Appendix A:

Description of business inspection, source tracing, and line cleaning programs in the Lower Duwamish Waterway

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1. Business Inspections

1.1. INSPECTION PROGRAM HISTORY

In 2003, SPU and King Co started business inspections in the Diagonal Ave S CSO/SD basin to support cleanup efforts in the Diagonal/Duwamish Early Action Area. These inspections targeted stormwater quality, industrial wastewater and hazardous waste management. The joint inspection program lasted for three years, at which point King County withdrew to focus on businesses that are permitted under the King County Industrial Waste program.

SPU has continued in the subsequent years to develop a robust inspection program. In 2007, SPU was one of the distinguished programs selected to be supported by the Department of Ecology Local Source Control (LSC) grant and training assistance program. In the years since SPU has continued to support LSC as a leadership program providing training and mentoring to new inspectors across western Washington. The modern business inspection program encompasses the entire City of Seattle separated drainage basin, but special emphasis is placed on the LDW. SPU currently carries out comprehensive inspections at businesses in the LDW to evaluate compliance with both City and County, State and Federal regulations regarding stormwater, industrial wastewater, spill containment, and hazardous waste management practices.

1.2. CROSS PROGRAM REFERRALS AND COLLABORATION

Business inspectors primarily verify compliance with the City of Seattle Stormwater code but are also trained to perform multi-media inspections beyond stormwater compliance. Through internal training and collaboration meetings with external partners, inspectors have sufficient expertise to refer issues to our regulatory partners for targeted follow-up. Areas of concern include hazardous waste management, industrial wastewater discharges to the sanitary sewer, volatile or particulate releases affecting air quality, safety concerns, fire risk, construction and permitting, and business licensing. SPU Source Control has an effective working relationship for referrals with King County Industrial Waste, King County Hazardous Waste Program, Department of Ecology Hazards Waste and Water Quality Programs, Seattle Department of Construction and Inspections, Puget Sound Clean Air Agency for independent follow-up. Likewise, our partner agencies refer stormwater-related issues to SPU staff when encountered during their inspections. Section 3.1.2 of the SCIP contains additional information on referrals.

If SPU is aware that the business has an NPDES Stormwater Permit from Ecology or an Industrial Waste permit/authorization from King County, the Inspector may call the respective agency to coordinate a joint inspection. These joint inspections are often coordinated through the Duwamish Inspectors Group, a partnership of inspectors from EPA, Ecology, King County, and Seattle that meets regularly to discuss inspection activities. SPU periodically updates its database with permitting information from other agencies so that Inspectors are aware when a joint inspection should be arranged.

1.3. INSPECTION PROCESS CONTINUOUS IMPROVEMENT

Since its inception in 2003, SPU source control has operated under a culture of continuous improvement of our processes to increase inspector efficiency, business efficacy, our collaboration, and record keeping. Over the years these improvements have included routine updates of our inspection procedures manual and inspection forms, development of an Access database to store and retrieve historic inspection records, and development of communication aids and reference documents for inspectors.

In spring of 2017, SPU undertook a process evaluation under LEAN program management principles. As a result of this effort significant improvements were made to our enforcement process which resulted in a concise

process which is faster and easier to implement. An additional goal developed from the LEAN process and initiated mid-year 2018, SPU conducted an extensive update of our inspection records database. This effort transitioned the team to all electronic record keeping, mobile data entry, and primarily paperless communication with our partner businesses. This culture of continuous improvement ensures program relevance with changing technology, culture, economy and regulatory environment.

1.4. BUSINESS INSPECTION PROCESS AND PROGRESSIVE ENFORCEMENT

SPU conducts both unscheduled and scheduled inspections. The decision to schedule or conduct an unannounced inspection is done at inspector discretion, with the inspector seeking to balance the desire for a candid evaluation of a business, inconvenience to the business owner or manager, and inspector efficiency. The inspection process is summarized in Figure A-1.

At the initial inspection, the inspector gathers information on stormwater source control practices, industrial wastewater discharges, and hazardous waste management practices. A typical inspection includes both an interview with staff and a tour of the facility. Inspection notes and photographs are entered directly into the database either through a field tablet or a cell phone application. At the conclusion of the inspection, the Inspector reviews the required corrective actions, if any, and the compliance process with the owner and/or operator. Post inspection, the inspector selects appropriate violations of the stormwater code for inclusion in a 'Corrective Action' letter. The letter and supplemental drainage map, contractor list, guidance sheets, or best management practice (BMP) information is sent with the corrective action letter. This information is typically sent via email, but paper copies may be sent on request. The business is provided 30 days to comply with the required corrective actions. Business may be provided a compliance extension if requested in writing and accompanied by supporting information.

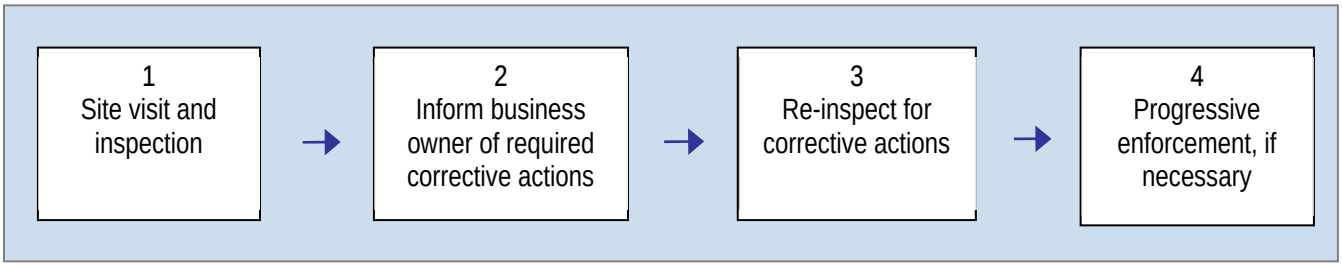

Figure A-1: SPU stormwater inspection process.

After 30 days, the Inspector re-inspects the site to evaluate the compliance status and affirm the corrective actions have been implemented. If the business is compliant, a 'Closure' letter is sent to document the end of the inspection cycle. If the corrective actions have not been implemented, SPU uses a "progressive enforcement process" to achieve compliance.

Under the guidance of progressive enforcement, the business is typically issued a Notice of Violation (NOV) however with a suspended penalty. The potential penalty amount is based on a point system matrix of eight elements including:

- Public health risk
- Environmental damage or adversely affecting infrastructure
- Willful or knowing violation
- Unresponsive in correcting action
- Improper operation or maintenance
- Failure to obtain necessary permits and approval

- Economic benefit to non-compliance
- Repeat violation

NOV's are drafted by the lead inspector but reviewed by the business inspection lead, City attorney's office, and the Source Control program manager.

The business is usually provided 2 weeks to comply upon receipt of the NOV. Unlike regular corrective action letters, NOV's are typically sent through registered mail in addition to email. If the violation involves an illicit discharge or is an otherwise egregious violation, the financial penalty aspect of the NOV may be issued immediately, and the compliance window shortened. The inspection team has flow charts and guidance documents detailing enforcement criteria for source control implementation and illicit discharges/connections. These documents and NOV review process ensure that there is consistency and transparency in the enforcement process. For complex sites, such as those that may require an engineered solution to comply, the responsible party and the City may choose to enter into a Voluntary Compliance Agreement, which identifies milestones for compliance and acts as a contract between the parties. The City also has an administrative appeal process as part of its progressive enforcement process. The progressive enforcement process for inspections is outlined in Figure A-2.

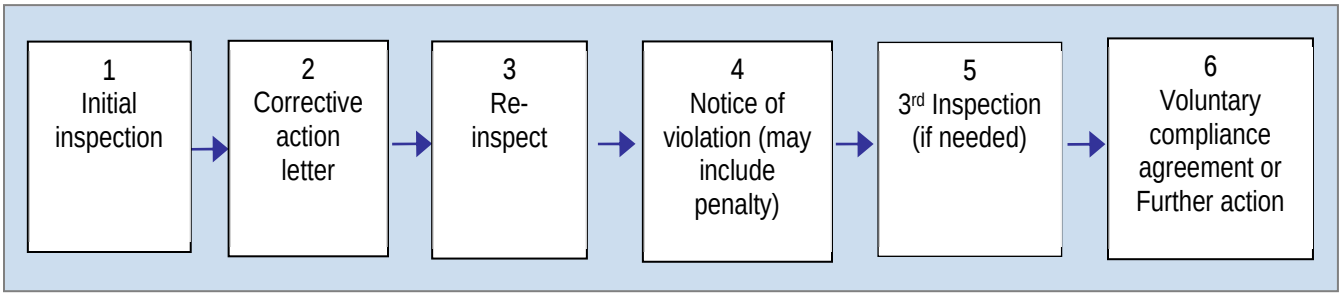

Figure A-2: SPU stormwater enforcement process.

1.5. PROGRAM PROGRESS

The joint SPU-King County business inspection program continued from 2003 to 2006. During that time, 1,100 inspections were completed at approximately 625 businesses, mostly in the Diagonal Ave S CSO/SD basin. In 2006, SPU took over the business inspection program while King County continued to inspect those businesses in the LDW that are permitted under its Industrial Waste Program. King County also provides technical assistance to SPU as needed on issues related to industrial waste and hazardous waste.

In 2010, the City completed the first round of inspections at the approximately 1,166 pollution-generating businesses in the Lower Duwamish drainage basin. Between 2003 and December 31, 2019, approximately 3,421 inspections were conducted in the Duwamish basin (1,620 initial inspections, 1,801 follow-up inspections). Businesses inspected between July 1, 2014 and June 30, 2019 are shown on Maps 31-54 and are listed in Appendix G.

1.5.1. Corrective Actions

When inspectors find problems, they require businesses to implement corrective actions. SPU tracked 26 different corrective actions in the original Business Inspection Database (Table A-1). The expanded and improved 2018 database has the ability to cite 131 unique corrective action conditions (see Appendix L). Eight of the corrective actions are violations of conditions under the jurisdiction of a partner agency and are used to generate and track referrals, 34 are specialized stormwater infrastructure maintenance actions, while 7 are related to maintenance of stormwater treatment infrastructure. The 123 remaining corrective actions pertain to implementation of best management practices outlined in the Stormwater Manual. However, many of these

corrective actions are rather specialized (examples include airplane deicing procedures or log handling and sorting) which are rarely cited. Approximately 30 corrective action conditions are routinely cited by business inspectors in the modern program configuration. Over the life of the program, business inspectors have shifted a focus onto citation of corrective actions directly enforceable under the City of Seattle Stormwater Code and referral of hazardous waste or industrial waste violations to our partner agencies as described previously.

Table A-1: Corrective actions tracked in SPU's original business inspection database.

Hazardous Waste	Spill Control	Industrial Waste
Repair or replace degraded open chemical containers	Clean and eliminate leaks and spills from storage areas	Implement pretreatment for discharge
Properly designate waste	Properly educate employees	Maintain pretreatment system
Properly dispose of waste	Improve or purchase adequate spill response materials	Obtain proper permit for facility discharge
Properly document waste disposal	Develop and implement spill response procedures	
Properly label containers		
Properly store product/waste		
Stormwater		
Don't discharge process wastewater to storm drain	Implement proper fueling operations	Obtain NPDES permit for discharge
Implement proper material transfer practices	Implement proper washing practices	Make storm drain facility parts accessible
Properly perform maintenance of vehicles and equipment	Properly store containerized materials	Storm drain facility needs to be cleaned
Implement proper housekeeping	Properly store non-containerized materials	Missing or damaged components to storm drain facility need replacement
		Correct illicit connection

As of December 31, 2019, inspectors have required 7,175 corrective actions at 1,042 different businesses or business sites from inspections conducted within the LDW.[1] The most common problems encountered during inspections are listed in Table A-2.

[1] Inspection counts exceed number of businesses inspected because businesses may need to be inspected more than once during an inspection cycle to achieve compliance with the City Stormwater Code.

Table A-2: Corrective actions required of businesses in LDW (2003 - 2019).

Corrective Action	Number of Violation	% of Total Violations
Spill plan	1,039	14%
Clean stormwater catch basins and components	823	11%
Spill kit	804	11%
Stormwater and spill Response training	801	11%
Referral to partner agency (e.g., King County, Department of Ecology)	781	11%
Illicit connections, prohibited discharges, and spill cleanup	767	11%
Container storage	495	7%
Perform routine site maintenance	474	7%
Solid waste storage	307	4%
Repair, map or install drainage infrastructure	284	4%
Cleaning and washing	218	3%
Storage of leachable or erodible materials	212	3%
Equipment and vehicle repair	77	1%
Material transfer or loading/ unloading	50	1%
Vehicle and equipment fueling	43	1%

2. Source Tracing

2.1. SAMPLING METHODS

No single sampling methodology exists to effectively trace potential sources of contaminants to LDW sediment. Therefore, a variety of sampling techniques are used. Sediment (or solids) samples, rather than whole water samples, are generally preferred because:

- Storm drain solids samples provide a more direct measure of potential contaminant contributions to waterway sediment, because many contaminants of concern are relatively insoluble and tend to attach to the particles present in stormwater/wastewater. Consequently, they are transported to the waterway primarily as particulates.
- Storm drain solids samples can be collected relatively quickly using simple tools and equipment. By comparison, stormwater sampling requires fairly expensive automatic samplers, which may require structural modifications to install, as well as considerable staff resources to operate and maintain.
- Storm drain solids that accumulate in the stormwater/wastewater systems provide a measure of pollutant contributions over a longer time period (generally what has been deposited since the system was last cleaned), whereas water samples provide only a snapshot of a single event.
- Unlike whole water samples, storm solids samples do not usually present detection limit problems for the analytical laboratory. Contaminants present in storm drain solids can usually be quantified, which makes it easier to evaluate and interpret the sample results.

Samples of solids are collected from various locations within the stormwater/wastewater collection systems. Sampling solids enables the source tracing efforts to maximize coverage of the LDW stormwater/wastewater

systems and to gather information on the extent and location of contaminants within the systems. Because active City CSOs represent only 436 acres of the approximately 20,000 acres of combined sewer service area in the LDW, SPU has focused its efforts on the City-owned MS4.

Each type of sample represents a different geographic scale and a different component of the sediment in the stormwater/wastewater systems. SPU uses the following four types of samples to track and identify potential pollutant sources in the LDW:

1. Inline Sediment Traps. Sediment traps consist of a device mounted inside the conveyance system that passively collects suspended particulate material that passes by the sampling station. SPU has primarily used the modified-Norton style trap which consists of 1 L Teflon® bottle held in sleeve held in a stainless-steel sleeve/bracket that attaches to the pipe or vault structure where they are typically deployed (Figure 3). The bottle is approximately 8 inches tall. As a result, these traps are only used in pipes that are 18-inches or larger in diameter[2]. Using a grant from Ecology, SPU developed a lower profile, bowl-style trap that could be installed in smaller diameter pipe (Figure 4).

   Traps are generally left in place for 12 months to collect enough material for chemical analysis. Sediment traps typically represent the suspended solids that are transported in the system. Sampling stations are selected to isolate specific drainage sub-basins or capture contributions from the entire drainage basin (e.g., generally greater than 50 acres for separated storm basin). Sediment traps are typically installed to identify potential problem areas within a drainage system and are followed up with more intensive sampling to identify potential specific contaminant sources (e.g., inline grabs and private onsite catch basin samples).

2. Inline Sediment Grab Samples. Inline sediment samples are grab samples collected from maintenance holes or other structures located on the SD line where sediment may accumulate. Like sediment traps, inline grab samples also represent contributions on a basin-wide or sub-basin scale. However, inline grabs typically represent the heavier material that accumulates and is transported in the bedload material that moves along the bottom of the pipe. These samples are collected using a long-handled scoop from areas where sufficient sediment is present for chemical analysis (Figure 5). Inline sediment samples are usually collected prior to installing a sediment trap or prior to cleaning the drain to characterize the chemical quality of sediment in the SD or combined sewer system and are useful in tracing sources in systems that are not large enough to install a sediment trap.

3. Catch Basin Solids. Catch basin samples are grab samples of solids that have accumulated in the catch basin. Catch basins are part of the stormwater collection system and collect runoff from a small catchment area (less than 0.5 acres). These structures are equipped with a small sump to capture solids and other large debris before it can enter the stormwater conveyance system (or before it can enter the combined sewer system). Because many pollutants present in urban stormwater runoff tend to adhere to solids, catch basins can also trap pollutants. The solids that accumulate in catch basins provides a measure of the quality of storm drain solids discharged from a specific location. Catch basin samples are collected either from a specific site or property (private onsite) or from the public ROW. .

4. Soil/Street Dust. Soil and street dust samples are collected to confirm offsite transport of contaminants from adjacent properties to the City right-of-way and in areas where there is no formal storm drain system to collect/convey street runoff. Like catch basin samples, soil and street dust samples represent contributions from a small local area. SPU refers to these samples as “outside the drainage system” or ODS because samples are not collected from within the stormwater collection/conveyance system.

[2] To obtain representative samples, the water level in the pipe needs to overtop the sample bottle during most storm events. In smaller diameter pipes, the sediment traps are only effective during larger storms.

Figure 3: Modified-Norton style trap that has been used by SPU.

Figure 4: New bowl-style trap.

Figure 5: Inline grab sampling

2.2. DATA INTERPRETATION

There are no regulatory standards for catch basin solids, inline solids, and sediment trap samples. SPU typically compares results to the state sediment management standards (SMS) and the Washington State Model Toxics Control Act (MTCA) Method A cleanup standards[3]. Although these standards do not apply to storm drain solids, SPU, Ecology, and other members of the LDW Source Control Work Group commonly use the SMS as screening levels to provide a rough indication of storm drain solids quality. The SMS establish two levels:

- Sediment cleanup objective (SCO): Ecology's goal for protection of human health and the environment.
- Cleanup screening level (CSL): Maximum allowed concentration of any contaminant and level of biological effects permissible at a site or site cleanup unit after completion of a cleanup action.

Because storm drain solids samples typically contain fairly high concentrations of total organic carbon (TOC), the dry-weight equivalent SMS values (i.e., LAET and 2LAET) are used for the organic compounds where SCO/CSL values are based on TOC-normalized concentrations.[4]

[3] MTCA Method A cleanup standards are used only to evaluate contaminants for which there are no sediment management standards (e.g. total petroleum hydrocarbons).

[4] TOC concentrations in storm drain sediment samples ranges from 0.3 to 42 percent with average and median concentrations of 6.3 and 5.6, respectively.

SPU uses the CSL/2LAET to trigger source tracing activities. To date, SPU has focused on looking for sources of metals, PAHs, and PCBs, because they exceed the CSL/2LAET screening levels more often than other chemicals.[5] Source tracing screening levels are used to focus City activities on areas where the highest levels of contaminants are present that may be affecting the City's-owned MS4 (i.e., a "worst first" approach). To date, these levels have been effective in informing the City's actions. Screening levels may change over time to reflect overall improvements in source concentrations and/or regulatory requirements.

Comparison of storm drain sediment collected from catch basins, maintenance holes, and sediment traps to SMS criteria is considered conservative. If storm drain solids samples are below the SCO criteria, there is little chance of stormwater causing sediment offshore of the outfalls to become re-contaminated above these levels. However, a concentration above the SCO does not necessarily indicate that the sediment offshore of the outfall will exceed standards, because sediment discharged from storm drain disperses in the receiving environment and mixes with sediment from other sources before depositing.

When specific sources of contaminants are identified, SPU inspectors work with the discharger to control sources by requiring the discharger to comply with the City Stormwater Code to eliminate or modify the practice that generates the problem chemical or by moving a particular activity inside where contaminants can be effectively contained or by isolating outdoor activities to prevent contaminants from coming in contact with stormwater. In most cases, SPU has been able to effect the necessary changes using City code authority. When problems extend beyond what the City has legal authority to require, the situations are referred to partner agencies that have the appropriate authority:

- Sites with industrial waste management issues (e.g., process waste being discharged to the sanitary of combined sewer without a permit) are referred to King County Industrial Waste
- Sites with hazardous waste handling, labelling, or disposal issues are referred to King County Local Hazardous Waste Program (small quantity generators) or Ecology Hazardous Waste and Toxics Reduction (large quantity generators)
- Sites that should have an industrial stormwater general permit and do not, or sites with a permit that are not in compliance with permit requirements are referred to the Ecology Water Quality Program.
- Sites where releases of hazardous materials have occurred that require onsite cleanup are referred to EPA and/or Ecology.

3. Line Cleaning

Cleaning is not conducted until source tracing efforts have been exhausted in a given location or system. Depending on the situation, cleaning may be limited to a specific area where problems were identified, or the entire City-owned MS4 drainage system may be cleaned. In cases where specific sources are identified, line cleaning occurs after SPU inspectors have worked with the responsible party, verified that appropriate controls have been put in place, and the property owner has removed any contaminated sediment from the private onsite drainage system. Where no source(s) can be identified, City lines are scheduled to be cleaned after the SPU source control team has inspected all of the businesses that are considered to be potential sources and when sufficient samples have been collected upstream and downstream of a problem area to identify the pipes where sediments containing elevated levels of contaminants have accumulated. In these cases, it is assumed that there is no longer an ongoing source and cleaning is performed to remove what is considered to be legacy contaminants that may interfere with future source tracing efforts. The SPU source control team meets weekly to discuss overall progress and issues encountered by the inspectors. Information exchanged during these

[5] The one exception is BEHP, which is frequently above the 2LAET in storm drain solids samples. See Section **Error! Reference source not found.**for a discussion of phthalates.

meetings helps to determine when source tracing has been completed. Pipe cleaning activities are prioritized based on the following criteria:

- Severity of contamination as determined by source tracing sampling (e.g., number and magnitude of exceedance of sediment management standard CSL/2LAET screening levels)
- Length of pipe affected (it is easier to schedule and implement cleaning when only a short section of line is involved)
- Depth of solids (heavy solid accumulation can reduce pipe capacity and contribute to flooding problems)
- Need for video inspection to evaluate pipe condition or support other investigations
- Availability of a suitable site to install the necessary decant/dewatering/treatment facility. Sites must have access to a sanitary sewer, access for vactor trucks and equipment, and ideally be near the area being cleaned to minimize travel time.
- Available resources. Existing budget is limited; therefore, SPU has aggressively sought outside funding to expand its line cleaning efforts.

Lines are re-sampled after sufficient material has accumulated in the system to evaluate whether sources are adequately controlled. If chemical concentrations following cleaning exceed the CSL/2LAET triggers, the source tracing/cleaning cycle begins again until confirmation samples show that concentrations remain below the CSL/2LAET.

Line cleaning work in the LDW is typically conducted by a contractor that has experience conducting similar work for the City. Line cleaning operations include installing and operating a temporary decant/treatment facility to dewater the solids removed by cleaning, jetting and cleaning lines/structures, disposing of all solids removed from the system, and video-inspecting the lines after cleaning to confirm that cleaning was successful and to assess the condition of the pipes. Sediment removed during storm drain cleaning operations typically must be dewatered prior to disposal. Excess water is removed, treated, and discharged to the local wastewater collection system under a discharge authorization with King County. Decant/treatment facilities generally include two 20,000-gallon storage tanks to remove solids by settling and a third tank to hold treated water for testing. In some cases, additional filtering using bag or sand filter systems is needed to remove solids. In addition, a granular activate carbon (GAC) filter may also be required to remove PCBs and other organic chemicals that could interfere with treatment plant operations or biosolids disposal. The remaining solids are then shipped offsite for disposal, typically a Subtitle D landfill.