipe location in Tables 1 and 2 of Appendix 13. Source tracing data collected from January through December 2019 are provided in Attachment A of this report and will be loaded into EIM<sup>3</sup>.

### **Business Inspection Program**

In support of the LDW cleanup efforts, multi-media inspections are conducted, which cover stormwater pollution prevention, hazardous waste management and industrial waste management. In 2019, SPU conducted 209 inspections in the LDW. Each business is inspected for compliance with the City's Stormwater Code and required to be brought into compliance with all relevant best management practices (BMP) for source control. The inspections resulted in 79 Corrective Action Letters, and one of the sites was referred to Ecology for potential NPDES Industrial Stormwater permit coverage. Three facilities were issued NOV's for non-compliance with the City's Stormwater Code.

The SCIP described several planned enhancements to streamline the business inspection program in the LDW. The status of these efforts is provided in the following sections.

#### ***Shortened business compliance period***

Seattle Public Utilities continues to seek ways to most effectively require that businesses come into compliance and remain in compliance. In January 2016, SPU Source Control conducted a Rapid Office Kaizen (Japanese for "improvement") workshop to improve the stormwater code compliance inspection processes and improve our customers' experience. The objective of the event was to streamline our processes by identifying and eliminating wastes. The hope was to accomplish efficiency changes before implementing a mobile inspection data collection system. One of the inefficiencies that was identified in this Kaizen process was that inspected businesses with code violations were taking too long to return to compliance. Because of our workshop, SPU Source Control modified the business inspection process to reduce the return-

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<sup>2</sup> SPU. 2019. Sediment trap pilot project: field testing results. Seattle Public Utilities, Seattle, WA.

<sup>3</sup> Results for samples collected and validated since the 2018 annual report.

to-compliance period by eliminating an unnecessary and time-wasting step, the “second and final letter.”

Prior to the Kaizen workshop the Source Control inspection return-to-compliance process progressed through a series of inspections followed by compliance letters and ending with a closure letter whenever compliance was achieved in this process:

- Initial inspection
- Corrective action letter + 30 days
- Follow-up inspection
- Second and final letter + 15 days
- Follow-up inspection
- Notice of Violation with deferred penalty + 15 days
- Follow-up inspection (and penalty if still in non-compliance)
- Acknowledgement of Completion letter.

The typical return-to-compliance process was taking on average 55 days. Under the pre-Kaizen process, businesses would get a site inspection, a corrective action letter, a re-inspection and then a “second and final” letter, which provided additional time to come into compliance before a Notice of Violation is issued. Now, a business has 30 days to come into compliance after receiving the corrective action letter, and if the corrections are not made, a Notice of Violation is issued. Extensions may be issued on a case by case basis. This change has resulted in a reduction of process time, allowing SPU to inspect more businesses.

SPU also has implemented a procedure whereby if a business has been inspected multiple times, it can be immediately issued a Notice of Violation for not maintaining best management practices between inspection cycles. Elimination of the “second and final letter” step required less time to re-inspect, write letters, and input data. This change established that consequences for non-compliance, and lack of action are more immediate when code violations were observed. This move is intended to impress upon businesses the importance of maintaining stormwater best management practices, rather than implementing them just for an inspection period. At the closing of an inspection cycle, businesses are alerted that they may be issued a Notice of Violation immediately upon the next inspection if compliance is not sustained. This process is used on a case by case basis, for businesses that SPU has inspected multiple times with no sustained improvement between inspection cycles.

Following the Kaizen event, the new inspection protocol implemented is as follows:

- Initial inspection
- Corrective action letter + 30 days
- Follow-up inspection
- Notice of violation with deferred penalty + 15 days
- Follow-up inspection (and penalty if still in non-compliance)
- Acknowledgement of Completion letter.

As this process was refined and implemented by SPU Source Control inspection staff, the time for a business to return to compliance has decreased on average 22 days.

### ***Revisions to Business Inspection Information Gathering Protocols***

For many years, the SPU Source Control Team had used a lengthy inspection checklist that covered not only City Stormwater Code compliance but included multimedia inspection observations for compliance with air, hazardous waste, and industrial waste regulations. The data were recorded on the inspection checklist and entered into the SPU inspection database. Data collection could be time consuming and cause confusion or cloud authority and cloud SPU's message about City source control measures required by City code. Referrals from these observations were made to state, county, and regional agencies with code authority. Indication from other agencies is that they rarely used the data collected in the SPU inspection process. To improve efficiency with the inspection process, SPU decided that the data entry for these Non-City Stormwater Code violations would be discontinued. Inspectors were still encouraged to look for these other environmental concerns to act as a "triage" for other agencies (King County Industrial Waste and Ecology Hazardous Waste and Water Quality); as part of "triage," the inspector may refer issues or problem sites to another agency for follow up and will be part of that agency's enforcement activity for resolving the issue. These changes have helped to shorten SPU's inspection time onsite, without compromising the integrity of the inspection.

### ***Transition to Electronic Information Collection***

SPU has used paper inspection forms and two Microsoft Access databases to track business inspections, stormwater facility inspections, water quality complaints and spills since 2003. These databases are near the end of their useful life, and mobile devices such as cellular telephones and tablets have made a paper-based inspection system obsolete.

SPU conducted a Kaizen event to identify ways that the Source Control Team could become more efficient and develop a team culture that supports continuous improvement. The Kaizen event was a 5-day workshop at which source control team members mapped out the current business inspection process, evaluated the process to identify areas where a new process would improve efficiency, and then designed a new process to realize the efficiencies.

A focus of the Kaizen event was to map out the team's process so that business requirements could be developed. The business requirements form the basis of a SPU business case document that authorizes funding and resources to develop a replacement database and mobile solution.

SPU has completed the design and build of the replacement database. The database was "live" on July 31, 2018 and the Source Control Team has been using and adjusting the database since that time.

## *Effectiveness Evaluation of the Enhanced Business Inspection Program*

SPU submitted a final report to Ecology on July 18, 2018 to meet the Appendix 13 requirement to develop and implement the following Business Inspection Program Enhancements no later than July 31, 2018. Below is a brief summary of the findings of the evaluation.

In January 2016, Seattle Public Utilities (SPU) began a Lean transformation of its source control inspection program to bring businesses into compliance more quickly and efficiently. These changes were part of SPU's efforts to develop an enhanced program for source control inspections of businesses to meet NPDES permit requirements (Appendix 13) established by the Washington Department of Ecology. The business inspection team conducted a one-week Lean event, facilitated by OfficeRocket, a consulting organization, in which the team worked together to identify goals for the Lean transformation, barriers to efficiency, opportunities for improvement, and a plan to implement improvements. In 2018, SPU commissioned Cascadia Consulting Group to conduct an independent evaluation of the program regarding whether the Lean transformation met its goals of improving effectiveness of SPU's source control program. Based on an analysis of inspection data, the changes made as part of the Lean transformation have substantially improved the effectiveness of SPU's source control business inspection program.

- The median time that businesses take to come into compliance has decreased substantially from 61 days before the Lean transformation to 36 days after the program changes.
- After the Lean transformation, 44% of inspection cases that required corrective actions came into compliance within 30 days, compared to 11% before (see Figure 1).
- In addition, 75% of these cases after Lean came into compliance within 60 days, compared to 50% before the Lean transformation.
- The percentage of corrective action cases that were not corrected within 90 days decreased from 27% before Lean to 13% after the changes.

Based on interviews with program management and staff, the most important changes contributing to these improvements were that the program:

- Created a new Corrected Closing procedure to correct certain issues immediately onsite during the initial inspection and sending a Corrected Closing letter noting the correction. At least three-quarters of Corrected Closings recorded in the database were related to signing up businesses to receive a free spill kit, plan, or training from an SPU contractor. This efficiency saved a re-inspection to the business to verify things like spill kit drop off or a dumpster lid being closed.
- Removed the 2nd and Final warning letter before issuing a Notice of Violation. Previously, businesses were told they would receive a warning if they did not come into compliance within 30 days; now businesses are told they will receive a notice of violation if they do not come into compliance within 30 days. As an alternative,

inspectors can provide extensions to businesses that are demonstrably making progress on their corrective actions but will not come into compliance within 30 days. After Lean, 14% of cases requiring corrective action received extensions, compared to 17% who received 2nd and Final warning letters before Lean.

- Improved messaging and letter templates to use common talking points with businesses during inspections and in follow-up letters so that businesses received consistent messaging from the Source Control Team.

Other efficiencies that contributed to program success included:

- Getting smartphones to schedule inspections from the field and access email and inspection related information from the field
- Moving to a field facility and being co-located with other Source Control Division teams.

Some key challenges with the Lean transformation and related program changes identified by program management and staff included:

- Limited management availability during and after Lean implementation due to management transitions in 2016 and staff relocation to the Ballard location.
- Lack of staff time available to spend time on continuous improvement, a key element of Lean, in part due to not being fully staffed.
- Staff dissatisfaction with stand-up meetings associated with Lean due to lack of clarity regarding their purpose, amount of time required to conduct them, and perception that they occurred too frequently.
- Inspector dissatisfaction with the length and structure of the inspection checklist form, lack of clarity regarding what information the regulatory staff require inspectors to collect, and concerns that these issues will remain in the electronic form associated with the new database.

Based on manager and staff interviews, some key potential future changes to consider include:

- Dedicating time in staff work plans to process improvements and increasing recognition for staff who identify and implement changes.
- Creating and clearly communicating management support for an easy and flexible way for staff to request and make changes throughout the year as staff identify opportunities for improvement.
- Having the Program Manager accompany inspectors more regularly to learn more about their work in the field and increase visible Manager presence.
- Conducting a workshop with inspectors and management to identify options for streamlining the data collection form and to identify which data (and in what format) are vital for regulatory requirements versus wanted by inspectors versus able to be eliminated.

- When additional inspectors are hired, restarting business inspector meetings to share information, discuss inspection-related issues, and support camaraderie.
- Identifying options for improving messaging in Notice of Violation letters and for streamlining and accelerating their review.

## **Operations & Maintenance**

In 2019, SPU cleaned approximately 20,745 linear feet of pipe in the Diagonal Ave SD sections on 6th Ave S and S Dakota St. Both basins were identified as priority basins in the City's 2015 SCIP. This work is conducted to remove solids that have accumulated in the MS4, to prevent them from discharging into the LDW and to facilitate source tracing efforts. Water generated during line cleaning operations was treated and discharged to the sanitary sewer under a discharge authorization with King County. Solids were dewatered and transported to Waste Management's reload facility in Seattle, for eventual disposal.

### ***Operation and Maintenance for Duwamish Source Control Needs***

SPU conducted an evaluation of existing operation and maintenance work for catch basin and flow control/water quality facilities in the MS4 basins that discharge to the LDW to determine if programmatic strategies could be implemented to assist with Source Control. The evaluation was delivered to Ecology in February 2018 (180 days prior to the expiration date of the permit).

The results of this evaluation are that SPU will continue with the current approach to inspection and maintenance of catch basins. The schedule will be to inspect all catch basin annually, and to perform maintenance as needed within 6-months. The performance target is the target contained in the permit under S5.C.9.d.iii: inspect all catch basins and achieve at least 95% of required inspections.

SPU will continue with the current approach to annual inspection and maintenance of stormwater facilities owned and operated by the permittee. The performance target is the target contained in the permit under S5.C.9.c iii: inspect all sites and achieve at least 95% of required inspections.

SPU will continue with the current approach to line cleaning in the Lower Duwamish SCIP basins as detailed in Section 7 of the 2015-2020 Source Control Implementation plan, which is designed to clean a minimum of 4,000 linear feet of storm drain line each year. SPU will be working to establish consistent preventative maintenance (PM) frequencies as part of the refinements to planning and scheduling associated with the line cleaning program in the Lower Duwamish Waterway. SPU will hold an annual meeting between the Source Control Team and the Drainage and Wastewater Maintenance team to coordinate line cleaning efforts between contracted crews and SPU crews.

SPU will report on progress and accomplishments made towards completion of the South Park Conveyance Project in the 2021 Annual Report.



SPU will continue the development and refinement of preventative maintenance and job plans for City owned stormwater infrastructure and report on status in the 2021 Annual Report.

### ***Identification and Prioritization of Priority Capital Projects to Improve Roadway Surfaces in the LDW MS4 Basins***

For the entire City, a key element for identifying locations for roadway surface improvement is pavement condition. SDOT evaluates arterial road conditions once every three years based on ASTM standards. The most recent pavement condition inventory for arterial roads was completed between 2013 and 2015. In addition, about 85% of non-arterial roadways were evaluated between 2013 and 2015. For non-arterials, the condition of a single sample street within a geographic area is used as an estimate of the pavement condition within that grid. Most of SDOT's pavement repair budget targets arterial streets.

SDOT has several programs aimed at maintenance and improvement of roadway surfaces throughout the City. SDOT has reviewed each program to identify relevant projects. Once a project is funded, it progresses through a series of milestones that lead up to construction. These milestones are planning start, design start, design (10%, 30%, 60%, 90%, 100%), bid advertisement, bid award, and construction start. The farther along the milestone path the project has progressed, the more certain the scope and schedule become.

SDOT has evaluated paving programs and identified funded priority pavement improvement projects within the Lower Duwamish drainage basins. These projects are described below.

#### *Move Seattle*

In 2015 Seattle voters passed the Move Seattle nine-year, \$930 million property tax levy which is a significant source of funding for the transportation budget. This levy replaces funds previously obtained from the Bridging the Gap levy that helped fund SDOT between 2006 and 2015. The Move Seattle funds support on-going pavement maintenance and corridor improvement projects. The Move Seattle 10-year Strategic Vision for Transportation set forth methods for identifying streets as priority corridors for investment and ranking projects proposed for these corridors. The Move Seattle methodology used several factors including leveraging opportunities, funding availability, community support, SDOT's existing commitments, geographic equity, and avoidance of major maintenance to prioritize capital projects. SDOT has identified the Move Seattle priority projects, listed by project type below, that are located within the Lower Duwamish drainage basins and can reduce pollutants in the roadway runoff and/or improve the effectiveness of operational BMPs.

### Corridor Projects

Corridor projects install a suite of improvements within a specific geographic area. These improvements can focus on bike facilities, safety improvements, utility upgrades, providing greenways, traffic revisions, transit lanes, and freight corridors, but they also frequently include pavement improvements.

### 23rd Avenue Corridor Project

Two phases of the 23<sup>rd</sup> Avenue Corridor Project are located in the LDW drainage basin. Phase 1 of the 23<sup>rd</sup> Avenue Corridor Project repaved 5.4 lane miles (a lane mile is 5,280 feet of an average lane width of 12-feet) of roadway between East John Street and South Jackson Street and was completed in 2017. To comply with City Stormwater Code basic treatment requirements, SDOT installed 5 storm drain filter systems and 13 Filterra bioretention systems as part of the project.

Phase 2 of the 23<sup>rd</sup> Avenue Corridor Project repaved 2.3 lane miles of roadway between South Jackson Street and Rainier Avenue South in 2019. The repaving included mill and overlay of approximately 0.9 linear miles of asphalt roadway, and approximately 1.4 lane miles of concrete panels, and repair of the roadway base where it was broken. Treatment was not required for Phase 2 because the project did not meet the threshold requirements (i.e., existing basin surface coverage is >35% impervious and new pollution generating hard surface is <5,000 ft<sup>2</sup>) in addition to being partially located in the combined sewer basin.

Phase 3 of the 23<sup>rd</sup> Avenue Corridor project is scheduled to begin in 2020 and is located outside of the LDW basin.

### SPU Drainage Partnership -South Park

The project is a partnership with Seattle Public Utilities (SPU) that will rebuild priority roads and stormwater conveyance to direct stormwater to a planned pump station and water quality treatment facility. The project is located within the 7<sup>th</sup> Avenue S SD and the 2<sup>nd</sup> Avenue S SD Lower Duwamish drainage basins.

Several roads in the proposed project area are in need of repair. SDOT will decide whether or not rebuilds will occur based upon several factors and considerations. SDOT is currently working with SPU to finalize which streets to rebuild based on the drainage improvement plan footprint, the technical feasibility, the cost of the roadway improvements and available funding. The streets selected for rebuilding are located near the 1,880 linear foot portion of South Portland Street that SDOT rebuilt in 2015 for \$3.4 M. As with the Portland Street rebuild, the South Park Partnership project is expected to significantly reduce the quantity of solids generated from the roadway and entering the roadway runoff.

SDOT has allocated \$10M for the rebuild of arterial and non-arterial roadways for the South Park project. The current milestone status for this project is 10% design. The SDOT goal is to complete the South Park road improvements by the end of 2022. This schedule and actual

completion of this project are subject to change based on the identification of the needed drainage improvements, changes in scope identified during the design process, SPU/SDOT project delivery decisions, technical feasibility and other competing City priorities. At this time the paving for the SPU/SDOT partnership is expected to cover approximately 3,100 linear feet of roadway.

### Arterial Asphalt and Concrete Program (AAC)

SDOT's Arterial Asphalt and Concrete Program resurfaces several major arterial streets each year with the larger goal of enhancing both mobility and safety citywide. The projects are prioritized and selected by SDOT's Pavement Engineering and Management Section based on pavement condition, volume and type of traffic, identified needs of residents and businesses, opportunities for coordination with other capital projects, and identified maintenance and liability concerns. These paving projects include enhancements such as improved curb ramps and sidewalks, providing a safer and more convenient pedestrian environment, as well as road markings and signal detectors to help bicycles and vehicles share the road more safely. Between 2015 and 2019, approximately 29 lane miles of roadway in the LDW drainage basin were paved as part of the AAC Program.

One project has been identified for paving in the LDW drainage basin for 2020 – 2024. The 15th Ave S/S Columbian Way/S Spokane St AAC Paving Project is scheduled to start in November 2020 and be completed in June 2021. The project will repave approximately 5.4 lane miles of roadway located on 15th Avenue S between S Spokane Street and S Angeline St; S Columbian Way between 14th Ave S and 15th Avenue S; and S Spokane St between S Columbian Way and Beacon Ave S. Additional Paving Programs

In addition to the capital project programs discussed above, SDOT operates paving programs that are implemented by SDOT's in-house crews and a micro-surfacing program that is normally scheduled each summer if funds are available. Schedule and actual completion of particular projects depend upon funding, project scopes, and competing work priorities. In 2016 and 2017 SDOT completed approximately 21,300 square feet of crew-led roadway improvements and 1,000 linear feet of micro-surfacing. The projects were located within in the 7<sup>th</sup> Avenue S SD, SW Idaho SD, I-5 SD at Slip 4, and the Diagonal Avenue S SD/CSO lower Duwamish basins. The programs are described below.

### Micro-surfacing

Micro-surfacing, the application of a protective seal coat to extend pavement life, has been an on-going program managed by SDOT's Capital Project Division since 2014. The streets chosen for micro-surfacing are selected based on pavement age, pavement maintenance history and inspection results from Maintenance Operations Division. They are mostly low-volume, non-arterial streets.

### Arterial Major Maintenance (AMM)

This is a program implemented by SDOT in-house Maintenance Operations crews. The program typically has funds to repair approximately 8 lane miles per year at about 65 targeted locations. The jobs typically consist of one to three blocks of mill and overlay or replacement of eight to ten concrete panels. No project exceeding \$120,000 in value can be constructed by crews, so only projects that do not trigger drainage improvements per Seattle Stormwater Code are undertaken. About 65% of work is planned about a year in advance, the remainder is complaint-driven. For the planned portion of AMM projects there are several areas that are repaired annually because they fail repeatedly but have not been upgraded by an AAC project. AMM priority locations are near schools, hospitals, or bike routes or in an area where the work can be combined with other City departments. As much as 35% of the AMM budget is spent constructing ramps for ADA compliance. Between 2015 and 2019, approximately 14.5 lane miles of roadway in the LDW drainage basin were paved as part of the AMM paving program. For 2020 and 2021, approximately 2.2 lane miles of paving have been planned for locations in the LDW drainage basin.

### Non-Arterial Street Resurfacing and Restoration (NASRR)

This is a program operated in the same manner as the AMM program except that the streets repaired are non-arterials. This is the only SDOT maintenance program that addresses pavement conditions on non-arterials, and its budget covers about 2 lane-miles per year. As for the AMM program, improvements to street conditions through the NASRR program reduce the generation of solids and enhances the ability of street sweeping to remove solids and other pollutants before they can enter the drainage system. Between 2015 and 2019, approximately 7.4 lane miles of roadway in the LDW drainage basin were paved as part of the NASRR program. For 2020 and 2021, approximately one mile of paving has been planned for locations in the LDW drainage basin.

### Pothole Repair

Maintaining safe roadways is the main priority of the pothole repair program. The locations of the pothole repairs are based on public complaints. According to the Maintenance Operation personnel who implement the program, the Greater Duwamish area may have a higher pothole repair rate because freight trucks tend to break up roads.

### Slurry Sealing

Slurry seal is a type of protective seal coat which extends pavement life. It's a thin layer of asphalt emulsion blended with finely crushed stone for traction. The streets chosen for this process are selected based on pavement age, pavement maintenance history and inspection results from Maintenance Operations Division. They are mostly low-volume, non-arterial streets. During 2019, approximately 3,900 feet of roadway in the LDW drainage basin was treated using slurry seal. For 2020, there are no roadways in the LDW drainage basin scheduled for slurry seal treatment.

***Report on weekly sweeping of S. Myrtle St.***

S. Myrtle St. was swept by SDOT 42 times in 2019 as part the Street Sweeping for Water Quality Program (SS4WQ).

***Report on quarterly inspection of catch basins and maintenance holes on S. Myrtle St.***

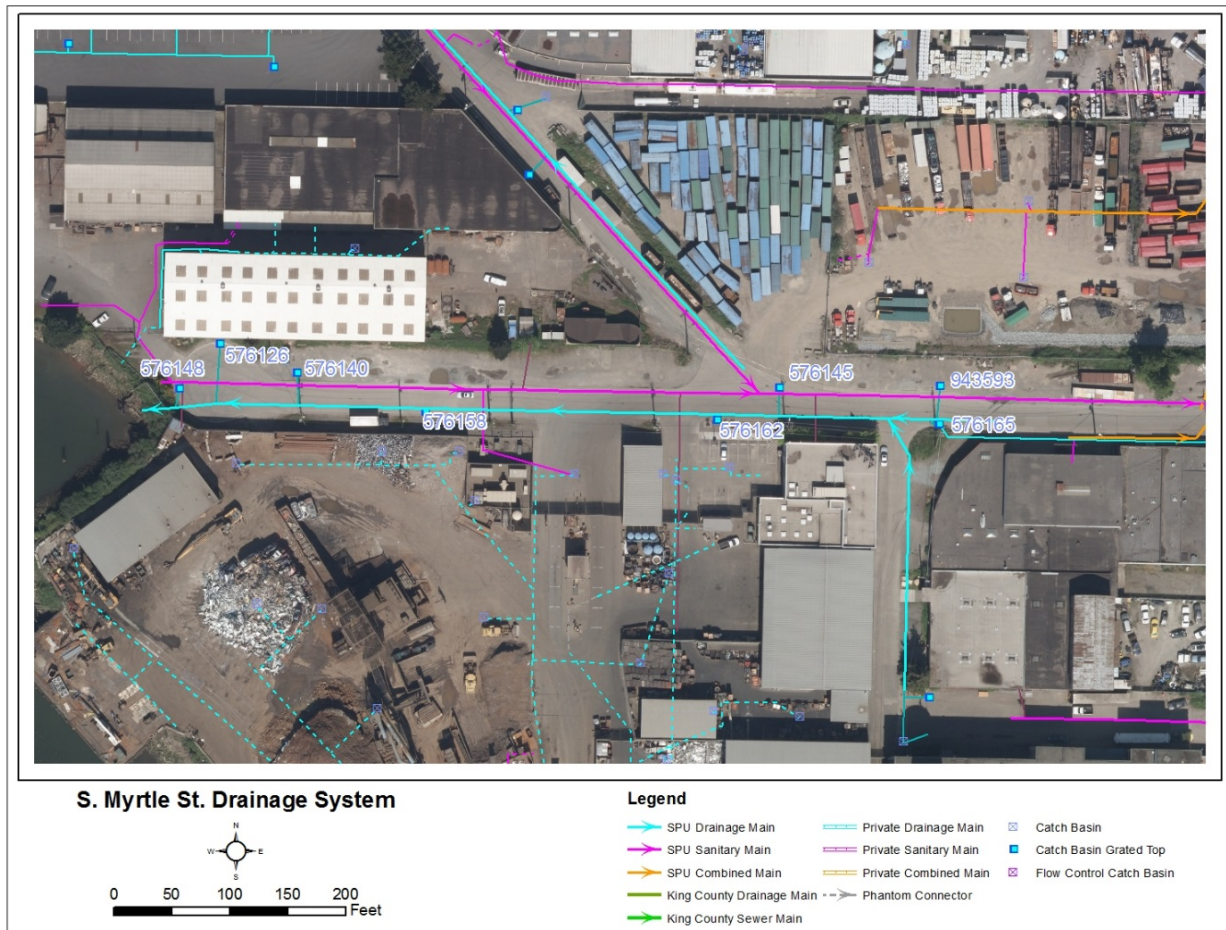
SPU conducted quarterly inspections of catch basins and mainline maintenance holes from 2011 – 2019.

The data for catch basin and mainline maintenance hole measurements from 2011 to 2019 are provided in Table 1. Measurement locations on shown on Figure 1. The data from 2011 to 2017 were evaluated as part of the evaluation of existing operation and maintenance work for catch basin and flow control/water quality facilities in the MS4 basins that discharge to the LDW, to determine if programmatic strategies could be implemented to assist with Source Control. The evaluation determined that the catch basins on S. Myrtle Street accumulate solids or require maintenance similar to those in the rest of the LDW MS4 basins. However, Per Ecology’s direction, SPU will continue quarterly inspections of catch basins and mainline maintenance holes.

**Table 1: S Myrtle St maintenance hole measurements.**

EQNUM	576148	576126	576140	576158	576162	576145	576165	943593	599350	599353	599354
Location	S Myrtle St cul-de-sac, west CBL	S Myrtle St cul-de-sac, north CBL	north side S Myrtle St, west of SIM CBL	south side S Myrtle St, west of SIM CBL	south side S Myrtle St, east of SIM CBL	S Myrtle St and Fox Ave S CBL	south side S Myrtle St at 7th Ave S CBL	north side S Myrtle St, east of SIM CBL	S Myrtle St cul-de-sac MH	S Myrtle St at SIM MH	S Myrtle St at 7th Ave S MH
Type	CBL	CBL	CBL	CBL	CBL	CBL	CBL	CBL	MH	MH	MH
Outlet pipe size	8	8	8	8	8	8	8	8	8	8	8
Casting Width	1'-4"	1'-4"	NA	1'-4"	1'-4"	1'-4"	1'-4"	1'-8"	NA	NA	NA
Casting Length	2'-7"	2'-7"	NA	2'-7"	2'-7"	2'-7"	2'-7"	2'-0"	NA	NA	NA
Structure Depth (ft)	6.45	7.90	NA	7.22	6.4	6.61	5.76	6.2	7.45	7.35	5.76
Sump Depth (ft)	3	2.4	2.6	2.4	2.9	2.9	2.5	2.3	NA	NA	NA
<b>2011 percent full</b>											
04/21/11	0%	0%	4%	0%	13%	3%	46%	11%	0%	0%	0%
07/14/11	0%	0%	3%	8%	29%	13%	1%	21%	0%	0%	0%
<b>2012 percent full</b>											
01/05/12	0%	1%	10%	11%	50%	13%	19%	27%	0%	0%	0%
06/22/12	1%	19%	11%	16%	57%	11%	41%	20%	0%	0%	0%
10/11/12	1%	9%	16%	27%	62%	14%	45%	27%	0%	0%	0%
<b>2013 percent full</b>											
02/11/13	9%	22%	22%	38%	69%	14%	53%	28%	0%	0%	0%
05/01/13	12%	24%	23%	48%	3%	23%	52%	33%	0%	0%	0%
10/28/13	2%	2%	29%	50%	8%	28%	49%	34%	0%	0%	0%
12/23/13	4%	5%	31%	58%	9%	17%	51%	29%	0%	0%	0%
<b>2014 percent full</b>											
03/14/14	4%	13%	30%	68%	19%	38%	49%	26%	0%	0%	0%
06/23/14	5%	15%	38%	73%	21%	27%	55%	37%	0%	0%	0%
09/29/14	6%	13%	42%	72%	22%	29%	55%	36%	0%	0%	0%
12/29/14	6%	15%	43%	81%	30%	28%	50%	36%	0%	0%	0%
<b>2015 percent full</b>											
03/27/15	7%	16%	43%	80%	33%	32%	53%	44%	0%	0%	0%
06/23/15	8%	17%	40%	2%	36%	32%	55%	41%	0%	0%	0%
09/22/15	10%	28%	50%	2%	37%	31%	0%	45%	0%	0%	0%
12/29/15	9%	15%	43%	12%	40%	39%	8%	37%	0%	0%	0%
<b>2017 percent full</b>											
02/22/17	14%	30%	56%	49%	63%	48%	34%	55%	0%	0%	0%
05/25/17	16%	30%	0%	5%	5%	45%	41%	0%	0%	0%	0%
08/17/17	20%	36%	0%	5%	0%	43%	38%	0%	0%	0%	0%
11/22/17	24%	38%	0%	14%	8%	48%	42%	0%	0%	0%	0%
<b>2018 percent full</b>											
03/12/18	20%	36%	1%	15%	4%	48%	38%	0%	0%	0%	0%
05/23/18	23%	37%	3%	21%	5%	28%	41%	-6%	0%	0%	0%
08/29/18	22%	40%	1%	24%	-1%	46%	33%	-5%	0%	0%	0%
12/07/18	23%	0%	13%	21%	8%	2%	20%	1%	0%	0%	0%
<b>2019 percent full</b>											
03/01/19	21%	0%	3%	22%	13%	-3%	39%	-7%	0%	0%	0%
05/22/19	22%	0%	5%	29%	6%	-1%	33%	-6%	0%	0%	0%
08/29/19	1%	-6%	5%	29%	11%	-1%	38%	-8%	0%	0%	0%
12/04/19	23%	2%	0%	29%	3%	7%	42%	-7%	0%	0%	0%
Times Exceeded Maintenance Threshold (60% full)	1 in 8 years	3 in 8 years <sup>1</sup>	1 in 8 years	1 in 8 years	3 in 8 years	1 in 8 years <sup>2</sup>	0 in 8 years <sup>3</sup>	0 in 8 years	0 in 8 years	0 in 8 years	0 in 8 years
		1. Cleaned multiple times due to spills and illicit discharges				2. Impacted by private construction filert sock	3. Impacted by private construction filert sock				

**Figure 2: Catch basin and maintenance holes measuring locations on S. Myrtle St.**



## Structural Controls

### *South Park Pump Station*

The South Park Pump Station is designed to reduce chronic flooding problems in the lower 7<sup>th</sup> Ave S drainage system and will convey stormwater to the South Park Water Quality Facility for treatment. The drainage system cannot currently drain at high tide. The pump station will allow the main trunk line to function properly during a wide range of tidal conditions. It will also support future local drainage and roadway improvements needed to improve drainage service in the lower basin. The pump station will be located on city-owned property at 636/640 S Riverside Dr. Design was completed in 2019, the project will be advertised for construction in early 2020, and construction is anticipated to begin in summer 2020.

### *South Park Drainage and Roadway Partnership Project*

The South Park Drainage and Roadway Partnership Project is a cooperative effort between SPU and SDOT to improve the stormwater collection and conveyance system, reduce flooding, and

improve roadway conditions in the lower 7th Ave S drainage basin. Phase 1 of the project includes improvements on nine city blocks in the South Park neighborhood. Design began in 2019 and will be completed in 2020. The project is expected to be advertised for construction in late 2020 with construction starting in 2021.

### ***South Park Water Quality Stormwater Treatment Facility***

The South Park Water Quality Facility is one of the projects included in SPU's Integrated Plan approved by Ecology and EPA in 2015 as part of the City's Long-Term CSO Control Plan. It will treat runoff from the 230-acre 7th Ave S drainage system. SPU originally intended to build the water quality facility in conjunction with the South Park Pump Station on the 636/640 S Riverside Dr site. Unfortunately, SPU was unable to acquire the needed adjacent street end vacation to allow both the pump station and the water quality facility to be constructed at this location. SPU decided to construct the pump station on the two properties on S Riverside Dr and in 2019, began searching for alternate locations for the water quality facility. SPU also started to consider additional treatment options, including bioretention, understanding that bioretention would require more space for construction than the mechanical treatment systems that had previously been considered.

### ***Street Sweeping Expansion – Arterials***

This program has expanded the City's arterial street sweeping program, per commitments in the Plan to Protect Seattle's Waterways (aka Integrated Plan).

The team began implementing the plan in 2016.

During 2020, the team will continue to implement the plan and adapt as needed to meet the regulatory targets. The key tasks planned for this year include:

- Continue sweeping new arterial routes.
- Use SDOT's day shift staff as available to alleviate the current difficulty maintaining a night crew of six.

### ***Terminal 117 Adjacent Streets and Drainage Project***

SPU installed a sediment trap near the downstream end of the 17<sup>th</sup> Ave S storm drain in 2017. There was not enough material in the trap for analysis when retrieved in 2018. SPU retrieved the trap again in May 2019 and was able to obtain enough material for analysis of PCBs. The trap sample contained 685 ug/kg dw PCBs

### **Annual Prioritization**

Seattle has prepared the next SCIP (SCIP 2) for the Lower Duwamish Waterway (LDW) which will be submitted to Ecology at the same time as this annual NPDES report. SCIP 2 describes the City's planned source control activities in the LDW for the period 2021-2026. In developing SCIP



2, SPU compiled data collected over the past five years (July 1, 2014 through June 30, 2019) to evaluate conditions in the City MS4.

### ***Data Review***

Comparisons for the major risk drivers in LDW sediment that are monitored in storm drain solids (arsenic, PCBs, and cPAH), are provided in the form of box plots in Figures 2-4<sup>4</sup>. These box plots compare data from the previous SCIP (2003 through June 30, 2014) to the data collected during the SCIP 2 reporting period (July 1, 2014 through June 30, 2019).

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<sup>4</sup> Dioxins/furans have been identified as a risk driver in LDW sediment, but these chemicals are not routinely analyzed in storm drain solids samples.

## Arsenic (As) Box Plots

Concentrations (mg/kg dw) over time for all samples in Seattle's MS4 collected between August 13, 2003 and June 30, 2019

\* Blue line = SCO (57 mg/kg dw), and Red line = CSL (93 mg/kg dw)

\* Median concentrations by outfall are shown in bolded text.

\* SCIP 1 = August 18, 2003 - June 30, 2014.

\* SCIP 2 = July 1, 2014 - June 30, 2019. If the storm drain has been cleaned during SCIP 2, only the most recent post-cleaning samples are included.

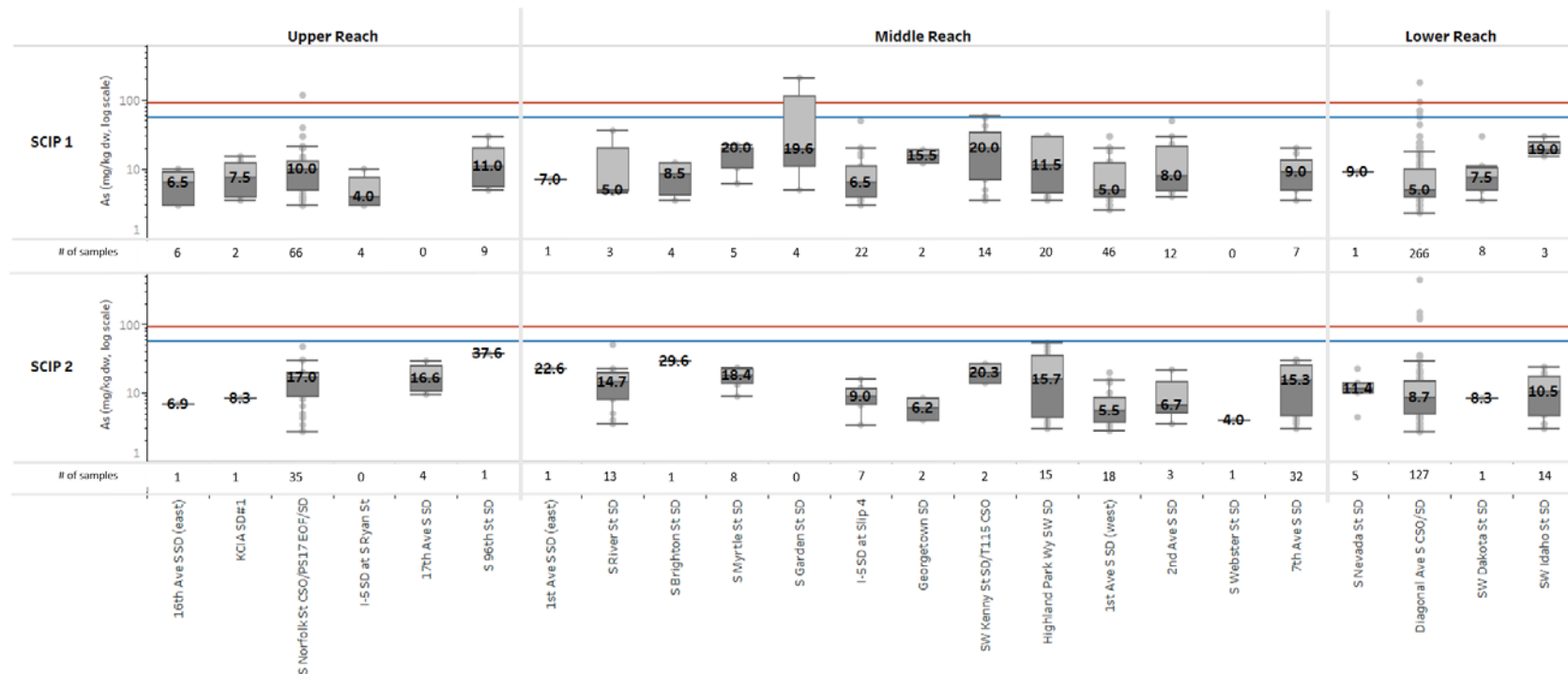


Figure 2: Arsenic s boxplots from the SCIP

## cPAH Box Plots

Concentrations (ug/kg dw) over time for all samples in Seattle's MS4 collected between August 13, 2003 and June 30, 2019

\* Red line= LAET/2LAET (1,000 ug/kg dw)

\* Median concentrations by outfall are shown in bolded text.

\* SCIP 1 = August 18, 2003 - June 30, 2014.

\* SCIP 2 = July 1, 2014 - June 30, 2019. If the storm drain has been cleaned during SCIP 2, only the most recent post-cleaning samples are included.

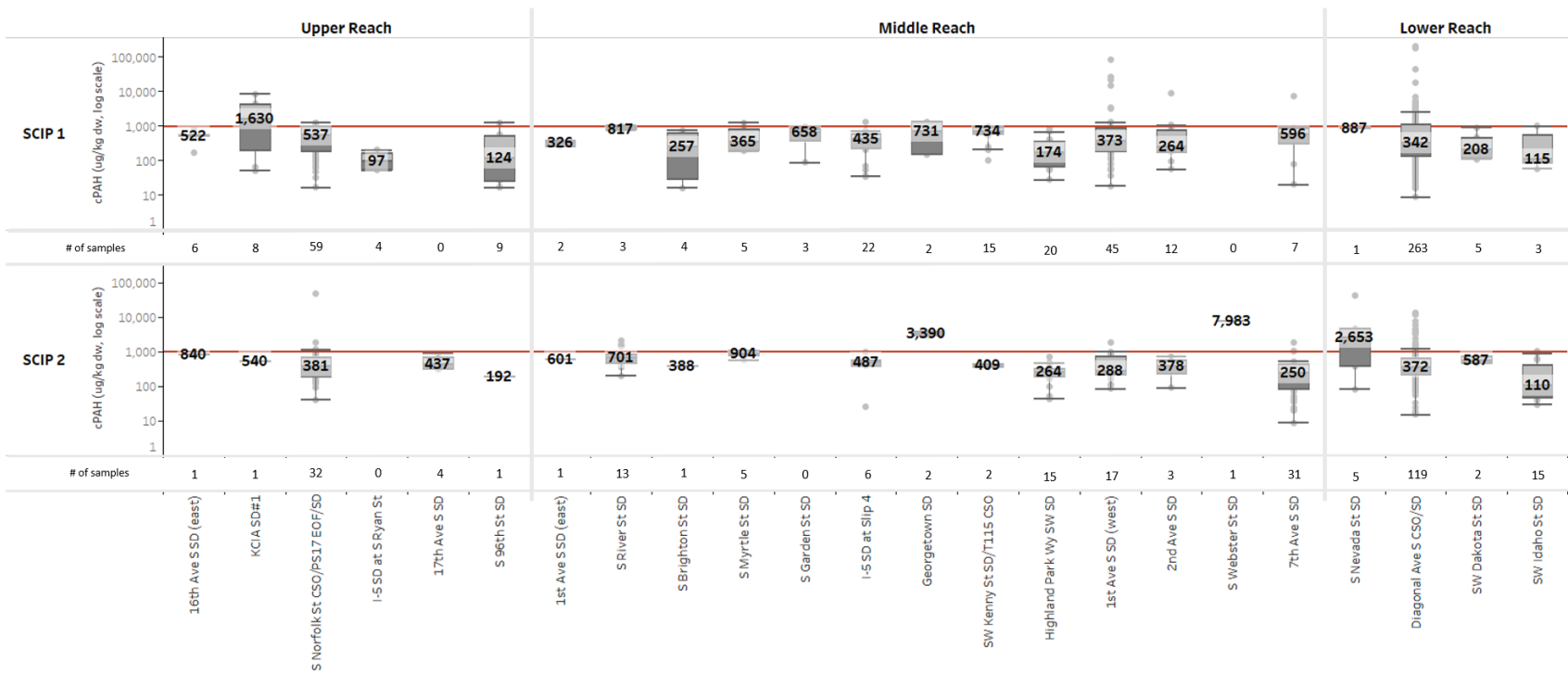


Figure 3: cPAH boxplots from the SCIP

# Polychlorinated Biphenyls (PCBs) Box Plots

Concentrations (ug/kg dw) over time for all samples in Seattle's MS4 collected between August 18, 2003 and June 30, 2019

\* Blue line = LAET (130 ug/kg dw), and Red line= 2LAET (1,000 ug/kg dw)

\* Median concentrations by outfall are shown in bolded text.

\* SCIP 1 = August 18, 2003 - June 30, 2014.

\* SCIP 2 = July 1, 2014 - June 30, 2019. If the storm drain has been cleaned during SCIP 2, only the most recent post-cleaning samples are included.

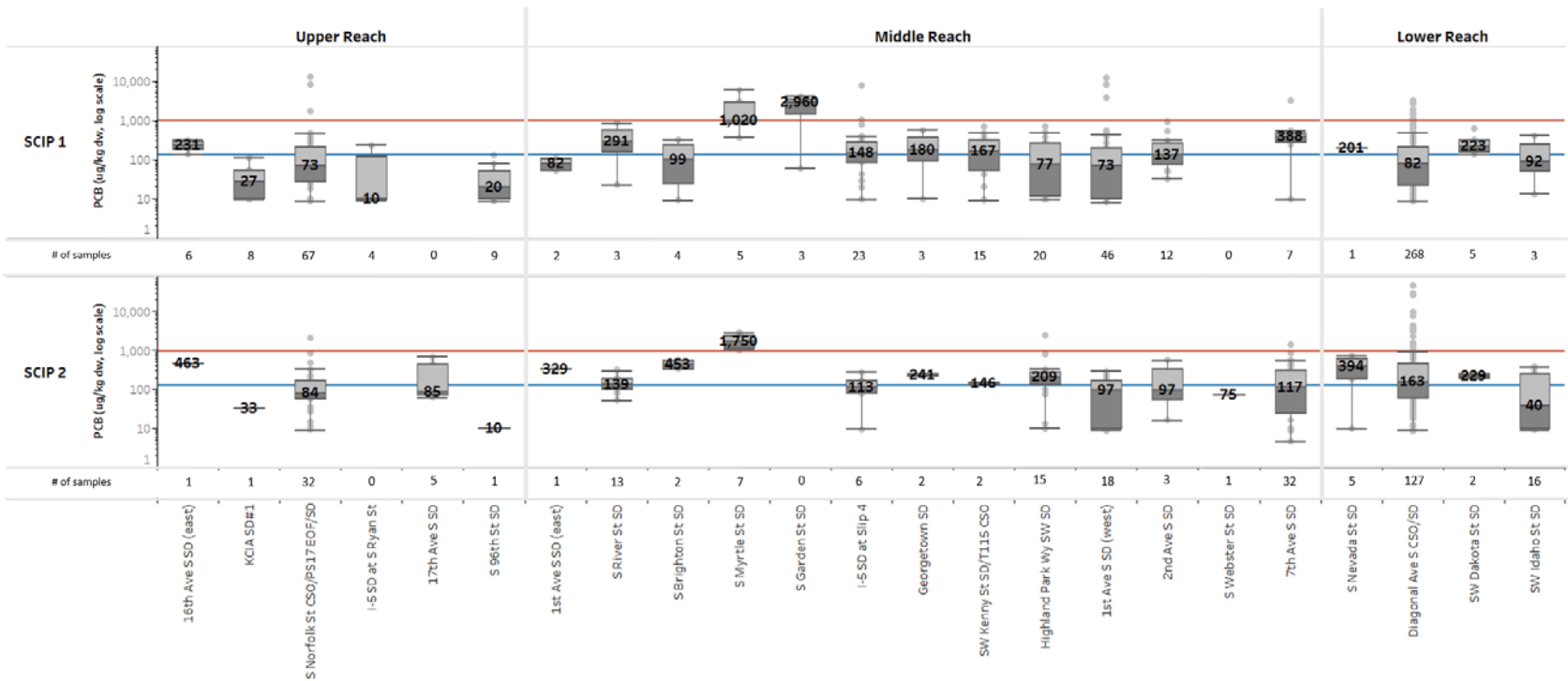


Figure 4: PCB boxplot from SCIP



Outfalls that have not been sampled since the SCIP include:

- S Garden St SD
- I-5 SD at S Ryan St
- S 96th St SD
- 16th Ave S SD (east).

The S Garden, I-5 SD at S Ryan St, and the S 96<sup>th</sup> St storm drains were not identified as priorities in the SCIP. SPU cleaned the city-owned portions of the 16<sup>th</sup> Ave S SD (east) system in 2013 and Boeing has disconnected its drainage system from this outfall. The downstream end of this system was also modified in 2014 when King County reconstructed the South Park bridge. Runoff from the approach to the bridge is now treated in a wet vault and discharges to the waterway via a new 24-inch outfall. However, runoff from portions of 16<sup>th</sup> Ave S and E Marginal Way S is not conveyed to the treatment vault and continues to discharge to the waterway via the old 8-inch outfall.

The median concentrations of arsenic measured in each outfall between August 2014 and December 2019, were either slightly lower or similar to the concentrations reported in the SCIP. Exceedances of the sediment cleanup objective (SCO) for arsenic (57 mg/kg) were low in the older samples (2 percent exceeded the SCO). Only two of the 277 samples collected between July 2014 and December 2019 exceeded the SCO. One sample was collected in October 2017 from MH29, which is located just downstream of an old flush tank on the sanitary sewer which has since been converted to a storm drain<sup>5</sup>. The flush tank is old and no longer used. SPU cleaned this section of pipe in 2018. The other was collected in February 2018 at a private catch basin in an area where scrap wood is stored. SPU required the company to cover treated lumber.

Median PCB concentrations in the July 2014 – December 2019 samples also remained fairly similar to the concentrations reported in the 2015 SCIP. The main exceptions are the 7<sup>th</sup> Ave S SD, S River St, and SW Idaho St SD, where median PCB concentrations were lower in the more recent samples and the Diagonal Ave S CSO/SD, S Brighton St SD and S Myrtle St SD where the median concentrations in August 2014- December 2019 samples were higher than the values reported in the SCIP (Table 2).

**Table 2: Outfalls where PCBs changed between SCIP and recent samples.**

Outfall	Results from SCIP		Results from 2014-2019 samples	
	Median concentration (ug/kg dw PCBs)	n	Median concentration (ug/kg dw PCBs)	n
7 <sup>th</sup> Ave S SD	388	7	137	56
S River St SD	291	3	130	12
SW Idaho St SD	103	4	40	23
S Brighton St SD	158	5	39	7
S Myrtle St SD	1,483	13	1,483	13
Diagonal Ave S CSO/SD	86	222	158	123

<sup>5</sup> The 12-inch sanitary sewer was converted to a storm drain as part of the Diagonal Avenue S CSO Control Project constructed in the early 1990s.

The 7<sup>th</sup> Ave S, S River St, and SW Idaho St drainage systems were cleaned in 2013, 2010, and 2012, respectively. Data presented in the SCIP included only the post-cleaning samples, but the new data indicate that PCB concentrations may be declining in these three systems. The S Myrtle St drainage system was also cleaned in 2010, but as reported in the SCIP, there is an ongoing source in the S Myrtle St system. Five samples were collected from the S Myrtle St between August 2014- December 2018; elevated levels of PCBs and mercury continue to be present in this system. Additional sampling will be conducted after additional source control actions required of Seattle Iron and Metal, Inc. as part of the recent settlement with Puget Soundkeeper Alliance are completed.

The median concentration of PCBs in the Diagonal Ave S CSO/SD has increased by nearly a factor of two over the past four years. This change may be due to the emphasis on following up in areas where the detection dog detected PCBs or where SPU inspectors suspected potential PCB sources. SPU installed three additional traps in the S Snoqualmie sub-basin in 2018 to assist in tracing elevated levels of PCBs found in the maintenance hole located on S Snoqualmie St at 6<sup>th</sup> Ave S.

With the exception of a few outfalls, median cPAH concentrations in the August 2014- December 2019 samples were fairly similar to the concentrations reported in the SCIP (Table 3):

**Table 3: Outfalls where cPAHs changed between SCIP and recent samples.**

Outfall	Results from SCIP		Results from 2014—2019 samples	
	Median cPAH (ug/TEQ/kg)	n	Median cPAH (ug/TEQ/kg)	n
7 <sup>th</sup> Ave S SD	596	7	236	35
Norfolk CSO/EOF/SD	831	59	420	100
SW Kenny St SD	734	15	331	4
2 <sup>nd</sup> Ave S SD	216	17	378	3
S Myrtle St SD	365	5	788	11

n = number of samples

Median concentrations of cPAH have declined in the 7<sup>th</sup> Ave S, Norfolk, and SW Kenny St storm drains. As mentioned above, the data presented in the SCIP for the 7<sup>th</sup> Ave S and SW Idaho St storm drains included only post-cleaning samples, so the recent data may indicate that cPAH concentrations in these two systems are continuing to decline. The August 2014- December 2019 dataset for the Norfolk system is fairly robust (100 samples), because SPU conducted a focused investigation in this basin to identify source(s) of PAHs, which involved intensive inspections and sampling. However, no specific sources were found. Over the past 5 years, a number of PAH sources have been identified and controlled in this system. SPU cleaned most of the MLK Wy Jr. sub-basin of the S Norfolk drainage system in 2018.

Although the recent data indicate that cPAH concentrations may be increasing in the 2<sup>nd</sup> Ave S and S Myrtle St storm drains, there are not enough samples to confirm whether this is the case. SPU intends to continue sampling in these two basins.

## Priorities for 2020

### Source Tracing/Sampling

Source tracing priorities for 2020 will largely remain the same as described in the SCIP. Changes identified based on recent sampling and business inspections are summarized below:

- Sample to fill data gaps. Remaining data gaps are largely in smaller areas (1-5 acres) within the MS4 that discharge to other larger drainage systems (e.g., 16<sup>th</sup> Ave S SD-west, W Marginal PI SD) or areas that have been difficult to sample due to lack of solids in the system (e.g., I5 SD at S Ryan St).

### Line Cleaning

For the past few years SPU has utilized the 636/640 S Riverside Dr site for the temporary decant facility for line cleaning. This site will no longer be available when construction of the South Park pump station begins. SPU is in the process of finding a new temporary decant location. MTCA grant funding for line cleaning ran out in 2017. In 2016, the end date of this grant was extended from 2017 to 2019, but no additional money was provided. Line cleaning in 2020 will focus on:

- S Norfolk St Storm Drain
- 1st Ave S Storm Drain (west)
- Diagonal Ave S Storm Drain, Denver Ave S sub-basin.
- Diagonal Ave S Storm Drain, S Snoqualmie St sub-basin

SPU intends to clean at least 4,000 linear feet of storm drain lines in 2020 to comply with Appendix 13 requirements.

## Citywide Programs that Support Source Control Efforts in the LDW

In addition to the specific adaptive management elements, SPU conducts other citywide programs that support these efforts. The following is a summary of the 2019 accomplishments in these citywide programs:

- Stormwater Facility Inspections: While inspecting a business for source control BMPs, the flow control and/or treatment facility is also inspected. Within the LDW, 54 facilities were inspected for Code compliance with regard to flow control and treatment system code requirements during 2019.
- Illicit Discharge Detection and Elimination (IDDE): SPU conducts sediment sampling of onsite catch basins, right of way catch basins and drainage system mainlines to identify sources of contamination and potential illicit discharges and illicit connections. Sampling is conducted in tandem with business inspections to identify and terminate sources of pollution. Samples are analyzed for the LDW contaminants of concern, including total organic carbon, semi-volatile organic compounds, TPH-Dx, metals, polychlorinated biphenyls, grain size, and occasionally site-specific parameters, such as pH, additional metals, and volatile organic compounds.



- **Water Quality Complaints:** Inspectors respond to complaints as they are received through the water quality hotline, webpage or agency referrals. In 2019, 68 water quality complaints were reported in the LDW and EW basins that resulted in 5 business inspections. When a complaint is reported at a business, a full business inspection is completed.
- **Spill Response:** Spills are dispatched through the SPU Operations Response Center to on-call Spill Coordinators as they are received. In 2019, SPU responded to 84 spills within the LDW and EW basins.

#### *Denver Ave S PCB Spill*

In June 2019, an SPU inspector discovered a PCBs spill in the right-of-way along Denver Ave S between 1<sup>st</sup> Ave S and 2<sup>nd</sup> Ave S. Sampling confirmed that surface soil along the north/west shoulder of Denver Ave S contained up to 40,300 mg/kg dw PCBs and solids in storm drain inlet on Denver Ave S contained 6,970 mg/kg dw PCBs. The affected soil was determined to encompass an area of about 38 feet by 530 feet with PCB concentrations ranging from 0.1 to 14 mg/kg in the top 0 to 6 inches of soil. PCBs in the storm drain downstream of the inlet where soil initially entered the drainage system ranged from about 4 to 69.4 mg/kg dw PCBs. Both Ecology and EPA were notified. In July and August, SPU and SDOT conducted a cleanup under the Toxics Substance Control Act that was approved by EPA Region 10. Approximately 981 tons of non-regulated PCB-contaminated soil and 40 tons of regulated PCB-contaminated soil/storm drain solids were removed from the site and approximately 1,500 feet of pipe and associated structures (e.g., inlets, catch basins, maintenance holes, and vaults) on Denver Ave S were jetted and cleaned. Non-regulated waste was disposed at the Columbia Ridge Landfill and regulated waste was disposed at the Chemical Waste Management Landfill, both located in Arlington, Oregon. SDOT backfilled and paved the road shoulder after contaminated soil was removed. Soil samples collected at the bottom of the excavation prior to backfill contained <0.05 to 0.086 mg/kg dw PCBs.

- **Education and Outreach:** SPU funds the Green Your Business Program, a conservation service for Seattle businesses. Resource Venture implements the City's Spill Kit Incentive Program, which provides free spill kits, assistance in developing spill plan and site-specific technical assistance to Seattle businesses. Approximately 26 businesses in the LDW MS4 basins received spill kits, either stemming from a business inspection or through targeted outreach. Surveys conducted of spill kit recipients statistically show that businesses which participate in this program show an improved understanding of stormwater pollution prevention.

**Attachment A: Source tracing data collected from June 2016 through December 2019**

