Lower Duwamish Waterway Source Control Action Plan

for the Duwamish/Diagonal Way Early Action Cleanup

December 2004

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Lower Duwamish Waterway Source Control Action Plan

for the Duwamish/Diagonal Way Early Action Cleanup

Produced by
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Toxics Cleanup Program
Northwest Regional Office
Washington State Department of Ecology
Bellevue, Washington

With Assistance from:

City of Seattle
Port of Seattle
King County
U.S. Environmental Protection Agency

December 2004

Waterbody No. WA-09-1010

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Abstract

The Lower Duwamish Waterway is located in Seattle, Washington, and is approximately five miles long. The U.S. Environmental Protection Agency (EPA) added the waterway to the Superfund list on September 13, 2001. Chemicals of concern found in waterway sediments include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), mercury and other metals, and phthalates. These chemicals of concern may pose threats to people, fish, and wildlife.

In December 2000, EPA and the Washington State Department of Ecology (Ecology) entered into an order with King County, the Port of Seattle, the City of Seattle, and The Boeing Company to perform a Remedial Investigation and Feasibility Study (RI/FS) of sediment contamination in the waterway. The EPA is the lead agency for the RI/FS. Ecology is the lead agency for controlling current sources of pollution to the site, in cooperation with the City of Seattle, King County, the Port of Seattle, the City of Tukwila, and the EPA.

Phase 1 of the RI/FS used existing data to identify potential human health and ecological risks, information needs and high priority areas for cleanup (early action areas). The Duwamish/ Diagonal combined sewer overflow and storm drain (CSO/SD) is one of seven early action areas selected by EPA and Ecology. Partial cleanup of the Duwamish/Diagonal Way site began in November 2003 and was completed in March 2004.

This Source Control Action Plan (Action Plan) describes potential sources of contamination that may affect Duwamish/Diagonal Way sediments, the source control programs and authorities of the agencies involved, actions that will be taken to address identified sources, sampling and monitoring that will be used to identify sources and assess progress, and how these efforts will be tracked and reported.

Acknowledgements

The Department of Ecology would like to thank the members of the interagency Lower Duwamish Waterway Source Control Work Group for their contributions and support in developing this Action Plan:

- Beth Schmoyer, PE, Seattle Public Utilities
- Elsie Hulsizer, King County Wastewater Treatment Division, Industrial Waste Program Manager
- Peter Ressler, Port of Seattle, Corporate Environmental Programs
- Doug Hotchkiss, Port of Seattle, Senior Environmental Programs Manager
- Kristine A. Flint, Region 10, U.S. EPA Environmental Cleanup Division
- Richard Thomas, Washington State Department of Ecology, Toxics Cleanup Program

Acronyms/Abbreviations

CSL	–	Cleanup Screening Level (Washington State Sediment Management Standards)
CSO	–	Combined Sewer Overflow
CSO/SD	–	Combined Sewer Overflow/Storm Drain
Ecology	–	Washington State Department of Ecology
EPA	–	United States Environmental Protection Agency
gpd	–	gallons per day
LDW	–	Lower Duwamish Waterway
LUST	–	Leaking underground storage tank
mgd	–	million gallons per day
mgy	–	million gallons per year
mg/L	–	milligrams per Liter (parts per million)
MTCA	–	Washington State Model Toxics Control Act
NPDES	–	National Pollutant Discharge Elimination System
PAHs	–	Polycyclic Aromatic Hydrocarbons
PCBs	–	Polychlorinated biphenyls
PCE	–	Perchloroethylene (dry cleaning solvent)
RCRA	–	Resource Conservation and Recovery Act
RCW	–	Revised Code of Washington
RI/FS	–	Remedial Investigation/Feasibility Study
ROD	–	EPA Record of Decision
SCWG	–	Source Control Work Group
SHA	–	Site Hazard Assessment
SMC	–	Seattle Municipal Code
SMS	–	Washington State Sediment Management Standards
SPU	–	Seattle Public Utilities
SQS	–	Sediment Quality Standard (Washington State Sediment Management Standards)
Superfund	–	Comprehensive Environmental Response, Compensation & Liability Act (CERCLA)
TMDL	–	Total Maximum Daily Load
TCE	–	Tetrachloroethylene (dry cleaning solvent)
µg/L	–	micrograms per Liter (parts per billion)
UST	–	Underground storage tank
VCP	–	Voluntary Cleanup Program
WAC	–	Washington Administrative Code
WARM	–	Washington Ranking Method

Lower Duwamish Waterway Site

The Lower Duwamish Waterway is the downstream portion of the Duwamish River, and extends from the southern tip of Harbor Island to just south of the Turning Basin 3 (Figure 1). The shoreline along most of the Lower Duwamish Waterway has been developed for industrial and commercial operation and serves as a major shipping route for bulk and containerized cargo. Shoreline features within the Lower Duwamish Waterway include constructed bulkheads, piers, wharves, buildings extended over the water, and steeply sloped banks armored with riprap or other fill materials (Weston 1999). This development left intertidal habitats dispersed in relatively small patches, with the exception of Kellogg Island, which is the largest contiguous area of intertidal habitat remaining in the Duwamish River (Tanner 1991). Over the past 20 years, public agencies and volunteer organizations have worked to restore intertidal and sub tidal habitat to the river. Some of the largest restoration projects are at Herring House Park/Terminal 107, Turning Basin 3, Hamm Creek, and Terminal 105.

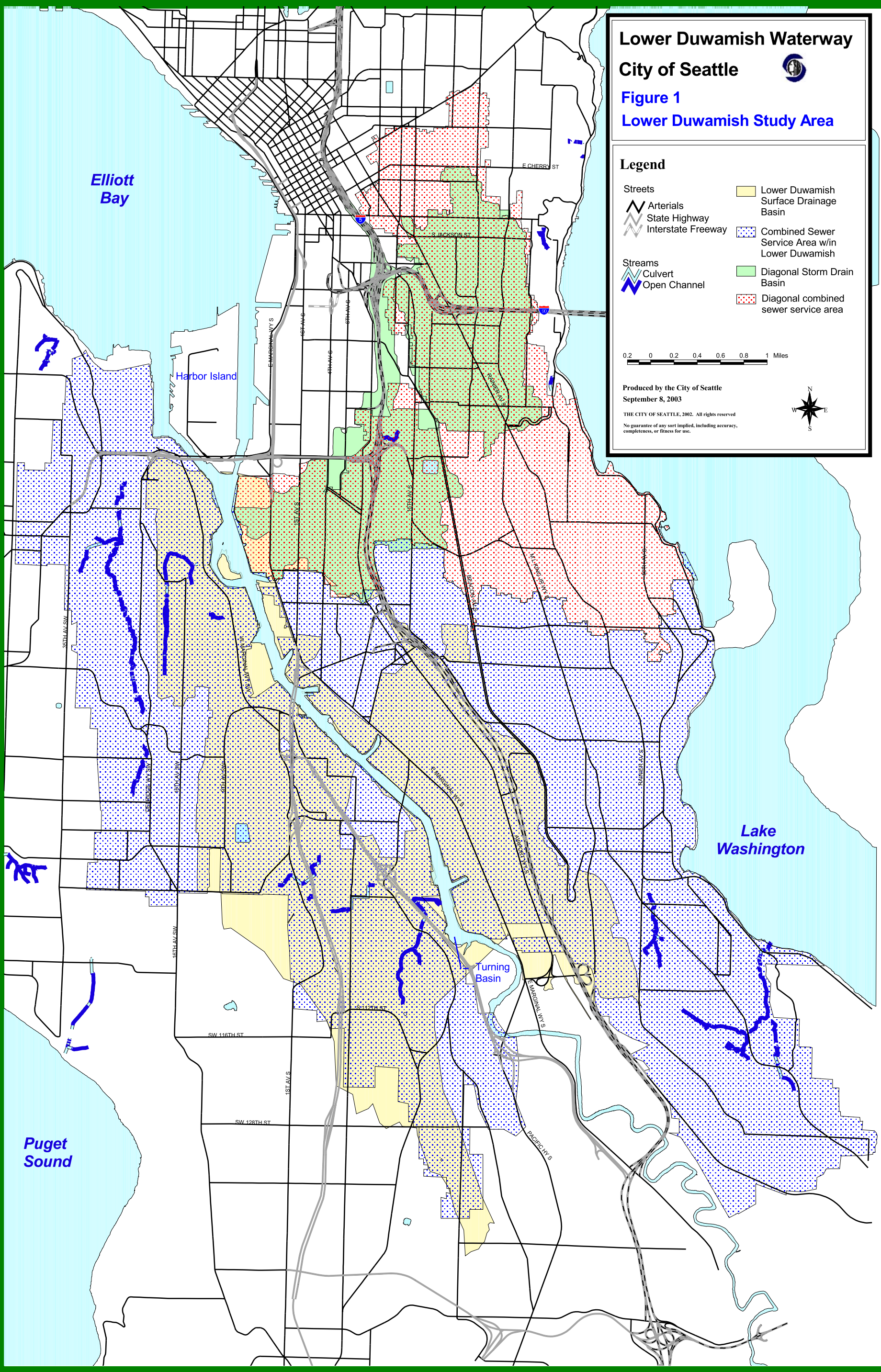
Beginning in 1913, the Duwamish River was straightened into the Duwamish Waterway to facilitate navigation and industrial development. Most of the upland areas adjacent to the Lower Duwamish Waterway have been heavily industrialized for many years. Historical and current commercial and industrial operations include cargo handling and storage, marine construction, boat manufacturing, marina operations, concrete manufacturing, paper and metals fabrication, food processing, and airplane parts manufacturing (Windward 2003).

The presence of chemical contamination in the Lower Duwamish Waterway has been recognized since the 1970's (Windward 2003). In 1988, the U.S. Environmental Protection Agency (EPA) investigated sediments in the Lower Duwamish Waterway as part of the Elliott Bay Action Program and identified a number of stations that exhibited high levels of contamination (stations north and south of Kellogg Island, Slip 3, Slip 2, and north of T115). Problem chemicals included metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalates, and other organic compounds. In 1999, EPA completed a study of approximately six miles of the Lower Duwamish Waterway, from the southern tip of Harbor Island to just south of the turning basin near the Norfolk combined sewer overflow (Weston 1999). Chemicals of concern found in the waterway include PCBs, PAHs, phthalates, mercury, and other metals. These chemicals may pose threats to people, fish, and wildlife

In December 2000, EPA and Ecology signed an agreement with King County, the Port of Seattle, the City of Seattle, and the Boeing Company, collectively identified for this project as the Lower Duwamish Waterway Group, or LDWG. Under the agreement, the LDWG is conducting a Remedial Investigation/Feasibility Study (RI/FS) to assess potential risks to human health and the environment and to evaluate cleanup alternatives. The RI for the Lower Duwamish Waterway site is being done in two phases. Results of Phase I were published in July 2003. The Phase I RI used existing data to provide an understanding of the nature and extent of chemical distributions in Lower Duwamish Waterway sediments, develop preliminary risk estimates, and identify candidates for early cleanup action within the Lower Duwamish Waterway. The Phase 2 RI will conduct investigations designed to fill critical data gaps identified in Phase 1. Based on the outcome of the Phase 2 RI, additional candidates for either early or long-term cleanup action may be identified. A feasibility study will then be completed that will address cleanup options in the Lower Duwamish Waterway.

Lower Duwamish Waterway
City of Seattle

Figure 1
Lower Duwamish Study Area



Legend

Streets
- Arterials
- State Highway
- Interstate Freeway

Streams
- Culvert
- Open Channel

- Lower Duwamish Surface Drainage Basin
- Combined Sewer Service Area w/in Lower Duwamish
- Diagonal Storm Drain Basin
- Diagonal combined sewer service area

0.2 0 0.2 0.4 0.6 0.8 1 Miles

Produced by the City of Seattle
September 8, 2003

N W E S

On September 13, 2001, EPA added the Lower Duwamish Waterway to the National Priorities List. This is EPA's list of hazardous waste sites that warrant further investigation and cleanup under Superfund. The Washington State Department of Ecology (Ecology) added the site to the Washington State Hazardous Sites List on February 26, 2002.

In April 2002, EPA and Ecology signed an interagency Memorandum of Understanding, dividing responsibilities for the site (Ecology/EPA 2002). EPA is the lead for the RI, while Ecology is the lead for source control issues. Based on discussions between the agencies, EPA will also be the lead for managing two of the early action cleanups, Terminal 117/Malarkey, and Slip 4. Two cleanups that are currently in the planning or implementation phase were begun before the Phase I work was initiated. These are Boeing Plant 2 (under EPA management) and Duwamish/Diagonal Way as part of the Elliott Bay-Duwamish Restoration Program [EBDRP].

In June 2003, the *Technical Memorandum: Data Analysis and Candidate Site Identification, Final* (Windward, 2003b) was issued. Seven candidate sites for early action were recommended (Figure 2). The sites are:

- Area 1: Duwamish/Diagonal combined sewer overflow and storm drain (CSO/SD)
- Area 2: RM 2.2, on the west side of the waterway, just south of the 1st Avenue S. Bridge.
- Area 3: Slip 4 (RM 2.8).
- Area 4: South of Slip 4, on the east side of the waterway, just offshore of the Boeing Plant 2 and Jorgensen Forge properties (RM 2.9 to 3.7).
- Area 5: Terminal 117/Malarkey, located at approximately RM 3.6, on the west side of the waterway.
- Area 6: RM 3.8, on the east side of the waterway.
- Area 7: Norfolk CSO (RM 4.9 – 5.5), on the east side of the waterway.

To date, EPA and Ecology have selected four of the candidate sites for early cleanup action, including the Duwamish/Diagonal area that is the subject of this Action Plan. The remaining sites may be selected by the agencies for early action areas or they may be deferred to the Phase 2 study for further consideration. Early action cleanups will involve members of the LDWG and other parties as appropriate. Planning and implementation of priority early action cleanups will be done concurrently with Phase 2 investigation work.

Further information about the Lower Duwamish Waterway can be found at:
http://yosemite.epa.gov/r10/cleanup.nsf/sites/lduwamish

Lower Duwamish Waterway Source Control Strategy

The Lower Duwamish Waterway Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective controls for the Lower Duwamish Waterway. The basic plan is to identify and manage sources of potential recontamination in coordination with sediment cleanups. The goal of the strategy is to minimize the potential for recontamination to levels exceeding the Lower Duwamish Waterway sediment cleanup goals and the Sediment Management Standards (WAC 173-204). This will be achieved by using existing administrative and legal authorities to perform inspections and require necessary source control actions.

Implementing the strategy will be done by developing a series of detailed, area-specific Action Plans that will be coordinated with sediment cleanups, beginning with the Early Action sites. These Action Plans will document what is known about the area, potential sources of recontamination and actions to address them as well as document when adequate source control is achieved for an area. Because the scope of source control for each site will vary, it will be necessary to adapt each plan to specific situations. The success of this strategy depends on the coordination and cooperation of all public agencies with responsibility for source control in the Lower Duwamish Waterway area, as well as prompt compliance by the businesses that must make necessary changes.

The focus of the strategy is on controlling contamination that affects Lower Duwamish Waterway sediments. It is based on the principles of source control for sediment sites described in EPA's *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites; EPA, February 12, 2002*, and Ecology's Sediment Management Standards (WAC 173-204). The first principle is to control sources early, starting with identifying all ongoing sources to the site. EPA's Record of Decision (ROD) for the site will require that sources of sediment contamination to the entire site be evaluated, investigated, and controlled as necessary. Dividing source control work into specific Action Plans and prioritizing those plans to coordinate with sediment cleanups will address the guidance and regulations and will be consistent with the EPA ROD.

Source control work is divided into four prioritized tiers. Tier One consists of source control work associated with the early action areas identified to date. Tier Two consists of source control work associated with any final, long-term sediment cleanup actions identified through the Phase 2 Lower Duwamish Waterway Remedial Investigation work, and the EPA ROD. Tier Three consists of source identification and potential source control work in areas that have not been identified for early or long-term cleanup actions through the Lower Duwamish Waterway RI/FS process but where source control may be needed to prevent future contamination. Tier Four consists of control work identified by post-cleanup sediment monitoring (Ecology 2004). This document is a Tier One source control action plan for an early action cleanup.

Within any drainage area, some businesses move to other locations while new businesses move into the area, altering the nature of industrial and commercial operations, and consequently, the types of chemicals which could pose a threat of recontamination. Due to the difficulty in identifying and completely controlling all possible sources, including illegal dumping, it is important to recognize that recontamination may occur even with an aggressive source control program.

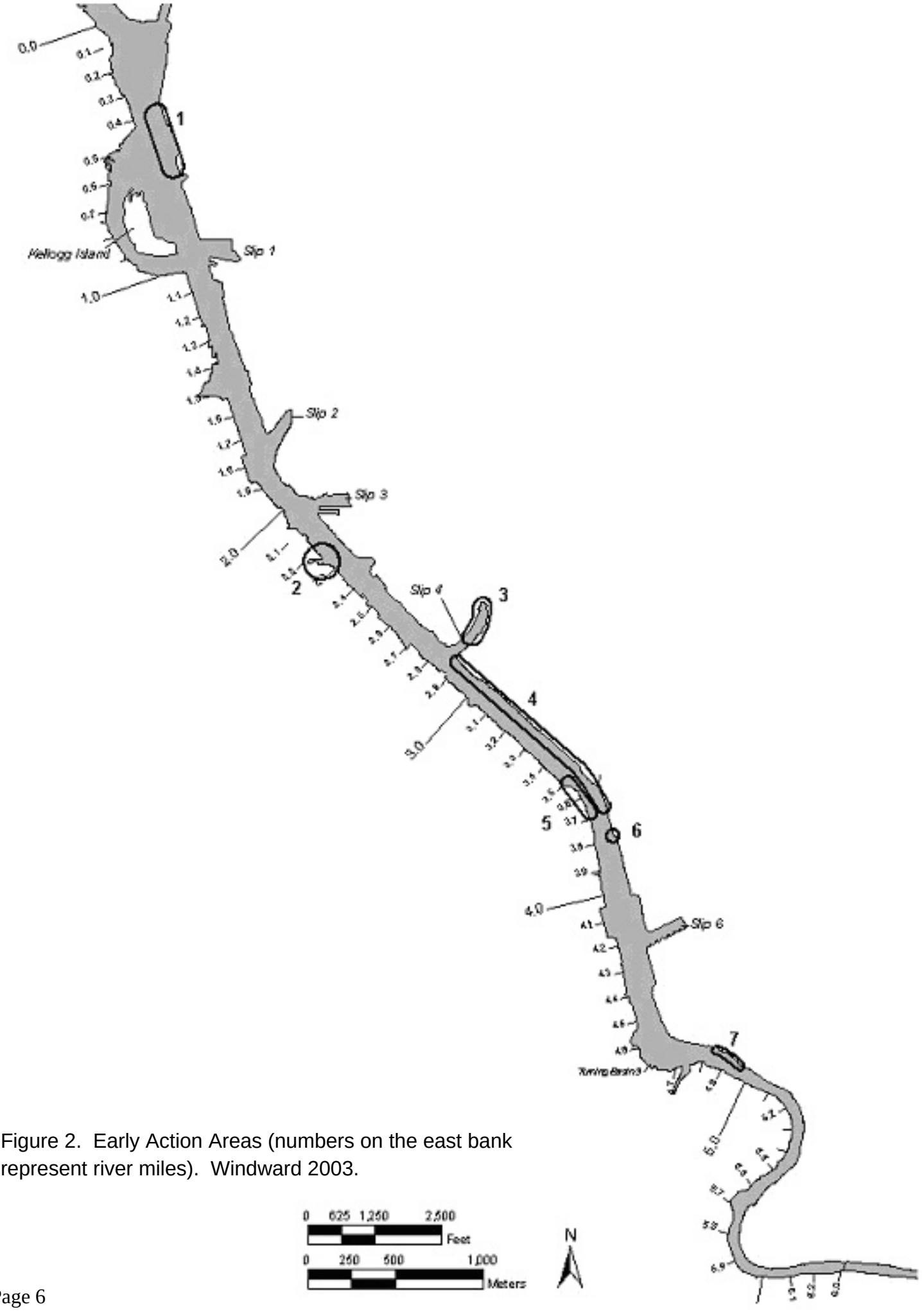


Figure 2. Early Action Areas (numbers on the east bank represent river miles). Windward 2003.

Source Control Work Group

The primary public agencies responsible for source control for the Lower Duwamish Waterway are Ecology, the City of Seattle, King County, Port of Seattle, City of Tukwila, and the EPA.

In order to coordinate among these agencies, Ecology formed the Source Control Work Group (SCWG) in January 2002. The purpose of the SCWG is to share information, discuss strategy, actively participate in developing Action Plans, jointly implement source control measures, and share progress reports on source control activities for the Lower Duwamish Waterway area. SCWG meetings are chaired by Ecology and are held monthly. All final decisions on source control actions and completeness will be made by Ecology, in consultation with EPA, as outlined in the April 2002 Ecology/EPA Lower Duwamish Waterway Memorandum of Understanding (Ecology/EPA 2002).

Because the City of Tukwila has no jurisdiction over the areas that drain to the Duwamish/ Diagonal early action area, they are not included in this Action Plan. Other public agencies with relevant source control responsibilities include the Washington State Department of Transportation, Puget Sound Clean Air Agency, and the Seattle/King County Department of Public Health. These agencies will be invited to participate as appropriate (Ecology 2004).

Duwamish/Diagonal Sediment Site

The Duwamish/Diagonal area, river mile 0.4 to 0.6 on the east side of the Lower Duwamish Waterway (Figure 3) was identified as a cleanup priority by the Elliott Bay/Duwamish Restoration Program (EBDRP) in the mid-1990s. This was based on concerns about contaminated sediments adjacent to storm drains and combined sewer overflows owned and operated by Seattle Public Utilities (SPU), King County, and the Port of Seattle. The Port also owns upland property adjacent to the cleanup site (see Upland Contaminated Sites, Port of Seattle Terminal 106, and Port of Seattle Terminal 108).

The Duwamish/Diagonal sediment cleanup project began in 1994, under provisions of Chapter 173-204 WAC, the State Sediment Management Standards (SMS). Based on the results of studies conducted in 1994 and 1996, PCBs, mercury, bis(2-ethylhexyl) phthalate (BEHP), and butyl benzyl phthalate were identified as the major chemicals of concern in the sediments. A draft site assessment and a cleanup study report were prepared by EBDRP (King County 2000, 2001).

The draft Duwamish/Diagonal Cleanup Study Report (King County 2001) proposed a cleanup of 4.8 acres. During public review in February 2002, some comments recommended the site be expanded to remove an area upstream, called a “hot spot” which contained high concentrations of contaminants. The concern was that the 5-acre cleanup area would be recontaminated with PCBs when the “hot spot” was dredged in the future. The project was expanded to remove the upstream “hot spot” resulting in a cleanup of approximately 7 acres (Ecology 2002c). Partial cleanup at the Duwamish/Diagonal Way site began in November 2003 and was completed in March 2004. Cleanup consisted of dredging contaminated sediments from the site followed by the placement of an engineered sediment cap in order to isolate remaining sediment contamination.

Lower Duwamish Waterway
City of Seattle

Figure 3

Diagonal/Duwamish Sediment Site and Outfalls

Legend

Mainlines
- Drainage Mainline
- Sanitary Mainline
- Metro Mainline

Parcel Boundaries
Building Outlines
Cleanup Area

Outfalls
- CSO: King County
- CSO/SD: KC/Seattle
- SD
- SD-Port

100 0 100 200 Feet

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September 8, 2003

N W E S

S Nevada SD (not found)

Cleanup Area

Siphon-west (not found)

Diagonal Ave S CSO/SD

Duwamish PS

Diagonal WWTP outfall (abandon

Diagonal Ave S SD

12" SD

Potential Recontamination Sources of Duwamish/Diagonal Sediments

Chemicals of Concern

Studies conducted in 1994 and 1996 identified PCBs, mercury, bis(2-ethylhexyl)phthalate (BEHP), and butyl benzyl phthalate as the major chemicals of concern in the sediments. Modeling of sediment deposition off Duwamish/Diagonal CSO/SD in 1999 predicted that BEHP, lead, and chrysene may accumulate in sediments at concentrations above state standards (King County 2001). Additional modeling conducted on sediment deposition off CSOs (King County 2001) predicted BEHP and butyl benzyl phthalate may continue to accumulate at concentrations above state standards. Source control efforts will include these as well as any other chemicals which could recontaminate sediments.

Piped Outfalls

The Lower Duwamish Waterway area is served by a combination of storm drain, sanitary sewer, and combined sewer systems. Storm drains convey stormwater runoff collected from streets, parking lots, roof drains, and residential, commercial, and industrial properties to the waterway. In the Lower Duwamish Waterway, there are both public and private storm drain systems. Most of the waterfront properties immediately adjacent to the Lower Duwamish Waterway are served by privately owned systems, which discharge directly to the waterway. The other upland areas are served by a combination of private and publicly owned systems. Most of the private storm drain systems in the upland areas connect to a public storm drain before discharging to the Lower Duwamish Waterway.

Storm drains entering the Lower Duwamish Waterway carry runoff generated during or shortly after precipitation events. A wide range of chemicals may become dissolved or suspended in runoff as rainwater contacts and flows over the land surface. Impervious surfaces may accumulate particulates, dust, oil, asphalt, rust, rubber, metals, pesticides, detergents, or other materials because of urban activities, which are flushed into storm drains during wet weather. In addition, storm drains can also convey materials from businesses with permitted discharges, car washing, over-watering lawns, groundwater infiltration, as well as materials that are illegally dumped into the system. Storm drains occasionally carry water released to allow maintenance and repair of city reservoirs.

Prior to formation of the Municipality of Metropolitan Seattle (METRO-now part of King County) in 1958, Seattle and other surrounding communities operated small treatment plants that discharged to Lake Washington, the Duwamish River, and Puget Sound. The Diagonal treatment plant was operated by Seattle until about 1969. The plant discharged treated wastewater to the Lower Duwamish Waterway in the vicinity of the Diagonal/Duwamish cleanup site (see Figure 3 for discharge location).

The current sanitary sewer system collects municipal and industrial wastewater from throughout the Lower Duwamish Waterway area and conveys it to the West Point wastewater treatment plant where it is treated before being discharged to Puget Sound. The smaller trunk sewer lines,

which collect wastewater from individual properties, are owned and operated by the individual municipalities (e.g., City of Seattle and Tukwila) and local sewer districts. The large interceptor system that collects wastewater from the trunk lines is owned and operated by King County. The Elliott Bay Interceptor (EBI) was constructed along the east side of the Duwamish River and Elliott Bay in 1964 to convey wastewater to the West Point plant.

Some areas of the Lower Duwamish Waterway are also served by combined sewer systems which carry both stormwater and municipal/industrial wastewater in a single pipe. These systems were generally constructed before about 1970 because it was less expensive to install a single system rather than separated storm and sanitary systems.

During large storm events, the volume of stormwater can sometimes exceed the capacity of the combined sewer system. The collection system designed for the West Point treatment plant contains relief points called combined sewer overflows (CSOs) to control the amount of combined sewage and storm water that could enter the system and especially the EBI. The CSOs prevent the combined system from backing up and creating flooding problems. During large storm events, these CSOs release a mixture of stormwater and sanitary sewage to the waterway. Depending on the location of the overflow point, CSOs may be piped directly to the waterway or may be discharged to a nearby storm drain system that then discharges to the waterway.

The outfalls that currently discharge to the Lower Duwamish Waterway in the vicinity of the Diagonal/Duwamish cleanup area include the Diagonal Ave S combined sewer overflow and storm drain system (CSO/SD), the Diagonal Ave S storm drain, the S Nevada St storm drain, and the Duwamish pump station emergency overflow. The following sections provide a detailed description of these discharges.

Potential sources that may contribute pollutants to these outfalls include:

- Chemicals carried by storm water runoff (e.g., street dust, atmospheric deposition, automobile emissions, fertilizers, household pesticides, etc.).
- Industrial and municipal wastewater discharged during CSO events.
- Contaminated groundwater that may have infiltrated into the system through breaks in conveyance lines.
- Materials improperly disposed of in the storm drain and/or combined/sanitary systems.

Diagonal Avenue South Combined Sewer Overflow/Storm Drain

The Diagonal Ave S CSO/SD discharges to the Lower Duwamish Waterway at approximately river mile 0.45 (Figure 3). It is the largest storm drain system in Seattle, draining an area of approximately 2,600 acres. The drainage basin is comprised of a 3.6-mile stretch of I-5, portions of the Central District, the Duwamish industrial area, Rainier Valley, and Beacon Hill (see Figure 4). Land use in the basin is shown in Figure 5. Average annual stormwater discharge from the Diagonal drainage basin is estimated at 1,100 million gallons per year (mgy) (King County 2002).

In addition to collecting stormwater runoff, the Diagonal system also receives discharges from nine combined sewer overflows, one operated by King County (Hanford #1), and eight operated by the City of Seattle (Diagonal 111A through 111 H). Estimates of the overflow frequency and volumes are provided below:

Table 1. Diagonal Avenue S CSO/SD Overflow Frequency and Volume

CSO Name/ID	Owner	Service Area (Ac)	Average Annual Volume (mgy)	Average Annual Frequency
Hanford 1 (031)	King County	4,900	65[a]	11
Diagonal (111A-H)	City of Seattle	624	2.2[b]	32

[a] Model estimate (Huber 2002).

[b] Total discharge from the eight individual overflow locations. Measurements from 1998 through 2002 ranged from 0.58 to 5.21 mgy and the frequency ranged from 21 to 40 overflow events per year.

Lower Duwamish Waterway
City of Seattle

Figure 4

Diagonal Ave. S. CSO/SD Drainage Basin Boundary

Legend

Streets
- Arterials
- Streets
- State Highway
- Interstate Freeway

- City CSO overflow location
- County CSO overflow location

Mainlines
- SPU-Owned Drainage Mainline
- Privately-Owned Drainage Mainline
- Metro Mainline

- Diagonal Storm Drain Basin
- Diagonal Combined Sewer Service Area

1000 0 1000 2000 Feet

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September 8, 2003

N W E S

Elliott Bay

East Waterway

Lake Washington

Lower Duwamish Waterway
City of Seattle

Figure 5

Land Use in Areas Discharging To Duwamish / Diagonal Cleanup Site

Legend

Streets
- Arterials
- Streets
- State Highway
- Interstate Freeway

Land Use Types
- Commercial
- Industrial
- Multi-Family
- Open Space
- Schools
- Single Family
- Vacant

- Diagonal Storm Drainage Basin Boundary
- Diagonal Combined Sewer Service Area

1000 0 1000 2000 Feet

Produced by the City of Seattle
September 8, 2003

N W E S

East Waterway

Lake Washington

Chemical Characteristics - Stormwater

King County collected stormwater samples at two locations from the Diagonal Ave S CSO/SD in 1995 (Stern 2002). Three stormwater samples were collected at the 8th Ave S and S Hinds St lateral and seven stormwater samples were collected at the 13th Ave S and S Horton St lateral (see Figure 6). Neither of these stations is affected by combined sewer overflows. PCBs (0.3 to 0.5 µg/L detection limit) and pesticides (0.03 to 0.3 µg/L detection limit) were not detected in any of the samples. PAHs were detected in only two samples. Metals and phthalates were the most commonly detected pollutants found in the stormwater samples. Detection frequencies and concentrations ranges for the most frequently detected pollutants are listed below:

Table 2. Detection frequencies and concentration ranges for the most frequently detected pollutants in Diagonal Avenue S CSO/SD stormwater, 1995

Parameter	Detection Frequency	Concentration (µg/L)
Arsenic (total)	10/10	2 –4
Cadmium (total)	10/10	0.4 – 1.3
Chromium (total)	10/10	2 – 22
Copper (total)	10/10	2 – 119
Lead (total)	10/10	9 – 68
Mercury (total)	1/10	0.3
Zinc (total)	10/10	50 – 225
Bis(2-ethylhexyl) phthalate	9/10	0.9 – 14.7
Butyl benzyl phthalate	5/10	0.79 – 1
Dimethyl phthalate	1/10	0.825
Di-n-butyl phthalate	1/10	9.13
Fluoranthene	1/10	0.84
PCBs	0/10	<0.26 – <0.5
Pyrene	1/10	0.998

The metals data are for the total concentration (dissolved plus particulate fraction) present in the samples. The state water quality standards for metals are based on the dissolved form only, so it is not possible to compare the data in Table 2 directly to the state standards. Of the organic compounds found in the stormwater discharges, water quality standards currently exist for only PCBs. The acute and chronic toxicity criteria for PCBs for marine waters are 10 and 0.03 µg/L, respectively. Concentrations measured in the Diagonal Ave S CSO/SD samples were well below the acute toxicity criterion. Because the analytical detection limits were greater than the toxicity criterion, it cannot be determined if the concentrations exceed the chronic criteria.

Another point of comparison is the existing federal human health standards. These criteria are maximum concentrations that are intended to protect people based on consumption of water and organisms or organisms only. These criteria apply to receiving water rather than the concentrations measured in the storm drain. The criteria for chemicals found in the Diagonal Ave S CSO/SD stormwater samples are listed below:

Table 3. Stormwater Sample Comparison Criteria [a]

Parameter	Water +Organism (µg/L)	Organism only (µg/L)
Arsenic (total)	0.018	0.14
Cadmium (total)	c.	c.
Chromium (total)	c.	c.
Copper (total)	2.4	2.4
Lead (total)	c.	c.
Mercury (total)	0.14	0.15
Zinc (total)	7,400[b]	26,000[b]
Bis(2-ethylhexyl) phthalate	1.8	5.9
Butyl benzyl phthalate	1,500[b]	1,900[b]
Dimethyl phthalate	313,000	2,900,000
Di-n-butyl phthalate	2,700	12,000
Fluoranthene	300	370
Total PCBs	0.00017	0.00017
Pyrene	960	11,000

a. 40 CFR 131.36 Toxics criteria for those states not complying with Clean Water Act section 303(c)(2)(B).
b. National Recommended Water Quality Criteria: 2002. U.S. EPA, EPA-822-R-02-047, November 2002
c. No published criteria

No samples have been collected from the Diagonal system during a combined sewer overflow event. Sample collection in the Diagonal system is difficult because the entire lower end of the system, which is where most of the industrial and commercial sources would be located, is tidally influenced.

The City of Seattle conducted a study in 2000 comparing the chemical data of Seattle's CSO discharges with data from CSO events in other municipalities in the Northwest (primarily King County and Bremerton) to determine whether there is any evidence that chemicals in sediment adjacent to outfalls can be attributed to CSOs (EVS 2000). The EVS study reported exceedances of CSLs in the sediment offshore of the Diagonal (111) outfall for BEHP, mercury, benzoic acid, butyl benzyl phthalate, silver, and 1,2-dichlorobenzene, based on eight samples located within 250 ft of the outfall. No spatial trends were seen in concentration gradients except for BEHP (EVS 2000).

Lower Duwamish Waterway
City of Seattle

Figure 6

Diagonal Ave. S. CSO/Storm Drain Monitoring Locations

Legend

Streets
- Arterials
- Streets
- State Highway
- Interstate Freeway

Mainlines
- SPU-Owned Drainage Mainline
- Privately-Owned Drainage Mainline
- Metro Mainline

Active Sample Station Locations
- King County Key Manhole Sampling Location
- Sediment Trap Locations

Historic Sample Station Locations
- Sediment
- Storm

- Diagonal West Basin
- Diagonal East Basin

1000 0 1000 2000 Feet

Produced by the City of Seattle
September 8, 2003

N W E S

East Waterway

E UNION ST
E MADISON ST
E CHERRY ST
E JEFFERSON ST
E YESLER WY
S JACKSON ST
S DEARBORN ST
S JUDKINS ST
S MASSACHUSETTS ST
S HOLGATE ST
S LANDER ST
S FOREST ST
S HANFORD ST
S SPOKANE ST
S SPOKANE CR ST
S INDUSTRIAL WY
S MC CLELLAN ST
S WALKER ST
S COLLEGE ST
S MOUNT BAKER BV
S COLUMBIAN WY
S ALASKA ST
S HUDSON ST
JAMES ST
JEFFERSON ST
BROADWAY
BOREN AV
BOREN AV S
MAYNARD AV S
GOLF DR S
RAINIER AV S
ALASKAN WY VI NB
E MARGINAL WY S
AIRPORT WY S
BEACON AV S
M L KING JR WY
M L KING JR WY S
LAKE DELL AV
LAKESIDE AV S
LAKE PARK DR S
S FRINK PL
19TH AV
14TH AV
12TH AV
23RD AV
34TH AV
32ND AV S
35TH AV S
37ST AV S
1ST AV S
4TH AV S
5TH AV S
6TH AV S
7TH AV S
8TH AV
12TH AV S
14TH AV S
17TH AV S
20TH AV S
23RD AV S
15TH AV S
5
90

Chemical Characteristics – Storm Drain Sediments

Two storm drain sediment samples were collected from the Diagonal Ave S CSO/SD in 1985 for the Elliott Bay Action Program (Tetra Tech 1988). Table 4 shows the results and compares them to the Washington State Sediment Management Standards (SMS) to provide a rough indication of overall quality. The SMS establishes the sediment quality standards (SQS), which identify surface sediments that have no adverse effects on biological resources and no significant health risk to humans, and the cleanup screening level (CSL), which is the "minor adverse effects" level used as an upper regulatory threshold for making decisions about source control and cleanup. It should be emphasized that the SMS do not apply to storm drain sediments. It is important to note that any comparison of this kind is most likely conservative given that sediments discharged from storm drains are highly dispersed in the receiving environment and mixed with the natural sedimentation taking place in the system. Chemicals detected in the samples that exceeded either the SQS or CSL are listed below:

Table 4. Diagonal Ave. S. Storm Drain Sediment Sample Results, 1985

Chemical	Measured Concentration		SQS	CSL
	Sample MH1	Sample MHU		
Zinc (mg/kg)	293E	419E	410	960
Organic compounds (mg/kg TOC)				
Acenaphthene	83E	63U	16	57
Fluorene	65E	54U	23	79
Phenanthrene	270E	49E	100	480
Total LPAH	574	379	370	780
Fluoranthene	230E	74E	160	1,200
Benzo(a)anthracene	210E	12E	110	270
Chrysene	240E	29E	110	460
Total benzofluoranthenes	350E	66E	230	450
Benzo(a)pyrene	140E	3.4E	99	210
Indeno(1,2,3-c,d)pyrene	170E	220U	34	88
Dibenzo(a,h)anthracene	47E	340U	12	33
Benzo(g,h,i)perylene	130E	200U	31	78
Total HPAH	1,697	1,001	960	5,300
1,2-Dichlorobenzene	39XE	270U	2.3	2.3
1,4-Dichlorobenzene	5,200XE	7,100X	3.1	9
Dimethyl phthalate	56E	40U	53	53
Dibenzofuran	45E	69E	15	58
Phenol	1,500E	75B	420	1,200
4-Methylphenol	5,900E	870E	670	670

B = Compound detected in method blank – possible laboratory contamination
E = Estimated value
X = Standard recovery <10 %
U = Compound not detected at value shown

In January and February 2003, sediment samples were collected from 11 locations in the Diagonal Ave S CSO/SD and 4 laterals that connect to the mainline (S Dakota St, S Snoqualmie St, S Denver St, and 1st Ave S). These sediment sample locations are shown on Figure 6. Chemicals exceeding SMS include metals (cadmium and zinc), polynuclear aromatic hydrocarbons (PAH), butyl benzyl phthalate, BEHP, and PCBs (see Table 5). Mainline sampling stations exceeded SMS for PAH and BEHP. Samples collected from all four laterals exceeded SMS for BEHP. Sediment collected from three of the laterals (S Snoqualmie St, S Denver St, and 1st Ave S) also exceeded SMS for zinc and butyl benzyl phthalate. In addition,

all laterals exceeded the MTCA Method A cleanup level for heavy oil (2,000 mg/kg as NWTPH) and the S Snoqualmie lateral also exceeded the MTCA diesel standard. One of the samples collected from the S Dakota St lateral exceeded the SMS for PCBs. The PCB contaminated sediments in the S Dakota St lateral were removed during the cleaning of the Diagonal Ave S CSO/SD lines.

PCBs are frequently detected at low levels in sediment collected from street rights-of-way (ROW). Over the last 2 years, SPU has collected sediment samples from catch basins at 39 ROW locations in the Diagonal Ave S CSO/SD service area. PCBs were detected in about 70 percent of the samples. Concentrations in samples where PCBs were detected generally ranged between 0.1 and 0.3 mg/kg total PCBs. The state cleanup level for unrestricted land use is 1 mg/kg PCBs. Elevated concentrations of PCBs were found at one location along Airport Way S (17.5 mg/kg). SPU is currently investigating the source of the PCBs in this area.

While investigating possible sources at the Terminal 117 Early Action site, SPU discovered elevated PCBs in street dirt and catch basin sediment in the South Park neighborhood in the vicinity of Dallas Ave S, S Donovan St, and 17th Ave S. PCB concentrations ranged from 0.1 to 9.2 mg/kg. Concentrations as high as 93 mg/kg were found in soil samples collected from beneath the street surface. PCB concentrations in sediment collected from streets adjacent to this area ranged from 0.1 to 0.6 mg/kg. SPU is currently conducting an interim cleanup to pave/cap the affected areas.

Modeling of sediment deposition off Duwamish/Diagonal CSO/SD in 1999 (using the 1995 sample data) predicted that BEHP, lead, and chrysene may accumulate in sediments at concentrations above state standards (King County 2001). Samples collected in the vicinity of various CSOs have shown BEHP concentrations consistently above state standards, but lead and chrysene concentrations have been below the state standards. Additional modeling conducted on sediment deposition off CSOs (King County 2001) predicted BEHP and butyl benzyl phthalate may continue to accumulate at concentrations above state standards and that some metals may exceed state standards in the future.

Prior to dredging the sediments near the Norfolk CSO outfall, water samples were collected to assess storm water quality entering the storm drains below the Norfolk CSO/SD regulator. The results indicated bis(2-ethylhexyl)phthalate (BEHP) was present in the storm water. Using these results and a simple and conservative model of recontamination, it was concluded that there was a possibility that the Duwamish River sediments near the Norfolk CSO could be recontaminated above State of Washington Sediment Management Standards (SMS) by BEHP within one year of the remediation project's completion. While BEHP has been detected during the first four years of post-cleanup monitoring, the concentrations remain below the SQS.

Table 5. February 2003 Diagonal Ave. S. CSO/SD Sediment Sample Results

Parameter	Mainline Diagonal[a]	Laterals S Dakota[b]	Laterals S Snoqualmie[c]	Laterals S Denver[d]	Laterals 1st Ave S[e]	State Standards SQS[f]	State Standards CSL[g]	State Standards MTCA[h]
Metals (mg/kg)								
Cadmium	0.56U - 0.92	0.6U - 1.1	2.8	1.3	1.3	5.1	6.7	2
Zinc	130 - 280	85 - 230	**460**	**580**	**410**	410	960	NA
Total petroleum hydrocarbons								
Diesel (mg/kg)	28U - 82	30U - 680	**6,300**	180U	170U	NA	NA	2,000
Heavy oil (mg/kg)	360 - 560	150 - **2,700**	**9,100**	**13,000**	**2,300**	NA	NA	2,000
Organic compounds (mg/kg TOC)								
Phenanthrene	12U - **174**	10 - 18	12	14	25	100	480	NA
Fluoranthene	20U - **216**	14 - 49	19	28	61	160	1,200	NA
Benzo(a)anthracene	12U - **133**	6 - 11	7M	9	20	110	270	NA
Chrysene	15 - **190**	10 - 22	12	14	30	110	460	NA
Benzo(b)fluoranthene	15 - **260**	8 - 24	14	14M	29M	230		NA
Benzo(a)pyrene	12U - **294**	7 - 16	9	10	24	99	210	NA
Indeno(1,2,3-c,d)pyrene	12U - **173**	4 - 6	5	4U	8	34	88	NA
Dibenzo(a,h)anthracene	12U - **36**	4U	4U	4U	5U	12	33	NA
Benzo(g,h,i)perylene	12U - **156**	4 - 7	6	4U	8M	31	78	NA
Total benzofluoranthenes	31 - **484**	18 - 39	25	25	61	230	450	NA
Butyl benzyl phthalate	12.3U - 78U	4.2U - 4.3	**8.2M**	**15.8**	**5.1**	4.9	64	NA
Bis(2-ethylhexyl) phthalate	86 - **264**	43 - **144**	**121**	**93**	**278**	47	78	NA
Aroclor 1254	9U - 12U	11U - **23.5**	3	1U	3U	12	65	NA
Aroclor 1260	9U - 12U	11U - **12.1**	2.2	1.9	3U	12	65	NA

Values shown in bold indicate exceedance of standard.

U = Compound not detected at reporting limit shown M = Estimated value

a. 5 samples collected from manholes between S Dakota St and the outfall
b. 2 samples collected from manholes located between 2nd Ave S and 4th Ave S
c. Sample collected at downstream end of lateral
d. Sample collected from manhole near S Alaska St
e. Sample collected at manhole between S Andover St and S Dakota St
f. Sediment quality standard (Sediment Management Standards)
g. Cleanup screening level (Sediment Management Standards)
h. Model Toxics Control Act Method A soil cleanup level for unrestricted uses

Duwamish Combined Sewer Overflow/Pump Station Emergency Bypass

Another outfall that discharges to the waterway in the vicinity of the Duwamish/Diagonal cleanup area is called the Duwamish CSO (#034); a submerged outfall located about 100 feet upstream from the Diagonal Ave S CSO/SD. The Duwamish CSO has not overflowed since 1989 and is not considered a significant recontamination source.

The Duwamish CSO is the emergency overflow for the Duwamish siphon and Duwamish pump station (PS) on the King County interceptor system. The siphon conveys wastewater from the West Seattle area across the Duwamish Waterway to the EBI located on the east side of the waterway. It has an emergency overflow at each end where the siphon reaches the riverbank. At the east bank, emergency overflows discharge out the Duwamish CSO.

The Duwamish PS is one of three pump stations on the EBI that conveys wastewater to the West Point treatment plant. Emergency overflows are required to protect conveyance pipes and pump stations from damage. Pipes need an emergency overflow because if the large volume of sewage flowing in the pipes were stopped immediately, the momentum of the flow would damage the pipe structures. Pump stations need an emergency overflow to prevent flooding and damage to pumps.

If there were an emergency shut down of the Duwamish PS, flow in the EBI must be diverted to protect the pump station facility and the interceptor line. In an emergency by-pass situation, the flow upstream of the Duwamish PS would begin to back up and divert flow out the Duwamish CSO. The Duwamish PS is equipped with three sewage pumps and an auxiliary power supply (engine generator unit) so there should be no need to by-pass out the Duwamish CSO except in an emergency beyond present back-up systems. The Duwamish PS has a peak flow of 63 mgd and a maximum pumping capacity of 100 mgd (three pumping units). In addition, under normal dry weather conditions (23 mgd), the station has two hours of storage time from shutdown to overflow. In addition, the pump station equipped with sensors for key operational conditions. Alarm signals are connected to telemetry sending alarm signals to West Division Main Control for continuous monitoring. Therefore, during normal conditions, it is unlikely that the pump station wet well will exceed a maximum set point because the station has been designed with enough reliability that overflow into the Duwamish River will not occur.

If an emergency by-pass was required at the Duwamish PS, the chemical concentrations in the sewage or mixed sewage/storm water should be similar to the concentrations that are found regularly in either sewage or CSO samples that are routinely collected from the sewer collection system and treatment plants. King County samples the influent to the Duwamish PS twice each year (during winter and summer base flow conditions).

An emergency by-pass from the siphon would involve combined sewage and storm water from the Delridge Trunk Sewer and the Chelan Avenue Regulator Station (both in West Seattle) that has a combined drainage basin of 1,169 acres. An emergency by-pass of the EBI flow to protect the Duwamish PS would involve all the flow coming down the EBI toward the Duwamish PS. The drainage basin for this by-pass would be all drainage basins upstream of the Duwamish PS. This EBI flow originates from two areas: (a) the East Marginal PS located upstream (drainage basin of 907 acres), plus (b) the flow from the local drainage located between the East Marginal PS and the Duwamish PS (local basin of 128 acres).

Diagonal Avenue South Storm Drain

The Diagonal Ave. S. SD discharges to the Lower Duwamish Waterway at river mile 0.55, and drains approximately 12 acres, including the Diagonal Ave S roadway west of East Marginal Way S and portions of Terminal 108 (see Figure 3). Potential upland sources that may discharge to the Lower Duwamish Waterway from this outfall include chemicals of concern carried by storm water, and contaminated groundwater that may have infiltrated the system through breaks in conveyance lines.

A storm drain sediment sample was collected from the Diagonal Ave S SD in 1985 for the Elliott Bay Action Program (Tetra Tech 1988). The storm drain sediment data was compared to the Sediment Management Standards (SMS) to provide a rough indication of overall quality. As previously stated, the SMS do not apply to storm drain sediments and any comparison of this kind is most likely conservative given that sediments discharged from storm drains are highly dispersed in the receiving environment and mixed with the natural sedimentation taking place. As shown below, four chemicals detected in the sample exceeded the SQS or CSL:

Table 6 1985 Diagonal Ave. S. Storm Drain Sediment Sample Results

Chemical	Measured Concentration	SQS	CSL
Chromium (mg/kg)	287E	260	270
Zinc (mg/kg)	675E	410	960
Di-n-octyl phthalate (mg/kg TOC)	560ZE	58	4,500
Indeno (1,2,3-c,d)pyrene (mg/kg TOC)	85E	34	88

E = Estimated value
Z = Concentration corrected for blank contribution. Value still exceeds detection limit.

The detection levels for 1, 2-dichlorobenzene, 1,4-dichlorobenzene, hexachlorobenzene, and benzyl alcohol exceeded the CSL values while the detection levels for (1,2, 4-trichlorobenzene, butyl benzyl phthalate, and total PCBs were above the SQS values). For these seven chemicals, it is not possible to know whether the concentrations present in the sample would have exceeded the SMS.

As part of the Duwamish/Diagonal site investigation, three sediment samples were collected offshore from this small drain outfall. The only chemicals that were found in increased concentrations near the outfall were butyl benzyl phthalate and bis (2-ethylhexyl) phthalate, which are present throughout the Duwamish/Diagonal cleanup area. The lack of any other elevated levels of chemicals in these three sediment samples suggests there are no problem discharges to this pipe that could be a potential source of contamination for the cleanup area sediments. (King County 2001).

Nevada Street Storm Drain

The 24-inch Nevada Street storm drain outfall is located several hundred yards downstream (north) of the Duwamish/Diagonal cleanup area (approximately river mile 0.25, see Figure 3) and discharges to the Lower Duwamish Waterway at the west end of S Nevada St. The drain runs along S Nevada St serving a portion of the Port of Seattle T106 property that is used for warehousing and the northern portion of a shipping container repair facility (Container Care Inc.). Total drainage area is estimated at about 26 acres. Recent efforts to locate the outfall have been unsuccessful.

A storm drain sediment sample was collected from the S Nevada SD in 1985 for the Elliott Bay Action Program (Tetra Tech 1988). As previously stated, the SMS do not apply to storm drain sediments and any comparison of this kind is most likely conservative given that sediments discharged from storm drains are highly dispersed in the receiving environment and mixed with the natural sedimentation taking place As shown below, four chemicals detected in the sample exceeded the SQS or CSL:

Table 7. 1985 Nevada St. Storm Drain Sediment Sample Results

Chemical	Measured Concentration	SQS	CSL
Cadmium (mg/kg)	12.3	5.1	6.7
Chromium (mg/kg)	1,790E	260	270
Lead (mg/kg)	1,330	450	530
Zinc (mg/kg)	654E	410	960

E = Estimated value

In addition, hexachlorobenzene and 1,2,4-trichlorobenzene were not detected in the sample, but the detection limits exceed the CSL and SQS values, respectively. For these two undetected chemicals, it is not possible to know whether the concentrations present in the sample would have exceeded the SMS.

Former Diagonal Avenue Wastewater Treatment Plant Outfall

After the West Point Treatment plant was constructed, the smaller local treatment plants were shut down and wastewater was conveyed to the King County plants for treatment. The Diagonal Wastewater Treatment plant was operated by the City of Seattle from 1938 until 1969 when King County constructed the final stage of the EBI and flows were diverted to the West Point plant.

The 30-inch outfall from the plant is located at approximately river mile 0.55 (see Figure 3), and is now inactive. The remnant end of this pipe can still be seen during low tides The Diagonal plant contained two primary clarifiers, two sludge digesters, and sludge drying beds. With a capacity of 8 mgd, the plant treated stormwater and sewage from a 5,100-acre basin along the eastern side of the Duwamish River, extending into the Rainier Valley. Major industries in the service area included adhesives and chemical plants (2), metal plating facilities (2), beverage bottling, cement handling, compressed gas, food canning, a sawmill, a steel plant, and truck manufacturing plants (Brown and Caldwell 1958). The average dry weather flow measured in July 1956 was 4.3 mgd. Wet weather flow to the plant was controlled by two upstream

regulators that diverted all flow above 6.5 mgd to the Duwamish Waterway. Excess flows were diverted at five locations, all upstream of the Diagonal/Duwamish cleanup site.

Direct Stormwater Discharges

Runoff from land immediately adjacent to the Lower Duwamish Waterway is discharged directly to the waterway via public and private storm drains. The properties adjacent to the Duwamish/Diagonal Way site are the Port of Seattle's Terminal 106 and Terminal 108 and Federal Center South.

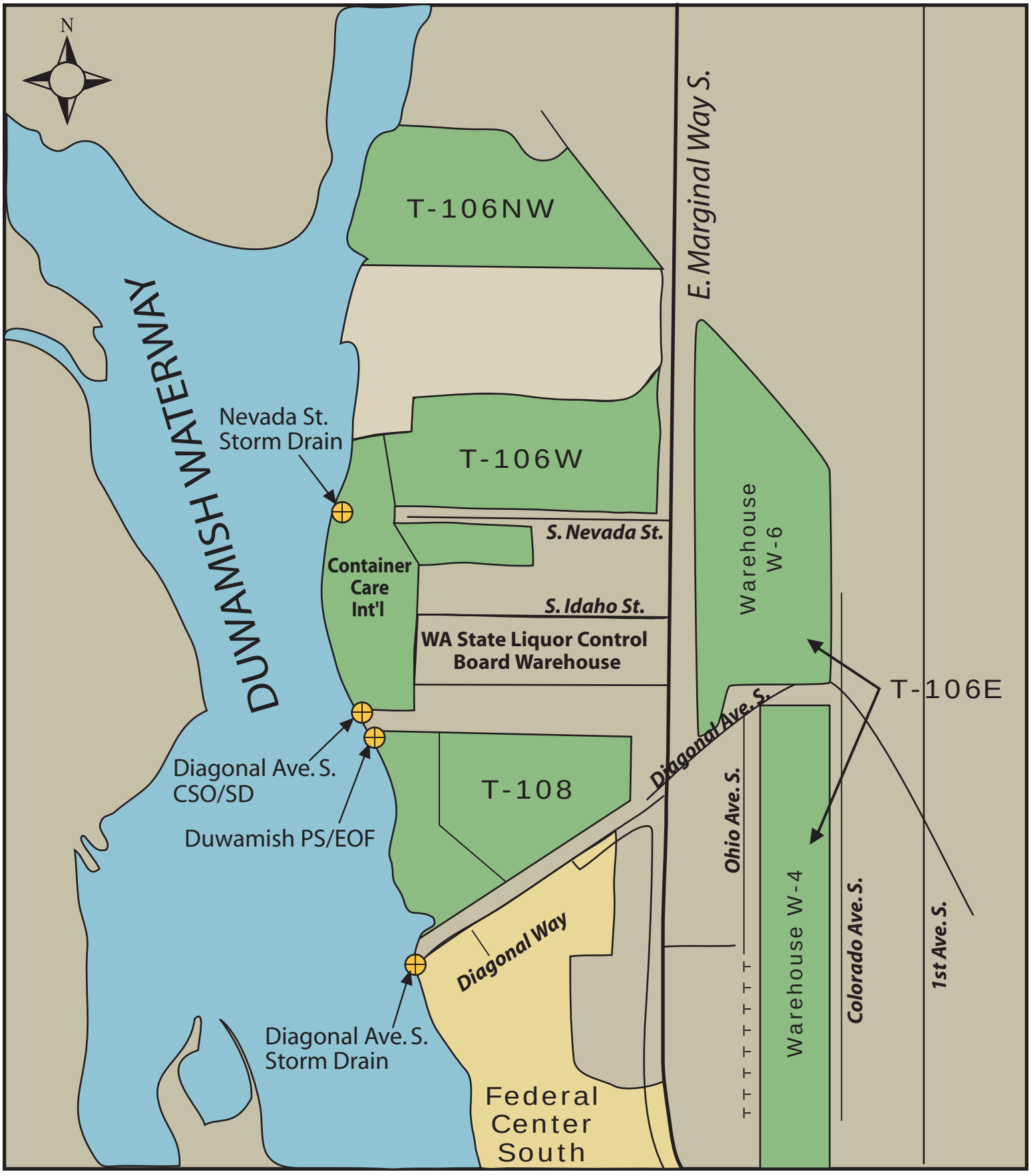
In the past, one private storm drain on the south end of Terminal 106 discharged to the small cove on the downstream side of the Diagonal CSO/SD. However, this pipe has been connected directly to the Diagonal CSO/SD pipe. Currently, any runoff collected from Terminals 106 and 108 are routed through the city storm drain system to discharge at one of three locations: Nevada Street SD, the Diagonal CSO/SD, or the Diagonal Avenue S. SD.

Environmental assessment reports for Federal Center South refer to floor drains and drain lines without stating if the drains connect to the sanitary or storm sewer system. It is possible that some areas of the facility discharge to the Diagonal Ave. South storm drain while other areas discharge through private outfalls to the Lower Duwamish Waterway. During an inspection by Ecology and SPU on June 25, 2004, the General Services Administration (GSA) stated that all stormwater discharges to the Duwamish or Slip 1 and that floor drains in the boiler room and warehouse are connected to the sanitary sewer. Diagrams of the stormwater drainage system for this facility have been requested from GSA by Ecology and SPU. GSA has also been asked to investigate drains in the FBI maintenance building and to dye test the drains in the boiler room to ensure they are connected to the sanitary sewer.

Upland Contaminated Sites

Upland sites may contribute contamination to the Lower Duwamish Waterway through contaminated groundwater discharging directly to the Lower Duwamish Waterway or infiltrating into a CSO or storm water system that discharges to the Lower Duwamish Waterway, or by contaminated soils eroding from the riverbank. If chemicals of concern from an upland site reach the Lower Duwamish Waterway, they have the potential to cause sediment recontamination.

This section provides information on the sites and leaking underground storage tanks (LUSTs) in the basins that drain to the Duwamish/Diagonal Way sediment site. In addition, the program to prevent underground storage tanks (USTs) from leaking is discussed. Port of Seattle Terminal 108 and part of Terminal 106 are located adjacent to the Duwamish/Diagonal Way sediment site and are discussed in more detail below. While not immediately adjacent to the Duwamish/Diagonal Way sediment site Federal Center South is included because of its proximity to the site and its potential connection to the Diagonal Ave. South storm drain.



LEGEND

- Publicly-owned storm drain or CSO
- Port of Seattle
- Federal Ctr South

NOT TO SCALE

Figure 7.
Upland Property Locations
Duwamish/Diagonal Way

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Port of Seattle Terminal 106

Terminal 106 is actually five locations (T-106 N, NW, NE, and SE) and multiple properties under Port ownership (Figure 7). The three properties listed below are relevant to this plan because they drain to stormwater systems that discharge to either the Diagonal Ave S CSO/SD or Diagonal Ave SD:

- T-106 SW (Container Care International): located west of East Marginal Way, south of the cement plant, and north of S. Oregon St. It is comprised of multiple properties on both sides of S. Nevada St., and the section bordering the Lower Duwamish Waterway between S. Oregon St. and the cement plant. In the past, portions of this plant drained directly into the Lower Duwamish Waterway just north of the Oregon St. right of way.

- T-106 SE (warehouse W-4): located east of East Marginal Way, east of the railroad tracks along the Ohio Ave. right of way, south of Diagonal Way, and north of S. Hudson St., and west of Colorado Ave.

- T-106 NE (warehouse W-6): located east of East Marginal Way, north of Diagonal Way, and south of the BNSF/UP railroad track right of way, and west of Colorado Ave.

The following two properties are not relevant to this plan because they do not discharge in the vicinity of the Diagonal/Duwamish cleanup site:

- T-106 NW: located west of East Marginal Way, north of the cement plant, and south of Spokane St. This property drains directly into the southern portion of the East Waterway.

- T-106N (Not shown in Figure 7): the Port sold most of T-106 N (a small warehouse/ office building, north of Spokane Street, east of East Marginal Way and south of Hinds Street). The smaller portion of this property, immediately south of Hinds street has largely been incorporated into the adjacent CW-100 Port Maintenance Shop and Yard.

Container-Care International, Inc. (CCI) is located at T-106 SW. The company stores, reconditions, and refurbishes shipping containers including refrigerated units. CCI has been operating at this site since July 1990 (Ecology 1992c). Specific activities at the site include marine cargo container structural repair (no sandblasting); container chassis repair and painting; repair of refrigeration equipment on refrigerated containers, pressure washing of marine cargo containers, container/chassis storage, and transportation services.

A facility inspection conducted by Ecology in January 2002 described the following chemical/waste storage areas:

- Used oil and antifreeze are stored in the west part of the chassis service area, on secondary containment pallets, and

- A satellite storage area contained a 55-gallon drum of aerosol cans

A 2001 site inspection by the City of Seattle and Ecology found an unmanaged waste storage pile containing empty Freon containers, scrap metal, and wood in the central west portion of the site (the refrigeration service area). An aboveground fuel storage tank was observed with no lid and contained fuel and possibly rainwater. Paint products (toluene) and new paint were stored inside a flammable storage container. In general, poor housekeeping was observed.

During earlier inspections, an outdoor storage area was observed which contained 55-gallon drums used for storage of hub oil, coolant, oil filters, and sludge (SAIC 2003).

Phase 1 Environmental Site Assessments (ESA) and Phase 2 investigations were completed for T-106 SE and T-106 NE by the Port of Seattle and were documented in four reports:

- Phase 1 ESA: Building 4, Terminal 106E (Pinnacle GeoSciences 2003a).
- Phase 1 ESA & Limited Phase 2 Study, Terminal 106E, Building 6 (Pinnacle GeoSciences 2003b).
- Supplemental Phase 2 Services Terminal 106E (Pinnacle GeoSciences 2003c).
- Report of Underground Storage Tank Decommissioning, Soil Excavation and Sampling Activities, Port of Seattle 106E Property (EMS Consultants Inc. 2004)

Each report includes descriptions and figures showing the location of the subject properties and specific areas on and adjacent to the property that were investigated.

The Phase 1 and 2 reports identified 14 potential areas of concern relative to soil and/or groundwater, that are either adjoining or on the Terminal 106E properties occupied by Buildings 4 and 6. The reports addressed historical uses of the Port property as well as neighboring and adjoining properties. Ecology files were reviewed for releases, the presence of underground storage tanks, and any other information pertinent to soil and ground water. A number of soil probes and borings were completed and 14 ground water monitoring wells were installed.

These investigations found petroleum compounds in soil and occasionally groundwater in various areas. Most of the impacts were near two of three underground storage tanks. Concentrations chemicals in other areas were below MTCA cleanup levels. The investigations did not discover any concerns or on-going contamination sources relative to stormwater or releases to the Duwamish/Diagonal outfalls. The contamination that was found was localized and determined not to be migrating to the Duwamish through stormwater (Pinnacle GeoSciences, 2003a-c). In April 2004, the three tanks and contaminated soils were excavated and disposed. All of the confirmational soil and groundwater samples were significantly below MTCA Method A cleanup standards

Union Pacific Railroad Argo Yard

The UPRR (Union Pacific Railroad) Argo Fueling Site is adjacent to T106E. In 1999, an extensive diesel release and groundwater plume was discovered that extended from the UPRR property onto the Port's Terminal 106 properties. Recent investigations by UPRR consultant RETEC discovered that the plume seems to be in the path, and possibly in the backfill material of the storm drain along Oregon St. & Diagonal Way and moving toward the Duwamish East Waterway. UPRR is conducting an independent cleanup of their property.

Port of Seattle Terminal 108/Chevron (Chiyoda) Property

Terminal 108 is located on the Duwamish Waterway immediately north of Diagonal Ave. S. (Figure 7). In 1976, PCB-contaminated dredge spoils from a 1974 transformer spill in Slip 1 (containing Aroclor 1242) were disposed on the Chiyoda property by the US Army Corps of Engineers. Two lagoons were excavated along the northern edge of the property in the former treatment plant for sludge beds to treat approximately 10 million gallons of PCB-contaminated sediment dredged from near Slip 1. PCB-contaminated sediment was deposited primarily in the first receiving lagoon located closet to the river. Water pumped from the disposal lagoons was treated by particulate, sand, and charcoal filters prior to discharge to the Duwamish Waterway (AGI 1992). The PCB disposal pits were eventually back-filled with material from the excavation and additional sediment that Chiyoda dredged from the shoreline in front of the old Diagonal treatment plant outfall to improve berthing (AGI 1992).

The Port of Seattle acquired the Chiyoda property in 1980. The Port later sold part of the property to Chevron, retaining the portion along the river. Soil contaminated with petroleum hydrocarbons was stockpiled in the vicinity of the former disposal lagoons (AGI 1992). This soil was treated to meet the State of Washington TPH cleanup level of 200 mg/kg. The Port leased the southern part of the site to Lafarge Cement Company, which occupied the site from 1989-1998 and loaded cement barges at the mooring pile dock. This site is currently the Port of Seattle's Terminal 108 expansion area and is used for container storage.

Two pipes that discharged directly to the Lower Duwamish Waterway were located on this property. The largest pipe was the historic outfall pipe from the old Diagonal Ave. treatment plant that operated from 1938 to 1969. The remnant end of this pipe can still be seen during low tides, but there has been no treatment plant discharge from this outfall for over 30 years. The other was a private storm drain on the south end of Terminal 106 that discharged to the small cove on the downstream side of the Diagonal CSO/SD. However, this pipe has been connected directly to the Diagonal CSO/SD pipe (Romberg 2004).

There were numerous activities at the old Diagonal Avenue sewage treatment plant property that could have introduced chemicals into the sediments. These activities include the use of sewage sludge drying ponds (1930-1969), dredge settling ponds for PCBs (1976) and filling with contaminated sediment dredged from near the old treatment plant outfall (1977). Consequently, regulatory agencies asked whether surface drainage, groundwater discharge, or bank erosion from the old treatment property could pose a potential source of recontamination to the Duwamish/Diagonal sediments.

After reviewing available information, King County staff concluded that it appears unlikely that surface water, ground water, or bank erosion from the old treatment plant property would be a significant source recontamination to the Duwamish/Diagonal cleanup project (King County 2002). Most of the shoreline of the old treatment plant property is covered with riprap rock to stabilize the bank. The one area that has exposed intertidal sediment was sampled and chemical analysis results showed low chemical concentrations. Sediment samples collected closest to shore near the old treatment plant property were low in most chemicals including PCBs. A large part of the old treatment plant property has been paved over (former Lafarge Cement site and

T108 container storage), which will limit surface water contact with underlying soils and prevent input to the Lower Duwamish Waterway.

The Port of Seattle sampled groundwater at 14 wells drilled on the old treatment plant property in 1991/1992 (also called the Chiyoda/Chevron property) and PCBs, PAHS, petroleum hydrocarbons, and metals were present in groundwater. The Phase 1 RI concluded that PCBs are not likely to be transported to sediment via groundwater from this upland area because of their low solubility and mobility in groundwater (Windward 2003). The Port of Seattle plans to collect samples in 2004 to evaluate the groundwater as a potential source of sediment recontamination.

Federal Center South

The facility is located on the east bank of the Duwamish River and south of Diagonal Ave. S. The General Services Administration (GSA) manages this property on behalf of the United States and leases space to various agencies of the federal government. Past or present tenants include, but are not limited to, the Army Corps of Engineers, the Federal Bureau of Investigation, Air Force Logistical Office, and Bureau of Indian Affairs.

A hazardous waste inspection by the Department of Ecology (Ecology) in 1993 documented several potential sources of contamination to the river and sediments. Among the potential sources, water in the boilers is treated with algaecides, biocides, and a fungicide and is discharged into the drain during maintenance periods. In addition, the chemically treated coolant water from air conditioning units was periodically discharged into a floor drain which discharges into the Duwamish River and the secondary containment of a drum holding area exposed to the elements relied on a plate and weir style oil water separator which is connected to storm drain lines which flow to the river. Numerous discrepancies relating to the storage, segregation, labeling, and manifesting dangerous waste were also found.

Ecology's files document five underground storage tank removals and associated cleanups of soil and groundwater. In 1997, a 2000 gallon unleaded gasoline tank and 10 cubic yards of soil were removed. No groundwater impacts were documented in this report and post-excavation samples showed that the walls of the excavation contained concentrations of petroleum of 110 -120 ppm. (Glacier Environmental 1997)

In May 1999, 3 USTs were removed and a 4th tank was closed in place. Tank #1 was a 300-gallon diesel oil tank used for an emergency generator. The tank was installed in 1986 and taken out of service in May 1997. Initially up to 17,000 mg/kg of petroleum was discovered in the soil. An unknown amount of soil was removed and the excavation was backfilled with clean soil. Confirmational sampling shows 55-75 mg/kg was left behind. Tank #2 was a 100-gallon diesel tank also used for an emergency generator. The tank was installed in 1964 and was abandoned before 1980. This tank was closed in place. Sampling showed soil contamination of 250 mg/ kg of contamination remaining, which is below MTCA cleanup standards. Tank # 3 was a 1000-gallon waste oil tank used by a motor pool located west of building 1202. The tank was installed in 1964 and abandoned in the early 1990's. Soil contamination ranged between 4,000 and 4,700 mg/kg of heavy petroleum. Since the tank was used for waste oils, additional analyses for metals, VOAs and PCBs were conducted. The results were non-detect for PCBs and VOAs and the results for metals were below MTCA cleanup standards. Tank #4 was a 12,000-

gallon gasoline storage tank also used by the motor pool and located near Tank #3. The tank was installed in 1964 and abandoned in the late 1980's. Gasoline range hydrocarbons in the soils were detected at 100-300 mg/kg. Total xylenes were detected at 66 mg/kg and total lead was at 31 mg/kg. (Herrera 1999)

In January 2000, Herrera Environmental installed seven groundwater monitoring wells and found a gasoline plume extending approximately 30 ft south and west from the Tank #4 location and free product (gasoline) on the groundwater. The monitoring well nearest the river (24 ft) showed 520 µg/L heavy hydrocarbons and upgradient wells had elevated levels of benzene, xylenes, and ethylbenzene. (Herrera 2001b). Subsequent sampling showed that benzene, toluene, ethylbenzene and total xylenes (BTEX) and hydrocarbon concentrations were generally below MTCA Method A standards, but there were occasional exceedances detected in 6 of 9 wells. While the concentrations continue to decline, one well continues to have high levels of heavy hydrocarbons. The conclusions presented by Herrera are that there may be a localized area of heavy hydrocarbon contamination caused by either historic site operations or the used of contaminated fill materials. (Herrera 2003)

An environmental site assessment conducted in 2001 (Herrera 2001) noted the possible existence of 3 large tanks (30,000 gallons each) located on the southern edge of the property in front of the 1206 building. The tanks were pumped dry with some sludge remaining. There is no mention of what the tanks contained; however, the contents are assumed petroleum used in the boilers located in a nearby building. There are several references to floor drains and drain lines in the report, but it was never determined if the drains connect to the sanitary or storm sewer system.

JANCO-United, Inc

I n 1986, two executives of Janco-United Inc. a janitorial supply company, pleaded guilty to having a pipe put in outside their former plant to carry chemicals into a storm drain that emptied into the Duwamish River. Between September 1982 and November 1984, Janco employees disposed of wastes, including degreasing compounds alleged to contain phthalates and chlorinated benzenes, through the pipe. Prior to installation of the pipe, the materials were dumped on the ground. The plant, formerly in the 4400 block of Fourth Ave. S., moved to a different location in late 1984. There is no record of any cleanup at this location and the fate of the pipe could not be determined at the time this was written.

Other Upland Contaminated Sites/LUSTs/USTs

Sites where there is evidence of a release of hazardous substances that may pose a threat to human health or the environment are entered into Ecology's Confirmed or Suspected Contaminated Sites list. Generally, these sites involve a release of chemicals from something other than an underground tank, such as a spill, material pile, waste storage or other source.

Thirty-seven site names on the list are located within the basins that drain to the Duwamish/Diagonal Way cleanup site (Figure 8). Twenty-three of these sites have had some form of site assessment conducted and require further investigation and cleanup. Nine are in

Ecology's Voluntary Cleanup Program with cleanup either in progress or reported as complete. The later are being evaluated by the department. Five sites have been cleaned up and have been issued "no further action" determinations by Ecology. A summary of available information about these sites is given in Table 8. Some of these properties have been combined due to redevelopment.

There are 105 leaking underground storage tank (LUST) sites listed in the basins that drain to the Duwamish/Diagonal Way cleanup site (Figure 9). The majority of these sites involve a release of petroleum products. The site names are given in Table 9.

There are approximately 196 underground storage tank (UST) sites in the Duwamish/Diagonal drainages (Figure 10, Table 10). Some of these tanks may be unregulated such as those used for heating oil. Ecology does not inspect unregulated tanks. Ecology conducts leak prevention inspections of regulated tanks in the Duwamish valley on a 5-year cycle.

The files for all of these sites will be reviewed to determine whether there are any chemicals of concern present and if the sites are a historic or potential source of sediment contamination or recontamination. Target chemicals include PCBs, mercury, phthalates and other chemicals which may partition into or affect the sediments.

It should be noted that errors in geographic positioning data (latitude and longitude) do occur. Thus, sites may exist in the Duwamish/Diagonal Way drainage basin that do not appear on the maps. Likewise, some of the sites on the maps may actually be located outside the source control project area. Corrections are made as Ecology becomes aware of the errors.

Lower Duwamish Waterway

City of Seattle

Figure 8

Confirmed or Suspected Contaminated Sites in the Duwamish/Diagonal Basin

Legend

- Confirmed or Suspected Contaminated Sites

Streets
- Arterials
- Streets
- State Highway
- Interstate Freeway

- Diagonal West Basin
- Diagonal East Basin
- Diagonal CSO Basin

1000 0 1000 2000 Feet

Produced by the City of Seattle
August 6, 2004

N W E S

Elliott Bay

East Waterway

Lake Washington

Table 8. Confirmed and Suspected Contaminated Sites in the Duwamish/Diagonal Basin. Ecology 2004 a.

Site #	Name	Address	Ecology Contact	Contaminant	Notes
1	Alaska Copper & Brass	3200 6th Ave S	None Assigned	Suspected soil & groundwater contamination by metals and corrosives	Awaiting site hazard assessment
2	Clayton VW Repair	4709 Martin Luther King Way S	J. Hickey	Soil: Gasoline & benzene Groundwater: Gasoline & benzene	UST removed in 1990. Site assessment done. No cleanup conducted beyond removal of tanks.
3	Jefferson St Bus Barn (Currently Seattle University Tennis Center)	1398 E Jefferson St	None Assigned	Petroleum, metals and chlorinated solvents in soil	Independent Cleanup Conducted, October 1989. Subsequent reports suggest contamination may remain.
4	Univar A.K.A. Vopak USA Inc.; Van Waters & Rogers	4000 1st Ave S	R. Timm	PCE in groundwater	Active VCP. Site is undergoing RI/FS.
5	Chevron Seattle Terminal 4097	4525 Diagonal Ave S	None Assigned	Petroleum in soil below 200 mg/l	Port of Seattle property. Port to conduct additional site assessment in 2004.
6	Rainier Plaza aka Rainier Valley Square	3820 Rainier Ave S	None Assigned	Petroleum in soil	Cleanup Conducted. NFA and restrictive covenant, April 1996
7	2011 S. Hanford St.	2011 S. Hanford St.	B. Sato	Petroleum and solvents	NFA issued December 31, 2003.
8	Alaska St. Property 2	601 S. Alaska St.	N. Madakor	Petroleum in groundwater	Interim NFA for petroleum only. Groundwater contaminated by PCE from unidentified, off-site source.
9	Sasaki Property	3417 18th Ave S.	B. Sato	Petroleum in soil	NFA issued September 30, 2003.
10	Alaska St. Property	615 S Alaska St.	N. Madakor	Petroleum in groundwater & soil	Interim NFA for petroleum only. Groundwater contaminated by PCE from unidentified, off-site source.
11	Puget Sound Electrical Supply Co.	640 S. Spokane St.	None Assigned	Petroleum in groundwater	NFA Issued February 06, 2004.
12	Rainier Brewery	3100 Airport Way S	R. Timm	Petroleum on groundwater & soil	Site is being cleaned up by Sound Transit Authority. Soils and petroleum on groundwater removed. Groundwater monitoring in place.
13	City Commerce Park (Former Penthouse Drapery)	4115 1st Ave S	R. Timm	PCE in soil & groundwater	Site is in VCP. Groundwater plume may have co-mingled with Site 4.
14	Washington Trucking Assoc	4101 4th Ave S	N. Madakor	Petroleum in soil below 200 mg/l. Petroleum in groundwater from off-site source.	Independent Cleanup Conducted April 1996. VCP review completed April 4, 2001. Further action required due to ongoing off-property source(s), upgradient and impacting the site with TPH-gasoline above the state standards.

Table 8. Confirmed and Suspected Contaminated Sites in Duwamish/Diagonal Basin (continued).

Site #	Name	Address	Ecology Contact	Contaminant	Notes
15	Allied Domecq (Starbucks)	2921 ML King Jr. Way	J. Cruz	Petroleum and lead in soil & groundwater	VCP review in process.
16	Rainier Court	3500 Rainier Ave. S.	R. Timm	Soil: PAHs, metals, petroleum, possibly PCBs. Groundwater: petroleum, arsenic, PCE	14 Tax Parcels 3500-3700 Block Rainier Ave. Active VCP/EPA Brownfield site. Parcel B (3601-33rd Ave S. & 3700 Rainier Ave). Investigation of PCBs ongoing.
17	East West Investments	6th Ave & S Lane	L. Bardy	Gasoline and diesel	Site was in VCP. Further action letter sent 11/30/1999. File closed 9/9/2002 because no additional work was planned at the site. Contamination remains.
18	Fed Express BFIA Former "Samis Land Co,"	651 S Alaska St.	S. Becker	Metals & petroleum in soil & Groundwater	NFA for Soils. Monitoring groundwater.
19	Unocal 5473	401 Rainier Ave S.	N. Madakor	Petroleum in soil & groundwater	NFA for groundwater only. Soils remain as of February 2000
20	Central Puget Sound Regional Transit Authority. Former Kwick Cleaners	2701 15th Ave S	B. Sato	PCE	Site is in VCP. Clean up plan submitted and approved.
21	Belshaw Brothers Inc.	1750 22nd Ave. S.	B. Sato	Petroleum BTEX, PAHs TCE Soils and groundwater	Interim report received 15 June 2004. VCP review in process.
22	Northwest Plating	825 S Dakota St	None Assigned	Metals and chlorinated solvents in soil & groundwater	Phase II Site Assessment conducted by owner. Awaiting SHA.
23	Metal Laundry Inc	614 12th	R. Timm	TCE in soil & groundwater	Active VCP. Site is undergoing a RI/FS. Storm & sewer pathway assessment conducted. No pathway found. Contact site manager for details.
24	Seattle Technical Finishing Inc	1005 S King	None Assigned	TCE in soil & groundwater	Partial soil cleanup of metals. Solvents remain.
25	Genesee Landfill	Genesee St & 43rd Ave S	Solid Waste Program	Suspected metals, PAHs, pesticides & methane	Old Municipal landfill. Suspect presence of contaminants listed. Surface drainage is toward Lake Washington.
26	Samis Land Co	647 S Alaska St	S. Becker	Metals and petroleum in soil & groundwater	Incorporated into Fed Express BFIA (# 18, above) during redevelopment. NFA for Soils. Monitoring groundwater.

Table 8. Confirmed and Suspected Contaminated Sites in Duwamish/Diagonal Basin (continued).

Site #	Name	Address	Ecology Contact	Contaminant	Notes
27	Seattle Barrel & Cooperage	7th Ave S & S Snoqualmie St	None Assigned	Petroleum, PAHs, lead	Site listed by Ecology in January 1991. SHA by King Co. in May 2001. WARM ranked a 4. King Co. Industrial Discharger Permit issued.
28	Ralph's Concrete Pumping	1511 Rainer Ave S	None Assigned	Petroleum in soil above 2000 mg/l	Contaminated with petroleum. Limited cleanup conducted. No current action at this location.
29	Ralph's Concrete Pumping Vacant Lot	1517 Rainier Ave S	None Assigned	Petroleum in soil above 2000 mg/l	Contaminated with petroleum. Limited cleanup conducted. No current action at this location.
30	D Leonard & Sons	3626 34th Ave S	None Assigned	Petroleum, metals & non-halogenated solvents in soil	WARM Ranked 4. August 1998
31	Spear Trusts Warehouse	4001 6TH Ave S	N. Peck	Soil: petroleum, metals groundwater: petroleum	WARM Ranked 5. August 2002. Site report dated February 1991. No cleanup reported.
32	Seattle Public Utilities Operations Center	2700 Airport Way S	None Assigned	Petroleum in soil	WARM Ranked 5. Independent Cleanup of soils. Some contamination remains under buildings. Groundwater Impacted
33	Union Pacific RR S. Spur	60 Diagonal Ave. S	None Assigned	Petroleum in soil & groundwater	Independent cleanup being conducted.
34	Time Oil Co. #01-216	2465 S College St	J. Hickey	Petroleum in soil; Petroleum in groundwater is below MTCA Method A	Former heating oil distribution facility. Four 10,000 gal. USTs removed in 1990. Contaminated soils treated in place. Residual petroleum contamination remains in soil and groundwater.
35	Seattle City Light 4th Ave S	3814 4th Ave S	None Assigned	Petroleum in soil & groundwater	Spill of 125 gallons of diesel followed by independent cleanup. Petroleum contaminated soils removed in 1992-93. Groundwater monitoring conducted. Status unknown.
36	Ralph's Concrete	800 Poplar Place S	None Assigned	Petroleum in soil above 2000 mg/l	Contaminated with petroleum. Limited cleanup conducted. No current action at this location.
37	Kane Properties LLC	4208 Rainer Ave S	None Assigned	PCE	No cleanup reports received. SHA done. WARM Ranked 5.

Lower Duwamish Waterway

City of Seattle

Figure 9

Leaking Underground Storage Tank Sites in the Duwamish/ Diagonal Basin

Legend

- LUST Sites

Streets
- Arterials
- Streets
- State Highway
- Interstate Freeway

- Diagonal West Basin
- Diagonal East Basin
- Diagonal CSO Basin

1000 0 1000 2000 Feet

Produced by the City of Seattle
August 6, 2004

N W E S

Elliott Bay

East Waterway

Lake Washington

Table 9. Map Key for Leaking Underground Storage Tank Sites in Duwamish/Diagonal Basin. Ecology 2004b.

Site #	Facility Name
1	10004D Right of Way
2	23rd & Jackson Site
3	Acme Poultry Cc Inc
4	AK Media NW
5	Allied Domecq
6	Alpac Corp
7	Anr Freight System Inc Seattle
8	Armored Transport of Seattle
9	Asian Resource Center
10	Barrett Property
11	Bloch Steel Industries
12	Burke Co
13	Business Pro Computers
14	Camcal Co Inc
15	Cascade Commercial Company
16	Cascade Machinery & Electric Inc
17	Cecil Leung
18	Chevron USA Inc 90333
19	Chin Brothers Inc
20	Chubby & Tubbys
21	City View Associates LLC
22	Clayton VW Repair
23	Consolidated Freightways S Edmunds
24	Damascus Baptist Church
25	Darigold Rainier dba Westfarm Foods
26	Deeny Construction Co Inc
27	DL Duckey Auto Freight Inc
28	Dorsey Property
29	East Pine Substation
30	East West Investments
31	Esquire Cleaners Seattle
32	Former Unocal 0166
33	Fred Hutchinson Cancer Research Ctr
34	Gais Seattle French Baking Co
35	Gardner Building
36	Genesee Shell & Mini Mart
37	Golden Grain Seattle Distribution Ctr
38	Gull Industries Inc 267
39	Gunning John
40	Hamilton Engine Sales

Site #	Facility Name
41	Herzog Glass Inc UST 9747
42	Herzog Glass Inc UST 9748
43	Hospital Corp Of America 1140
44	Hospital Corp Of America 904
45	Interstate Brands Corp Wonder Bread
46	Jims Auto Repair Seattle
47	Lago Vista Apartments
48	LC Jergens Painting Co
49	Lee Poletti
50	Leo Fix Transfer & Storage Co Inc
51	Les Schwab Tires Renton
52	Liquid Carbonic Seattle
53	Lloyds Rocket & Heating Oil Co
54	Model Instrument Development
55	Moss Alley Motors
56	Mt Baker Building
57	Ocean Beauty Seafood
58	Pacific Fruit & Produce
59	PJ Market
60	Pro Express Inc
61	Purolator Courier Corp UST 5561
62	Rainer Plaza Seattle
63	Rainier Brewery
64	Rainier Valley SQ Ltd Property
65	Residence 14th Ave S Exempt
66	Residence 34th Ave S Exempt
67	Ricchiazzi Industrial Buildings
68	Ricchiazzi Industrial Property
69	Ricchiazzi Industrial Property
70	Rudys Shell Service
71	Scalzo Co
72	Seattle Fire Station 13
73	Seattle Fire Station 6
74	Seattle Housing Authority Viburnam
75	Seattle Port Term 106e
76	Seattle Public Utilities Operations Ctr
77	Seattle School Dist DFC
78	Seattle University
79	Seattle University aka Blue Whale
80	Seattle University UST 433797

Table 9. Map Key for Leaking Underground Storage Tank Sites in Duwamish/Diagonal Basin (continued).

Site #	Facility	Site #	Facility
81	Shell 121499	94	VA Puget Sound Health Care Systems
82	Shell 121607	95	Valley Market
83	Shell Station 120984	96	WA DOT Corwin Place S
84	Signal Equipment Inc	97	WA DOT I90 Murrow Bridge
85	Signals Branch 7HDQ Site	98	WA DOT Seattle S Spokane St
86	Swedish Medical Ctr Providence	99	WA UW Harborview Medical Center
87	Taniguchi Property	100	WA UW Pacific Medical Center
88	Texaco Service Station - 128202	101	Walt's Radiator & Muffler
89	Time Oil Co 216	102	Walt's Radiator & Muffler 4th Ave
90	U Haul Co of Rainier Ave S	103	Washington Trucking Assoc
91	Unocal 5473	104	Welch Investment Co
92	Unocal SS 5477	105	Western Peterbilt Inc Seattle
93	US General Services Admin Seattle		

Lower Duwamish Waterway

City of Seattle

Figure 10

Underground Storage Tank Sites in the Duwamish/ Diagonal Basin

Legend

- UST Sites

Streets

- Arterials
- Streets
- State Highway
- Interstate Freeway

- Diagonal West Basin
- Diagonal East Basin
- Diagonal CSO Basin

1000 0 1000 2000 Feet

Produced by the City of Seattle
August 6, 2004

N W E S

Elliott Bay

East Waterway

Lake Washington

Table 10. Map Key for Underground Storage Tanks in Duwamish/Diagonal Basin. Ecology 2004b.

Site #	Facility Name
1	10004D Right of Way
2	23rd & Jackson Site
3	24 Hour Car Wash
4	4th S Gull 219
5	Acme Poultry Co Inc
6	Acme Poultry Co Inc Truck Parking Lot
7	Airgas Norpac
8	AK Media NW
9	Alaska Rental Equipment Co Inc
10	Allar Corporation
11	Allied Domecq
12	Alpac Corp
13	Anr Freight System Inc Seattle
14	Arco 5445
15	Arctic Ice Cream Novelties Inc
16	Armored Transport of Seattle
17	Asian Resource Center
18	Barrett Property
19	Baugh Construction Co
20	Belshaw Brothers Inc
21	Bloch Steel Industries
22	Budd & Co Inc
23	Budget Batteries Inc UST 7574
24	Burke Co
25	Business Pro Computers
26	C & C Food Store UST 8971
27	Camcal Co Inc
28	Canadian Jumbo Inc
29	Canella Inc
30	Capitol Hill Arco
31	Cascade Commercial Company
32	Cascade Machinery & Electric Inc Seattle
33	Cecil Leung
34	Chevron USA Inc 90333
35	Chin Brothers Inc

Site #	Facility Name
36	Chinatown Development Co
37	Chubby & Tubbys
38	City Electric Inc
39	City View Associates Llc
40	Citywide Horticulture Maint Fac
41	Clayton VW Repair
42	Consolidated Freightways S Edmunds
43	Continental Baking Co UST 4771
44	Cossack Caviar Inc
45	Daleys Dump Truck Service Inc
46	Damascus Baptist Church
47	Damm Fine Printing Ltd Type Connection
48	Darigold Rainier Dba Westfarm Foods
49	Davis Door Service Inc
50	Debman Property
51	Deeny Construction Co Inc
52	Dl Duckey Auto Freight Inc
53	Dorsey Property
54	E & E Foods Building
55	East Pine Substation
56	East West Investments
57	EF Johnson Co
58	Esquire Cleaners Seattle
59	Evergreen Electrical Contractors Inc
60	Exhaust Specialties
61	Firestone Store 31a8
62	Flint Ink Corp Seattle
63	Fm Higgins
64	Fm Higgins
65	Former Unocal 0166
66	Fred Hutchinson Cancer Research Center
67	Fred Rogers Building
68	Gais Seattle French Baking Co
69	Gardner Building
70	Garfield Recreation Center

Table 10. Map Key for Underground Storage Tanks in Duwamish/Diagonal Basin (continued).

Site #	Facility Name
71	Genesee Fuel Heating Co Inc
72	Genesee Shell & Mini Mart
73	Giebel & McCandless Enterprises
74	Golden Grain Distribution Ctr
75	Goodwill Industries Seattle
76	Gull Industries Inc 267
77	Gull Industries Inc 267
78	Gunning John
79	Guy F Atkinson Construction
80	Hamilton Engine Sales
81	Herzog Glass Inc UST 9747
82	Herzog Glass Inc UST 9748
83	Hospital Corp of America 1140
84	Hospital Corp of America 904
85	International Pacific Grocery
86	Interstate Brands Corp Wonder Bread
87	Jefferson Golf 85
88	Jims Auto Repair Seattle
89	Junction Manufacturing
90	King Cnty Youth Services
91	Lago Vista Apartments
92	LC Jergens Painting Co
93	Lee Poletti
94	Leo Fix Transfer & Storage Co Inc
95	Les Schwab Tires Renton
96	Liquid Carbonic Carbon Dioxide
97	Lloyds Rocket & Heating Oil Co
98	Lough Motors Inc
99	M & R Investments
100	Manson Construction Co
101	Martin Luther King 76
102	McFood Store
103	Merlino Fine Foods
104	Model Instrument Development
105	Moss Alley Motors

Site #	Facility Name
106	Mountain Safety Research
107	Mt Baker Building
108	New Hope Baptist Church
109	Northwest Forklift Inc
110	Northwest Plating
111	Oberto Sausage Co Inc
112	Ocean Beauty Seafood
113	Olympic Foundry Inc
114	Owl Transfer & Storage Co Inc
115	Pacific Fruit & Produce
116	PJ Market
117	Plymouth Poultry Company
118	Poke Cycle
119	Polymetrics Aqua Media
120	Praxair Distribution Inc Sea 3
121	Pro Express Inc
122	Pro Express Inc
123	Puget Sound Electric Supply Inc
124	Purolator Courier Corp UST 5561
125	Qwest Corp W00291
126	Rainier Avenue Pump Station
127	Rainier Brewery
128	Rainier Plaza Seattle
129	Rainier Valley Sq Ltd Property
130	Residence 14th Ave S Exempt
131	Residence 34th Ave S Exempt
132	Rex' s Service Inc
133	Ricchiazzi Industrial Buildings
134	Ricchiazzi Industrial Property
135	Ricchiazzi Industrial Property
136	Rudy’s Shell Service
137	Scalzo Co
138	Seafair
139	Sears Roebuck & Co UST 7837
140	Seattle City Transportation Dept

Table 10. Map Key for Underground Storage Tanks in Duwamish/Diagonal Basin (continued).

Site #	Facility Name
141	Seattle Farwest Service Corporation
142	Seattle Fire Station 13
143	Seattle Fire Station 6
144	Seattle Housing Authority Viburnam
145	Seattle I90 Tunnel & L10
146	Seattle Parks Genesee Park HQ SE
147	Seattle Port Term 106e
148	Seattle Port UST 10880
149	Seattle Public Utilities Operations Ctr
150	Seattle School Dist DFC
151	Seattle University
152	Seattle University AKA Blue Whale
153	Seattle University UST 101157
154	Seattle University UST 101159
155	Seattle University UST 433797
156	Seattle University UST 497049
157	Shell 121499
158	Shell 121607
159	Shell Station 120984
160	Showers of Blessing Church
161	Signal Equipment Inc
162	Signals Branch 7HDQ Site
163	Southland Corp 24497
164	Spear Trusts Whse
165	Swedish Medical Center Providence Campus
166	Taniguchi Property
167	Texaco Service Station Former 128202
168	Time Oil Co 216

Site #	Facility Name
169	Time Station 234
170	Totem Equipment Seattle
171	Transport Equipment Co
172	Transport Equipment Co
173	Tsue Chong Co Inc
174	U Haul Co Of Rainier Ave S
175	United Marine Shipbuilding E Marginal Way
176	Unocal 5473
177	Unocal Ss 5477
178	US General Services Admin Seattle
179	VA Puget Sound Health Care Systems
180	Valley Gear & Transmission
181	Valley Market
182	Van Vetter Inc
183	WA DOT Corwin Place S
184	WA DOT I90 Murrow Bridge
185	WA DOT Seattle S Spokane St
186	WA UW Consolidated Laundry
187	WA UW Harborview Medical Center
188	WA UW Pacific Medical Center
189	WA UW UST 469099
190	Walt's Radiator & Muffler 4th Ave
191	Walt's Radiator & Muffler E Madison St
192	Washington Trucking Assoc
193	Welch Investment Co
194	Welders Supply
195	Weller Street Assoc
196	Western Peterbilt Inc Seattle

Ongoing Source Control Programs and Authorities

All of the agencies involved in the Source Control Work Group, or with responsibility for pollution management within the Lower Duwamish Waterway have regular, on-going programs that address the protection of sediment and water quality. In reading the descriptions of the agency activities, it will be apparent that there are cases where more than one agency has responsibility for some aspect of source control. The agencies involved generally coordinate their activities through both formal and informal interagency agreements to share workload and prevent duplication of effort. This section describes programs relevant to the Duwamish/Diagonal Way site.

All of the agencies have expanded and enhanced their programs considerably in the last 20-30 years as federal and state requirements have been promulgated and improved methods of monitoring and analyzing wastes have been developed. Continuation of these ongoing programs at existing levels would prevent much recontamination in itself. However, all of the involved agencies are intensifying their efforts in the Duwamish/Diagonal basin, focusing on the specific chemicals of concern and the sources that produce them.

City of Seattle

In 1995, the City of Seattle was issued a National Pollutant Discharge Elimination System (NPDES) municipal stormwater permit from the Ecology for its separated storm drain system. Under the permit, the City is required to develop and implement a stormwater management program that includes a number of activities including establishing adequate legal authority to control discharges to and from the city-owned separate storm drain system. The City also has a NPDES permit for its combined sewer overflows. City authority to control pollutants discharged to the city-owned storm drain, combined sewer, and sanitary sewer systems is provided in the following two codes:

Stormwater, Grading, and Drainage Control Code (SMC 22.800)

The drainage code applies only to the separated storm drains within the City and establishes requirements for managing stormwater on new and redevelopment projects, operating and maintaining existing drainage facilities, controlling erosion from construction sites, and preventing pollutants from entering the city-owned storm drain system. For stormwater pollution prevention, the code specifies that only stormwater can be discharged to the city drainage system and prohibits illicit discharges (e.g., solid waste, chemicals, yard waste, automotive products, and others) to the city-owned system. It also requires that all property owners in the City implement the following operational controls on their properties:

- Maintain onsite drainage systems,
- Maintain private streets, driveways, parking lots, and sidewalks, and
- Identify and eliminate illicit connections to the drainage system)

In addition, businesses that engage in the following high-risk pollution generating activities are required to implement additional operational controls (e.g., employee training, spill prevention and cleanup, equipment maintenance, and general housekeeping practices):

- Onsite fueling of vehicles and equipment,
- Vehicle, equipment, and building washing and cleaning,
- Truck or rail loading and unloading of non-containerized liquid or solid materials,
- Liquid storage in above ground tanks,
- Outside portable container storage of liquids, food wastes, or dangerous wastes,
- Outside storage of non-containerized materials, by products, or finished products,
- Outside manufacturing, and
- Landscape construction and maintenance activities.

To minimize stormwater pollution, facilities that apply for building permits after January 1, 2001 must also construct structural source controls on the area of the site being redeveloped that involves these high risk pollution generating activities. Structural controls include enclosing, covering, or otherwise containing the pollution generating activity to prevent contact with rainwater or stormwater runoff. Specific stormwater source control requirements are spelled out in the City's source control technical requirements manual (Seattle 2000).

SPU has authority to take enforcement action against violators of the stormwater code and can issue civil penalties. A notice of violation process is used to enforce the code. Penalties start at $100 per day per occurrence and accumulate each day the violation is not corrected with a maximum penalty of $500 per day per occurrence for violations not corrected within 5 days. Triple penalties may be issued for repeat violations, violations resulting in physical harm to persons or public or private property, a knowing or deliberate violation, or a violation resulting from gross negligence.

Side Sewer Code (SMC 21.16)

The side sewer code applies to the construction and operation of private side sewers connecting to the city-owned sanitary, combined, and storm drain trunk system. Side sewers include all privately owned pipe systems that convey sewage, stormwater runoff, foundation drainage, or unpolluted water from a plumbing outlets or drains to the city-owned system. The code prohibits the discharge of harmful substances to the city system including wastewaters containing toxic or poisonous substances in sufficient quantity to injure or interfere with any sewage treatment process, constitute a hazard to humans, animals, fish, or fowl, or create any hazard in the receiving waters or sewage treatment plant.

The side sewer code is enforced under Seattle Criminal Code (SMC Chapters 12A.02 and 12A.04). Code violations are considered a misdemeanor and are subject to fines of up to $1,000.

Stormwater Pollution Prevention Program

As part of the SPU stormwater management program required under the NPDES municipal stormwater permit, SPU has implemented a number of citywide efforts to improve the quality of runoff discharged from city-owned storm drains. SPU continues to support and expand its stormwater pollution prevention program and has increased staffing from three FTE in 1999 to six in 2004. SPU plans to add a seventh inspector in 2005. The following sections describe ongoing pollution prevention programs as they relate to the Duwamish/Diagonal source control efforts.

Business Inspection Program

The SPU business inspection program, initiated in 2000, works with local business owners to implement appropriate best management practices to reduce stormwater pollution. The program was initiated in 2000 to implement the portions of the stormwater, grading, and drainage control code (SMC 22.800) and the accompanying source control technical manual (Seattle 2000) that deal with stormwater pollution prevention. Business inspections focus on outdoor areas to minimize the presence of pollutants that could come in contact with onsite stormwater. The number of business inspections has increased from about 40 in 1999 to over nearly 300 in 2003.

Private Drainage System Maintenance Program

The private maintenance inspection program was initiated in 1997 to encourage owners of private drainage systems to maintain these systems regularly so they continue to function properly. SPU inspectors regularly check about 200 private systems each year on commercial and multi-family properties. There are approximately 40 private commercial and 4 public stormwater detention systems in the Diagonal Ave S CSO/SD basin. These systems are regularly inspected as part of the citywide program. All but five of the private systems in the basin have been inspected within the last 2 years. The remaining five have been inspected within the last 3 years. In 2004, SPU plans to review information collected to date to develop a schedule for conducting future inspections. Systems that have experienced problems in the past will be inspected more frequently and others will be inspected less frequently.

Water Quality Complaint and Spill Response Programs

SPU inspectors routinely respond to water quality complaints throughout the City. Complaints are received from a number of sources, including the City's hotline number, staff reports, and referrals from other departments and agencies. In addition to identifying and controlling whatever is causing the complaint, City inspectors also provide technical assistance to local residents and businesses about best management practices to reduce pollution. Since 1990, SPU inspectors have responded to 40 water quality complaints in the Diagonal Ave S CSO/SD basin involving the following materials

Table 11. SPU Water Quality Complaint Response 1990-present. SPU 2004.

Material	Number of spills
Oil and grease	10
Paint	6
Automotive fluids	5
Washwater	3
Other	16

In addition to the complaint response program, SPU also maintains a spill coordinator network to coordinate spill response efforts for SPU. Spill coordinators are on call 24 hours a day, including weekends. In the event of a spill, the SPU spill coordinator (SSC) is responsible for assessing the level of hazard and necessary response activities, overseeing on-scene containment and cleanup operations, and coordinating with other agencies. Since the program was initiated in 1998, the team has responded to seven spills in the Diagonal CSO/SD basin. Three of the spills involved oil/diesel products in quantities ranging from 2 to 50 gallons. The four other spills involved antifreeze, paint, concrete aggregate, and an unknown material.

Drainage Operations and Maintenance

City field operations crews regularly inspect and clean catch basins in the public rights-of-way in Seattle. Approximately 40-60 percent of the estimated 35,000 catch basins are inspected each year. Catch basins are cleaned as needed depending on the amount of sediment and debris that accumulates in the sump. SPU crews last cleaned catch basins in the Diagonal area in 2000-2002.

Seattle CSO Control Program

In order to minimize overflows, SPU constructed a storage facility on one Diagonal CSO in 1994. SPU monitors the overflow frequency and volume at all eight locations discharging to the Diagonal Ave S CSO/SD. Overflows from the City system occur between 27 and 40 times per year, with most overflows occurring at one location (111D). CSO 111D is located near the intersection of Diagonal Ave S and 1st Ave. S., east of the rail yard, with a remaining CSO volume of about 1 mgy. The land use in this drainage basin of about 40 acres is approximately 95% industrial and 5% commercial. In July 2004, SPU replaced an undersized pipe on CSO 111D to reduce overflows by allowing more flow to the King County interceptor. The project will be monitored to determine whether additional storage is needed to control CSOs at this location. Seattle's CSO control plan will be revised in 2006.

King County

The Industrial Pretreatment, Local Hazardous Waste, and CSO Control Programs are King County's major efforts toward source control for the Lower Duwamish Waterway.

Industrial Pretreatment Program

The King County Industrial Waste Program is a regulatory program that applies to all non-domestic users of the King County sewage system, including industries, commercial businesses, institutions, and government agencies. The basis of the program is recognition that wastewater treatment plants are designed to treat human waste and wastes compatible with human wastes and that the best way to manage incompatible wastes is to prevent them from entering the system.

The King County Industrial Waste Program has been operating since 1969, first under Metro and then, beginning in 1994, under King County. Key milestones for the program are:

- 1981 - U.S. EPA authorized Metro to enforce federal pretreatment program.
- 1981 - U.S. EPA required electroplaters to meet new federal standards by 1983.
- 1983 - U.S. EPA required metal platers to meet new federal standards for heavy metals and total toxic organics by 1986.
- 1988 - Metro council authorized the Key Manhole Program to track down illegal dischargers.
- 1990 - Metro council authorized Post Violation Inspection and Monitoring Program to provide additional monitoring of companies that violated limits.
- 1991 - Metro adopted technically based discharge limits applying to all nondomestic dischargers.
- 1993 - Metro adopted its Enforcement Response Plan.
- 2000 - U.S. EPA required Transportation Equipment Cleaning companies to meet new federal standards by 2003.
- 2000 - U.S. EPA required Central Waste Treaters to meet new federal standards by 2003.

The objectives of the King County Industrial Waste Program are to (1) prevent the introduction of pollutants into the collection system that will interfere with the operations of the treatment plant or expose workers and the public to harmful substances, (2) prevent the introduction of pollutants into the sewage system that would pass through the treatment plants into Puget Sound or into the biosolids, and (3) to improve the opportunities to recycle and reclaim biosolids and wastewater.

The Code of Federal Regulations (40 CFR 403.8) requires all publicly owned treatment plants of five mgd or more that receive industrial waste to have a federally approved pretreatment program. The Industrial Waste Program meets those requirements and has been approved by EPA and Ecology. This approval gives King County delegated authority to enforce federal pretreatment regulations. Ecology performs a Pretreatment Compliance Inspection of the Industrial Waste Program annually and an audit every five years.

King County's pretreatment regulations are in Section 28.84.060 of the King County Code and in King County Public Rules, Public Utilities Management (PUT), specifically PUT 8-12 through PUT 8-16. These rules and regulations apply to all non-domestic discharges to the King County Metropolitan Sewerage System, regardless whether that discharge is first to a local sewer or directly to a county sewer.

The elements of the Industrial Waste Program are:

- Discharge Limits. King County enforces two types of discharge limits: Local Limits (discharge standards), specific to the King County system and designed to prevent pass through of pollutants into Puget Sound or the biosolids, and federal categorical limits. (Federal regulations require more than 20 different categories of industry to meet specific discharge standards.) King County's local limits are stricter than National Pretreatment standards for several chemicals. In those cases, the industrial users must meet King County's stricter limits rather than the National Pretreatment standards.

- Chemicals specifically regulated by King County local limits include flammable or explosive materials, settleable solids, organic compounds, hydrogen sulfide, corrosive substances, fats, oils, and grease, metals, and cyanide. In addition, the County may set individual permit limits for compounds not specifically listed in the local limits on a case-by-case basis using such factors as the compounds' characteristics and potential impacts to receiving waters as criteria. In addition to concentration limits, permit limits may also include mass limits stated as total pounds of a chemical per day.

- Permits and authorizations. As required by federal regulations, King County issues permits to significant industrial users, i.e. those industries that discharge more than 25,000 gpd and/or are in federal categories. In addition, King County goes beyond the federal requirement and issues discharge authorizations to companies with less than 25,000 gpd that are not categorical. Discharge authorizations commonly include effluent limitations and requirements for self-monitoring and reporting. They may also include limited special conditions. Permits have more comprehensive requirements than discharge authorizations. Permits include effluent limitations and requirements for self-monitoring, sample site access, notification, record keeping, operations, and maintenance. They may also include special conditions and compliance schedules. Special conditions may include spill control plans, solvent management plans, flow restrictions, best management practices, and special studies.

- Monitoring and inspecting. King County staff monitor the discharges of all permitted companies at least twice per year and requires them to self-monitor their discharge, sometimes as often as once per day. Industrial Waste staff inspect all permitted companies at least once per year and companies with discharge authorizations at least once every five years.

- Enforcement. King County has authority to take enforcement actions against dischargers that violate their limits or other permit conditions. Monetary penalties of up to $10,000 per day are possible as well as compliance schedules. Enforcement actions are governed by the County's Enforcement Response Plan that provides for escalating enforcement actions in response to repeated violations.

- Awards and Recognition Program. To encourage voluntary compliance, King County gives plaques and/or certificates to companies that consistently comply with regulations or take actions beyond the basic requirements. Award winners are advertised annually in the Seattle Times.

- Special programs for industry groups. Industrial waste staff have developed programs specific to dentists, hospitals, shipyards and boatyards, and other groups. These programs included research on treatment methods and development of best management requirements.

- Technical Assistance and outreach. To assist businesses in complying with Industrial Waste Regulations, Industrial Waste staff host informational workshops, publish a quarterly newsletter, provide Fact Sheets, and maintain a websites with downloadable forms and information on permitting and discharge limits.

- Key Manhole monitoring. The Industrial Waste staff monitors pollutant levels throughout the collection system. Samples of wastewater are collected two weeks each year at a number of pump stations, interceptors, and "key" manholes strategically located throughout the system. Each sampling station is monitored continuously for one week during the wet weather season (November through April) and for one week during the dry weather season (May through October). When heavy metal and other pollutants are detected at unusually high concentrations, additional samples are taken throughout the system. Staff often can determine the direction the pollutant is coming from, track the discharge to its source, and take corrective action.

  Treatment plant staff sample the influent at both West Point and South Plant daily. Industrial Waste staff uses this monitoring data in connection with the key manhole data to identify and track discharges.

- Stormwater regulations. In areas served by combined sewers, stormwater connections made prior to 1961 may continue to discharge without specific authorization from the County unless the stormwater has the potential to affect the county's ability to meet federal, state, and local regulations or meet county water quality objectives. In that case, the stormwater may be regulated as an industrial waste. Under this provision, King County Industrial Waste can require stormwater dischargers to use best management practices to prevent contamination or to treat their stormwater before discharge. The County may also allow new stormwater connections if the stormwater comes from an industrial activity and will not cause overflows.

Details of the King County's Industrial Waste Program may be found on the County's website at http://dnr.metrokc.gov/wlr/indwaste/index.htm, which includes links to King County rules and regulations.

Local Hazardous Waste Management Program in King County

The Local Hazardous Waste Management Program in King County is a regional partnership whose mission is to protect and enhance public health and environmental quality in King County by helping citizens, businesses, and government reduce the threat posed by the use, storage, and disposal of hazardous materials. As source control programs go, the Program is relatively new. The first business inspections by staff from the Local Hazardous Waste Management Plan occurred in 1992.

The Program's partners include King County, the City of Seattle, and the 37 suburban cities in King County. Because of its regional nature, the Local Hazardous Waste Management Program offers its services to all residents and small quantity hazardous waste generators within King County.

Funding to support the Program's activities comes from fees added to residential and non-residential solid waste accounts, fees levied at transfer stations and landfills, fees included in wastewater treatment bills, and a small part (approximately 5%) from Washington State's Coordinated Prevention Grant program. The 2003 budget was $12.7 million.

Program services are focused on helping local residents, business owners and operators, and other institutions such as schools, hospitals, and local government departments:

- Use fewer and/or less toxic materials,
- Properly use and store hazardous materials, and
- Properly dispose of hazardous wastes.

Program staff provide a wide variety of educational and technical assistance services tailored to specific waste and specific audiences. These services range from collecting household hazardous wastes to providing one-on-one assistance to business owners and operators. Program services are delivered by:

- King County Solid Waste Division,
- Seattle Public Utilities,
- King County Water & Land Resources Division,
- Public Health – Seattle & King County, and
- Suburban cities in King County.

When working with businesses, Program staff generally target specific industry groups and geographic areas. Staff make site visits to businesses throughout King County and all of its incorporated cities to observe operating practices. When companies fail to manage their waste properly, Program staff counsel the company on correct practices. When necessary, Program staff refer the matter to other agencies including the Industrial Waste Program, Seattle Public Utilities, or Washington State Department of Ecology for regulatory action. In 2000, Program staff inspected more than 3,000 businesses. Follow-up inspections indicate that 75 to 80 percent of businesses make at least one positive change in hazardous waste management or

environmental practices because of the initial visit and some businesses make numerous changes (Galvin, 2001). The Duwamish has been included in the geographic area coverage, where attempts are made to visit every business that could generate wastes, in addition to targeted efforts for all auto body and repair shops, machine shops, photo labs and dry cleaners in the basin.

In addition to site visits, the Program provides vouchers to qualified businesses (on a matching basis – up to $500) to help defray the cost of hazardous waste management and equipment upgrading. Staff also respond to complaints about pollution incidents related to hazardous materials.

Details may be found at http://www.metrokc.gov/hazwaste/general/working.pdf.

King County CSO Control Program

King County has achieved about 80 percent reduction in CSO volume from the Diagonal CSO/SD with about 65 mgy remaining. The majority of the reduction was from a partial separation project for the Hanford system completed in 1992. This separation controlled the majority of overflows from Hanford #1 (Rainier), which discharges into the city's Diagonal Way Storm Drain. In 2026 King County is scheduled to construct a 0.6 mg storage tank for final control of Hanford #1. King County is updating its CSO control plan and expects to have a decision on any scheduling changes by the end of 2005.

In addition to individual CSO control projects, King County also implemented computerized controls to reduce overflows throughout the system. The system uses pipe storage and controls that allow regulator gates to be kept closed for a longer time to reduce the volume of flow discharged.

Further information on this program is at http://dnr.metrokc.gov/wtd/cso/index.htm.

Port of Seattle

The Port and its tenants must comply with the appropriate federal, state, county, and city regulations that address source control issues. The Port has the authority through its leases to inspect its own properties, and require that tenants comply with the appropriate source control regulations.

The Port of Seattle has a multi-phased tenant compliance program that includes an environmental review of all proposed new and renewing tenant leases, a walk-through with each tenant upon occupancy and exit, and periodic multi-media inspections depending on the type of activity conducted by the tenant. On occasion, the inspections are conducted jointly with state and local regulatory agencies.

The Port also conducts a compliance inspection program that focuses on the industrial tenants whose activities can adversely impact stormwater discharges. These include container terminal and dock operations, cargo shippers, fishing vessel berthing, barge loading and unloading, grain terminal operations, boat and shipyards and marinas. The Port evaluates the activities that can impact stormwater discharges and recommend implementation of appropriate Best Management

Practices. The Port inspects all hazardous waste generating activities, usage, and storage of hazardous materials, and maintenance activities on Port property. If compliance cannot be achieved, the Port will refer the matter directly to the appropriate regulatory agency whose regulation is affected.

Washington Department of Ecology

Ecology has 11 programs that address environmental management issues in Washington State. Further information can be found at http://www.ecy.wa.gov/.

Source control efforts for the Lower Duwamish Waterway involve the Toxics Cleanup, Water Quality: Hazardous Waste and Toxics Reduction and the Spills Prevention, Preparedness and Response Programs.

Toxics Cleanup Program

The mission of the Toxics Cleanup Program (TCP) is to get contaminants out of the environment and keep them out. To date, TCP has identified nearly 9,000 contaminated sites in Washington. Roughly 6,000 of these are the result of an underground storage tank leaking into the environment and contaminating the soil and groundwater.

Laws and Rules implemented by the TCP include:

- Model Toxics Control Act Chapter 70.105D RCW,
- Model Toxics Control Act WAC 173-340,
- Underground Storage Tanks WAC 173-360, and
- Sediment Management Standards WAC 173-204.

TCP's activities include:

Upland Contaminated Site Cleanup: The TCP's highest priority is to clean up contaminated sites that pose the greatest risk to public health and the environment. These are normally sites where the contamination threatens drinking water, exists in large quantities, is very toxic, may affect people that are living, working, or recreating near the site or a water body. Contaminated sites range from complex, highly industrialized properties to corner gas stations where a leak from an underground storage tank has occurred. The contamination may be in the soil, groundwater, air, drinking water, and/or surface water.

Sediment Site Cleanup: Sediment contamination can also pose a risk to public health and the environment. In addition to cleaning up sediments and managing multi-agency sediment cleanup projects, TCP manages sediment standards and regulations, and maintains a sediment information database.

Voluntary Cleanup: TCP's voluntary cleanup program provides services to site owners or operators who initiate cleanup of their contaminated sites. Voluntary cleanups can be conducted in a variety of ways: completely independent of the agency, independent with some agency

assistance or review, or with agency oversight under a signed legal agreement (an agreed order or a consent decree).

Underground Storage Tanks/Leaking Underground Storage Tanks: TCP currently regulates active tanks on many types of properties, including gas stations, industries, commercial properties, and governmental entities. The Program works to ensure these tanks are installed, managed, and monitored in order to prevent releases into the environment. Compliance inspections and technical assistance are regularly provided to tank owners. TCP is working to get all tanks into compliance with EPA standards. About 96 percent of underground storage tanks now have leak detection equipment. All licensed tank owners have documented their ability to pay the costs of cleaning up releases in order to obtain operating permits. TCP also works with tank owners who have documented releases to the environment to clean up the contamination, often through the voluntary cleanup program (Ecology 2003).

Under MTCA, persons who own contaminated property are often encouraged to conduct independent cleanups under Ecology's Voluntary Cleanup Program. Where more formal agreements are preferable, Ecology will enter into Agreed Orders or Consent Decrees. As a last resort, Ecology will use Enforcement Orders, which are unilateral. These orders are usually issued to a potentially liable person when Ecology believes a cleanup solution cannot be achieved expeditiously through negotiation, or if an emergency exists.

A person who refuses to comply with an Enforcement Order or Agreed Order is liable for a civil penalty of up to $25,000 a day for non-compliance in an action brought by the Office of the Attorney General. Failure to comply with an Enforcement Order may result in Ecology performing the cleanup and recovering costs of up to three times the amount spent for the cleanup. Enforcement of the Model Toxics Control Act follows TCP Policy 540A.

For UST compliance, Ecology relies generally on a tiered approach that involves an inspection with written warning (Notice of Non-Compliance [NONC]) if violations are found. A limited field penalty may be issued if problems noted in the warning letter are not corrected (Field Citation), and a formal Enforcement Order, and usually a penalty, if compliance is not achieved through the Field Citation. Penalty amounts for specific violations range from $100 to $500. In a situation where the inspector feels that a field citation is insufficient, an order requiring specific actions and a penalty may be issued. Penalty amounts are calculated using the penalty matrix in the UST inspector's notebook. The final penalty amount cannot exceed $5,000 for each tank, for each day of each violation. Violations include failure to notify the department of a release, conduct a site assessment and submitting false information.

Further information can be found at http://www.ecy.wa.gov/programs/tcp/cleanup.html

Water Quality Program

The mission of the Water Quality Program (WQP) is to protect and restore Washington's waters. In an urbanized estuary such as the Lower Duwamish Waterway, the most common problems are toxic materials such as metals and pesticides from highway runoff, industrial discharges, bacteria, and nutrients carried by stormwater runoff from roads, rooftops, and parking lots.

Laws and Rules implemented by the WQP include:

- Water Pollution Control Chapter 90.48 RCW,
- Water quality standards for surface waters WAC 173-201A,
- State waste discharge permit program WAC 173-216,
- National pollutant discharge elimination system permit program WAC 173-220,
- Wastewater discharge standards and effluent limitations WAC 173-221A, and
- Sediment management standards, WAC 173-204.

WQP's activities include:

Point Source Pollution Prevention and Management: The WQP regulates discharges of pollutants to surface and ground waters and sediments by writing wastewater discharge permits for sewage treatment plants, storm water, and industrial discharges. A permit is a set of limits, monitoring requirements, or management practices, usually specific to a discharge, which is designed to assure that a facility can meet treatment and water quality standards as well as the environmental health of sediments. The WQP conducts inspections and site visits with permit holders, provides on-site technical assistance, distributes pollution prevention and best management practices publications, conducts workshops, and holds client group sessions. During follow-up on permit violations, the Water Quality Program works with permit holders to achieve compliance, using various compliance and enforcement avenues, depending on the history and severity of the violations.

Stormwater Management: Ecology published a new Stormwater Management Manual for Western Washington in 2001 and expects to publish the Eastern version in late 2004. The manuals provide guidance on controlling the quantity and quality of stormwater runoff from development and industrial activities. Following requirements and deadlines of the Clean Water Act, Ecology is re-issuing stormwater permits to Washington's largest cities (Phase I jurisdictions) which include cities and counties with populations greater than 50,000 such as Seattle, Tacoma, King County. Ecology will also develop a Phase II permit program that will require stormwater management programs for areas with populations of 10,000 or more, such as Tukwila.

Nonpoint-Source Pollution Prevention and Management: Nonpoint-source pollution (polluted runoff) is now the leading cause of water pollution in Washington. It poses a major health and economic threat to people and harms fish, shellfish, drinking water, recreation, and aesthetics. The program's efforts to solve these problems include raising awareness, education, encouraging community action, providing funding to solve problems, offering resources and tools for nonpoint pollution control, and supporting local decision makers by reviewing Growth Management Act and State Environmental Policy Act (SEPA) documents.

Total Maximum Daily Loads (TMDLs/Water Cleanup Plans): The federal Clean Water Act requires Ecology to identify water bodies that fail to meet water quality standards and to prepare water cleanup plans or TMDLs, to improve their health. The Lower Duwamish Waterway is currently 303(d) listed for water quality impairments due to fecal coliforms and pH, and for sediment quality impairments from PCBs, PAHs, phthalates, mercury, and other metals (Ecology

1998). Through a public process, the agency works with local interests to reduce pollution in a 303(d) listed water body. WQP then proposes and establishes conditions in discharge permits and nonpoint-source management plans to reduce pollution, and a monitoring plan to evaluate the effectiveness of the cleanup plan (Ecology 2003).

Authority for enforcing state and federal water pollution control laws is contained in Chapter 90.48 RCW. Based upon this authority, Ecology has promulgated rules, policies, and guidance for initiating and escalating compliance assurance actions. Civil penalties of up to $10,000 per day may be imposed for violations of state law, permits, regulations, or orders (RCW 90.48.144). Ecology may also issue administrative orders or, through the Attorney General, initiate legal action to enforce water quality statutes (RCW 90.48.037 and .120). Generally, there is a progressive escalation of effort to bring a facility into compliance. This could start with a warning letter or a Notice of Correction under Chapter 43.05 RCW. Failure to come into compliance can result in issuance of a formal Notice of Violation and ultimately and Administrative Order and Penalty.

Further information can be found at http://www.ecy.wa.gov/programs/wq/wqhome.html

Hazardous Waste and Toxics Reduction Program

The Hazardous Waste and Toxics Reduction Program (HWTR) addresses the long-term inherent risks of using hazardous chemicals, and improper hazardous waste handling and disposal. Reducing the use of toxic chemicals is the top priority, followed by ensuring that hazardous waste generated is managed safely.

Laws and Rules implemented by the HWTR include:

- Hazardous Waste Management Chapter 70.105 RCW,
- Dangerous Waste Regulations WAC 173-303,
- Pollution Prevention Plans WAC 173-307,
- Hazardous Waste Fees WAC 173-305, and
- Hazardous Waste Reduction Act RCW 70.95, and
- Model Toxics Control Act 173-340 WAC.

HWTR's activities include:

Inspection of Hazardous Waste Generators: HWTR inspects large and medium quantity generators and hazardous waste management facilities including used oil recycling processors, to ensure compliance with state and federal regulations. HWTR also inspects facilities that may have compliance problems, targeting facilities whose activities have the potential to cause serious environmental problems. HWTR coordinates closely with local authorities, including King County, in responding to complaints and inspecting small quantity generators and other regulated facilities.

Hazardous Waste Treatment Facility Permitting, Closure, and Corrective Action: Facilities that treat, store, and/or dispose of dangerous wastes (TSDs) are required to have permits to ensure that facility design, construction, maintenance, and operating procedures protect the environment. Facilities changing or expanding their operations are required to obtain a permit modification while operating permits need to be renewed after 10 years. TSD facilities also are required to have closure plans to effectively deal with the end of their waste management activities.

The owner or operator of a (TSD) facility must institute corrective action for all releases of dangerous wastes and dangerous constituents as necessary to protect human health and the environment. This includes releases from all solid waste management units at the facility. Corrective action is required regardless of the time the waste was managed at the facility or placed in management units and regardless of whether such facilities or units were intended for the management of solid or dangerous waste. Assurances of financial responsibility for corrective actions must be provided. The owner/operator must implement corrective actions beyond the facility property boundary where necessary to protect human health and the environment. Additionally, Ecology may require the owner/operator to implement on site measures to address releases that have migrated beyond the facility boundary. In the case of a facility seeking or required to have a permit under the provisions of chapter 173-303 WAC, corrective action must be specified in the permit and contain schedules of compliance corrective action where it cannot be completed prior to issuance of the permit. The facility must also provide assurances of financial responsibility for completion of the corrective action. At a minimum, corrective actions must be consistent with the requirements of the MTCA regulations, chapter 173-340 WAC

Sites that pose the greatest hazard to human health and the environment are addressed first. HWTR is currently working on 27 high priority corrective action sites[1], including Phillips Services in the Lower Duwamish area.

Hazardous Waste Management Compliance Technical Assistance: While formal compliance enforcement work is essential to protecting the environment, technical assistance visits and providing information can also bring facilities into regulatory compliance, protect the environment, and use substantially fewer resources for a given level of environmental benefit. HWTR provides guidance to businesses on how to manage their dangerous waste safely and in compliance with appropriate regulations.

Pollution Prevention Technical Assistance: The Hazardous Waste Reduction Act encourages reducing the use and creation of hazardous substances and waste, and requires certain businesses to prepare plans for voluntarily reducing their use and creation. HWTR implements programs that feature planning for reducing sources and waste generation, supported by technical assistance field visits and follow-up work.

Hazardous Waste and Toxics Release Tracking: HWTR tracks the amounts of dangerous waste generated each year and its proper transport, treatment, and/or disposal. HWTR tracks the storage of hazardous chemicals and releases of certain toxic chemicals under the federal Emergency Planning and Community Right to Know Act as well as the hundreds of facilities

[1] Ranking performed under the Region 10 Guidelines.

that prepare pollution prevention plans and pay fees. HWTR offers assistance to citizens and local governments wanting to know about toxic chemicals in their community (Ecology 2003).

The policies of the HWTR Program are found in the *Hazardous Waste and Toxics Reduction Program Compliance Assurance Policy (Policy 3-1).*

First time visits to a business by HWTR Program staff will typically be treated as technical assistance visits. On-site technical assistance visits may result in informal enforcement actions being taken by the HWTR Program. Current agency policies and interagency agreements with EPA that implement Chapter 43.05 RCW will be employed to address violations identified during technical assistance visits.

Informal enforcement actions may include verbal directions or warnings, written letters or checklists that constitute a Notice of Correction under Chapter 43.05 RCW, and a Notice of Deficiency for hazardous waste permit applications. Informal enforcement action will not result in penalties when a business operator completes necessary actions to comply with regulatory requirements within a reasonable time. They will, however, be considered part of the public record for a facility.

Formal enforcement actions may be taken to address imminent threats to human health and the environment and other conditions which cause the facility to be classified as a Significant Non-Complier (violations of permits or orders, for example). Formal enforcement actions include administrative orders, consent agreements, judicial actions, and civil penalties. Formal enforcement actions may be appealed to the Pollution Control Hearings Board. Penalties may be assessed to any person who fails to comply with any provision of RCW 70.105 or the Dangerous Waste Regulations in WAC 173-303 of up to $10,000 per day for every violation. Each violation is a separate offense.

Further information can be found at http://www.ecy.wa.gov/programs/hwtr/index.html

Spill Prevention, Preparedness and Response Program

The Spill Prevention, Preparedness, and Response Program (SPPRP) protects the environment, public health, and safety through a comprehensive spill prevention, preparedness, and response program. The Program focuses on preventing oil spills to Washington waters and land and ensuring effective response to oil and hazardous substance spills whenever they occur.

Laws and rules implemented by SPPRP containing authorities directed at response and cleanup activities include:

- Transport of Petroleum Products - Financial Responsibility, Chapter 88.40 RCW,
- Vessel Oil Spill Prevention, and Response, Chapter 88.46 RCW,
- Oil and Hazardous Substance Spill Prevention and Response, Chapter 90.56 RCW,
- Water Pollution Control - sections related to illegal discharges to Washington waters and natural resource damages, Chapter 90.48 RCW,
- Uniform Controlled Substances Act; Chapter 69.50 RCW,

- Clean Air Act, Chapter 70.94 RCW,
- Underground Storage Tank Act, Chapter 90.76 RCW,
- Hazardous Waste Management Act, Chapter 70.105 RCW, and
- Model Toxics Control Act, Chapter 70.105D RCW.

Other rules implemented by SPPRP directed at spill prevention include:

- Facility Oil-Handling Operations and Design Standards, WAC 173-180A,
- Facility Oil-Handling Operations Manual Standards, 173-180B WAC,
- Facility Oil-Handling Training and Certification, 173-180C WAC,
- Facility Oil Spill Prevention Plan Standards, 173-180D WAC,
- Facility Contingency Plan and Contractor Certification, 173-181 WAC,
- Pre-assessment Screening and Oil Spill Compensation Table, 173-183 WAC,
- Vessel Contingency Plans and Response Contractor Standards, 317-10 WAC,
- Cargo and Passenger Vessels - Substantial Risk, 317-31 WAC,
- Bunkering Operations, 317-40 WAC, and
- Financial Responsibility for Small Tank Barges and Oil Spill Response Barges, 317-50 WAC

SPPRP's activities include:

Vessel Screening and Inspection, and Oil Transfer Oversight: SPPRP reviews safety related information on cargo and passenger vessels and conducts approximately 1,000 onboard inspections per year to provide technical assistance and verify compliance with international, federal, and state requirements. SPPRP staff inspect vessel refueling operations and provide technical assistance to help reduce the frequency of spills during fuel transfers.

Oil Handling Facilities: SPPRP staff review and approve facilities' oil spill prevention plans and operation manuals to ensure tanks and pipelines are designed and operated in a manner that will minimize the risk of oil spills. There are 35 oil handling facilities in Washington under state regulation (none in the Lower Duwamish).

Incident Investigations: SPPRP staff investigates oil and hazardous material near-miss incidents and actual accidents to determine what can be done to prevent future problems. Investigations also help target inspections and risk management initiatives.

24-Hour Response Capability: SPPRP staff provides round-the-clock response to oil spills and hazardous material incidents that pose a risk to public health, safety, and the environment.

Methamphetamine Drug Lab Cleanup: SPPRP staff work with local, state, and federal law enforcement personnel to dispose of drug lab chemicals from the sites of illicit methamphetamine drug manufacturing labs and lab dumps

Compliance and Enforcement: SPPRP staff may initiate enforcement and compliance actions for violations related to oil and hazardous material spills. These actions include imposing fines or requiring changes in operating practices to prevent future spills.

Restore Environmental Damage Caused by Oil Spills: When an oil spill causes significant damage to publicly owned natural resources. SPPRP staff coordinates with other organizations to complete an assessment of the monetary value of the damages. Once the assessment is complete, the agency seeks compensation from the responsible party(s). After the compensation is collected, the agency works with other organizations to ensure the money is used for projects to restore the injured natural resources.

The program's three sections - Prevention, Preparedness and Response may issue enforcement actions to ensure compliance with specific laws and rules it administers. Depending on the law or regulation and the nature of the violation, penalties may be assessed which range from $1,000 to $100,000 per day of violation. The amount of any penalty is based on guidance contained in specific program policy and guidelines as well as Ecology's Compliance Assurance Manual.

Further information can be found at http://www.ecy.wa.gov/programs/spills/spills.html

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (USEPA) programs address the full range of environmental management issues in Region 10, consisting of Washington, Oregon, Idaho, and Alaska.

USEPA authorities that apply to Duwamish/Diagonal source control activities include:

- Clean Air Act , 42 U.S.C. § 7401 *et seq.*,
- Clean Water Act, 33 U.S.C. § 1251, *et seq.*,
- Resource Conservation and Recovery Act, 42 U.S.C. § 321 *et seq.*,
- Oil Pollution Act of 1990, 33 U.S.C. § 2702 to 2761),
- Pollution Prevention Act, 42 U.S.C. § 13101 and 13102 *et seq.*,
- Toxic Substances Control Act, 15 U.S.C. § 2601 *et seq.*,
- Comprehensive Environmental Response Conservation and Liability Act , 42 U.S.C. § 9601 *et seq.* as amended, and
- Pertinent sections of the Code of Federal Regulations, policies, and guidelines.

Many of the federal authorities listed above are delegated to state (i.e., Ecology) and local entities (e.g., King County, City of Seattle,) for direct implementation. As an example, according to the Clean Water Act and its regulations, King County has a delegated pre-treatment program through which hazardous and industrial waste inspections are being carried out in this basin. Another example is the NPDES permit and enforcement authority delegated to Ecology under Section 402 of the Clean Water Act. Under this delegated authority Ecology has issued stormwater guidance and the general NPDES permit which provides a framework for the City of Seattle's stormwater management program and inspections.

In the case of the Resource Conservation and Recovery Act ("RCRA"), Ecology is authorized to conduct permitting and corrective actions. The RCRA workload is divided between the agencies in annual interagency Performance Partnership Agreements (PPAs). Examples of this divided RCRA workload are Boeing Plant II and Rhone/Poulenc, for which EPA is the lead, and Philip Environmental Services/Georgetown for which Ecology is the lead. Neither of these sites is directly relevant to the Duwamish/Diagonal sediment cleanup.

EPA and Ecology signed a Memorandum of Understanding (MOU), which assigned the lead for source control in the Lower Duwamish Waterway to Ecology. Under that MOA, EPA's role is to

- Provide technical assistance to Ecology on source control,
- Coordinate EPA-lead activities (e.g., RCRA at Boeing Plant II, Rhone/Poulenc, and CERCLA Early Action at Malarkey/T-117) with source control, and
- Review and concur on the Source Control Strategy, Action Plans, source control reports, and source control determinations of source control completeness or effectiveness.

Further information can be found at http://www.epa.gov/region10/

Source Control Actions Specific to Duwamish/Diagonal

This section describes the source control actions that are currently being taken, or that will be taken to minimize recontamination of Duwamish/Diagonal Way sediments. Additional information and data collection, and monitoring plans are also discussed. Appendix A provides a list of source control actions, the responsible agency, and an estimated timetable for completion.

City of Seattle Actions

Business Inspections

In 1996 and 1997, the City's Drainage and Wastewater Utility (now SPU) inspected businesses in the Diagonal Ave S CSO/SD basin as a source control action for the sediment cleanup project. The inspections, funded by an Ecology grant, focused on businesses engaging in outdoor activities that could pollute stormwater runoff. Approximately 1,000 businesses were selected for inspection based on the standard industrial classification codes. The majority of these businesses involved manufacturing, scrap yards, transportation, or automotive repair operations. Of these businesses, it was determined that more than 700 did not conduct outdoor activities that could potentially harm the environment (City of Seattle 1996). The remaining businesses were targeted for source control inspections. The names of these businesses are listed in Appendix D of the Duwamish/ Diagonal Way Cleanup Study Report (King County 2001). The 264 businesses listed received either a drive-by inspection or an actual site visit. In addition, a series of information bulletins were mailed to businesses. The objective was to control contamination from upland basins by promoting best management practices, including disposal, storage and housekeeping practices, and to increase local awareness of the importance of protecting water quality.

In 2001, 200 businesses were inspected (109 drive-by inspections and 91 complete onsite inspections) in the western portion of the Diagonal Ave S CSO/SD basin (see Figure 11). Eighty-one (81) of the businesses inspected did not comply with City stormwater source control requirements. Most problems were related to inadequate maintenance of onsite storm drainage systems (33 percent) and inadequate spill response programs (47 percent). SPU inspectors worked with the business owners to improve their stormwater pollution prevention practices. Of the businesses inspected that were found to be out of compliance in 2001, over 90 percent had achieved compliance with City stormwater requirements as of March 2002.

SPU Source Tracing Efforts in Diagonal Ave S CSO/SD

On November 8, 1999, the U.S. Coast Guard observed a large oil sheen in the Duwamish River near the outfall from the Diagonal Ave S CSO/SD extending as far as the mouth of the river at Elliott Bay. The City installed a temporary containment boom offshore of the outfall to capture oil discharged from the storm drain. In addition, City staff began to monitor conditions at the outfall on a daily basis to determine the extent and severity of the oily discharge. Observations indicated that oil was consistently present in the discharge from the Diagonal drain, but never again approaching the magnitude of the November 8 spill. Daily observations continued through

2000 and were changed to weekly inspections in 2001. The boom was moved when the Diagonal Ave S CSO/SD was cleaned in 2003 and has not been redeployed.

Although a specific source of the November 8 spill has not been clearly identified, the following two potential sources were identified that may have contributed to the problem:

- In September 2000, SPU field crews removed approximately 6,500 gallons of oil-contaminated material from a storm drain at 7th Avenue S and S Charlestown St. Attempts to video-inspect the drain were unsuccessful due to an obstruction in the line east of 7th Ave S that prevented the camera from accessing the upper section of this drainage line. Runoff from this system discharges to a small, depression located on the southwest corner of S Charlestown St and 7th Ave S. During large storm events stormwater overtops the depression, runs down 7th Ave S, and enters the Diagonal Ave S CSO/SD system at S Andover St.

- In July 2000, King County Industrial Waste notified SPU of a groundwater contamination problem in the vicinity of the Diagonal Ave S CSO/SD at Denver Avenue S and Diagonal Avenue S. Union Pacific Railroad was conducting a groundwater pump and treat operation to remediate diesel-contaminated groundwater at its railroad fueling area. On July 27, King County and SPU observed heavy oil contamination in the 30-inch sanitary sewer line on Denver Avenue S. In August, SPU field crews video-inspected both the sanitary sewer and storm drains (36-inch along Denver Ave S and 144-inch extending northeast from Diagonal Ave S) to determine whether contaminated groundwater was infiltrating into SPU utility pipes. No visible oil infiltration was observed, however several areas of active groundwater infiltration were noted. The Union Pacific recovery system removed an estimated 38,000 gallons of diesel product from the groundwater. When active product recovery operations were initiated, the oil sheen at the Diagonal outfall noticeably declined, however it was not possible to link the oil observed at the outfall directly with the diesel-contaminated groundwater.

Another incident was occurred on September 25, 2000, when fishermen reported that their nets had become fouled by a sticky white material present in the Duwamish River offshore of the Diagonal Ave S CSO/SD. The Washington State Department of Ecology responded to the spill and notified SPU. On September 26, SPU collected samples of the material and found that it was a water-soluble acrylic resin, a product that has a variety of uses including coatings for paper, textiles, and wood products, and as an ingredient in adhesives ion exchange resins. SPU investigated a number of businesses in the vicinity of the outfall and checked the nearby King County pump station to determine whether the material could have been discharged during an overflow condition. No specific source of the resin material has yet been identified.

Diagonal Ave S CSO/SD Cleaning Project

In 2002, SPU began removing accumulated sediment from the lower portion of the Diagonal Ave S CSO/SD system as part of an agreement with the Elliott Bay Duwamish Restoration Panel to eliminate a potential source of contamination to the Duwamish/Diagonal sediment cleanup area. An estimated 498 cubic yards of sediment had accumulated in the flat section of the main

line and two of the major laterals located below 4th Ave S (on Denver Ave S and 1st Ave S). SPU crews cleaned the two laterals (approximately 2,800 lineal feet) in 2002.

In 2003, a contractor began work on the mainline and the S Dakota St lateral. Because the mainline and lateral in this area are tidally influenced, the entire drain had to be taken out of service so workers could enter the pipe for cleaning. A shear gate was installed at the downstream end of the system to block tidewater from entering the pipe. Because the gate also prevented drainage from leaving the pipe, a pump bypass was installed to divert base flows from the upper end of the Diagonal system around the section of pipe to be cleaned. Bypass flow was discharged to the sanitary sewer system. Approximately 2,500 lineal feet of the main drain from 4th Ave S to Colorado Ave S. and the S. Dakota St lateral between 5th Ave S and 2nd Ave S. was cleaned in 2003 before weather conditions changed, which necessitated bringing the storm drain system back online. Sediment removed from the Diagonal drain in 2002 and 2003 (estimated at well over the 498 cubic yards that was anticipated) was transported to a nearby cement plant, where it was used in the cement manufacturing process. Information on chemicals of concern present in the drain sediments is described in the section on piped outfalls.

SPU crews began cleaning the remaining 600 feet in the S Dakota lateral in July 2004 and finished in November 2004. Sediment removed from the drain will be dewatered at an SPU vactor decant facility and disposed by SPU's solid waste disposal contractor. The line will be video inspected in 2005 to identify connections and potential dischargers in to the line.

Nevada Street Storm Drain

Recent efforts to locate the outfall have been unsuccessful. SPU will investigate the line in the spring of 2005. Current plans include using dye to locate the outfall, identifying connections, confirming drainage areas and sampling sediments.

King County/City of Seattle Joint Actions

2003 Duwamish/Diagonal Multi-Agency Inspection Project

King County Industrial Waste and Seattle Public Utilities are co-leads in a project to inspect businesses in all areas that drain to the Diagonal Ave S CSO/SD through either the city-owned storm drain system or the combined sanitary/storm sewer system via a combined sewer overflow event. The Diagonal system was selected as the first area to be inspected under this program because it discharges to an identified early action area that was scheduled for cleanup beginning in November 2003. Between March 1, 2003 and May 31, 2004, 780 businesses were inspected. (see Figure 11). Of these, 249 (32 percent) were screening visits and 531 (68 percent) were full site inspections. Sixty-five percent of the sites where full inspections were conducted required some type of corrective action. By September 2004, 92 percent of all sites with corrective actions requested have come into compliance.

Stormwater-related problems were most common, followed by spill prevention/cleanup, hazardous waste, and industrial waste issues. The following agencies are participating on this project:

- King County Industrial Waste (IW)
- Seattle Public Utilities (SPU)

- King County Hazardous Waste, Water and Land Resources Division
- Public Health – Seattle & King County

In addition, the Port of Seattle will be inspecting its tenants using similar protocols and the Department of Ecology will inspect waterfront properties that discharge stormwater directly to the Duwamish Waterway through private rather then public storm drains.

King County IW and SPU are jointly responsible for developing inspection protocols and forms, assigning businesses to be inspected to inspectors, maintaining records, reporting regularly to the U.S. EPA and the State Department of Ecology, and developing public information materials for distribution to businesses and the public. King County Hazardous Waste and Public Health provide technical assistance on issues concerning their program areas and participate in inspections.

Objectives of Inspection Project

- Minimize the potential for chemicals to exceed the Sediment Management Standards (WAC 173-204) and sediment cleanup standards set forth in a future Lower Duwamish Waterway Record of Decision following cleanup.

- Develop a picture of the numbers and types of businesses in the drainage basin and their potential for discharging chemicals of concern to the Waterway in the future.

- Identify the types of activities that can cause discharges of chemicals of concern to the Waterway and develop recommendations to minimize those discharges.

- Develop BMPs and other requirements for stormwater in combined areas.

- Assist businesses in the drainage basins in their pollution control and pollution prevention efforts.

- Evaluate the potential for recontamination of the waterway from city storm drains and city and county combined sewer overflow outfalls.

Overall Approach

A flow chart of the inspection process within the Duwamish/Diagonal basin is shown in Figure 12. The basic approach will be to identify potential dischargers of chemicals of concern through mail surveys, visual inspections, and source tracing efforts in both the storm and combined sewers. One or more inspectors will visit businesses identified as possible sources, identify corrective actions needed, and send follow up letters. The goal is for each business to be inspected only once for all three areas of concern (industrial waste, stormwater, and hazardous waste) rather than three separate times for each area, unless the site requires significant follow up actions and enforcement. In that case, the original inspector will refer the business to the agency with jurisdiction for follow up action.

Lower Duwamish Waterway

City of Seattle

Figure 11
Joint Business Inspections Completed in Diagonal CSO/SD Basin as of June 2004.

Legend

Streets
- Arterials
- Streets
- State Highway
- Interstate Freeway

CSO service area

- Site inspection
- Followup inspection
- Screening visit
- Diagonal west drainage basin
- Diagonal east drainage basin

1000 0 1000 2000 Feet

Produced by the City of Seattle
September 8, 2003

N W E S

East Waterway

Lake Washington

More details of the procedure are given below:

Training. To ensure consistency of approach King County IW and SPU held a training session attended by more than 30 inspectors from six agencies and distributed a training manual with reference material. Each of the four county or city agencies involved has designated a lead inspector who is responsible for coordinating the work of the other inspectors in their agency, for distributing information to them, and for meeting with the two co-leads of the project to discuss project procedures.

Identification of potential sources. Project staff have used several methods to identify businesses requiring inspections. These include:

Mailed surveys. Approximately 500 questionnaires were mailed to businesses in the western portion of the drainage basin with Standard Industrial Classification (SIC) codes known to be at high risk for having pollution generating activities on site. The list was generated from City of Seattle business license lists. The survey instrument consisted of a cover letter and two questionnaires: (1) IW's Industrial User Questionnaire normally used to determine if a business needs an IW permit, and (2) an additional questionnaire about pollution generating activities for stormwater. A Fact Sheet about the Inspection Project accompanied the survey questionnaires.

Visual inspection. Because responses to the initial survey were low and the post office returned many questionnaires due to incorrect addresses, project staff switched to selecting businesses to inspect by conducting visual sweeps of an area. The project first mails postcards to all businesses in a given geographical area alerting them that inspectors will be coming to their neighborhood. Inspectors are then assigned to geographic sub areas and given lists of known businesses in the sub areas plus any other information available in county and/or city files. The lists are from the sort of business licenses. With this information, inspectors conduct a sweep through the area to visually survey all businesses and determine which need to be inspected. Businesses without outside activities or industrial processes and those that do not use hazardous materials are not inspected. Names of businesses that are not inspected are recorded.

Source tracing. Targeted sampling is being conducted to assist in identifying areas of concern within the Diagonal basin. This information will be used to prioritize future source control activities in the basin.

Sediment sampling. Simultaneously with inspections, SPU placed sediment traps at the following locations in the Diagonal basin to collect samples of suspended sediment present in stormwater discharges. (see Figure 6):

- E. Marginal Way S and S Oregon St. (ST1)
- Airport Way S and 6th Ave S (ST2)
- S Forest St off ramp from I-5 and Airport Way S (ST3)
- S Winthrop St and ML King Jr. Way S (ST4)
- S College St and Rainier Ave S (ST5)
- S Bush Pl and Rainier Ave S (ST6)
- S Dakota St and 6th Ave S (ST7)—installed October 2003.

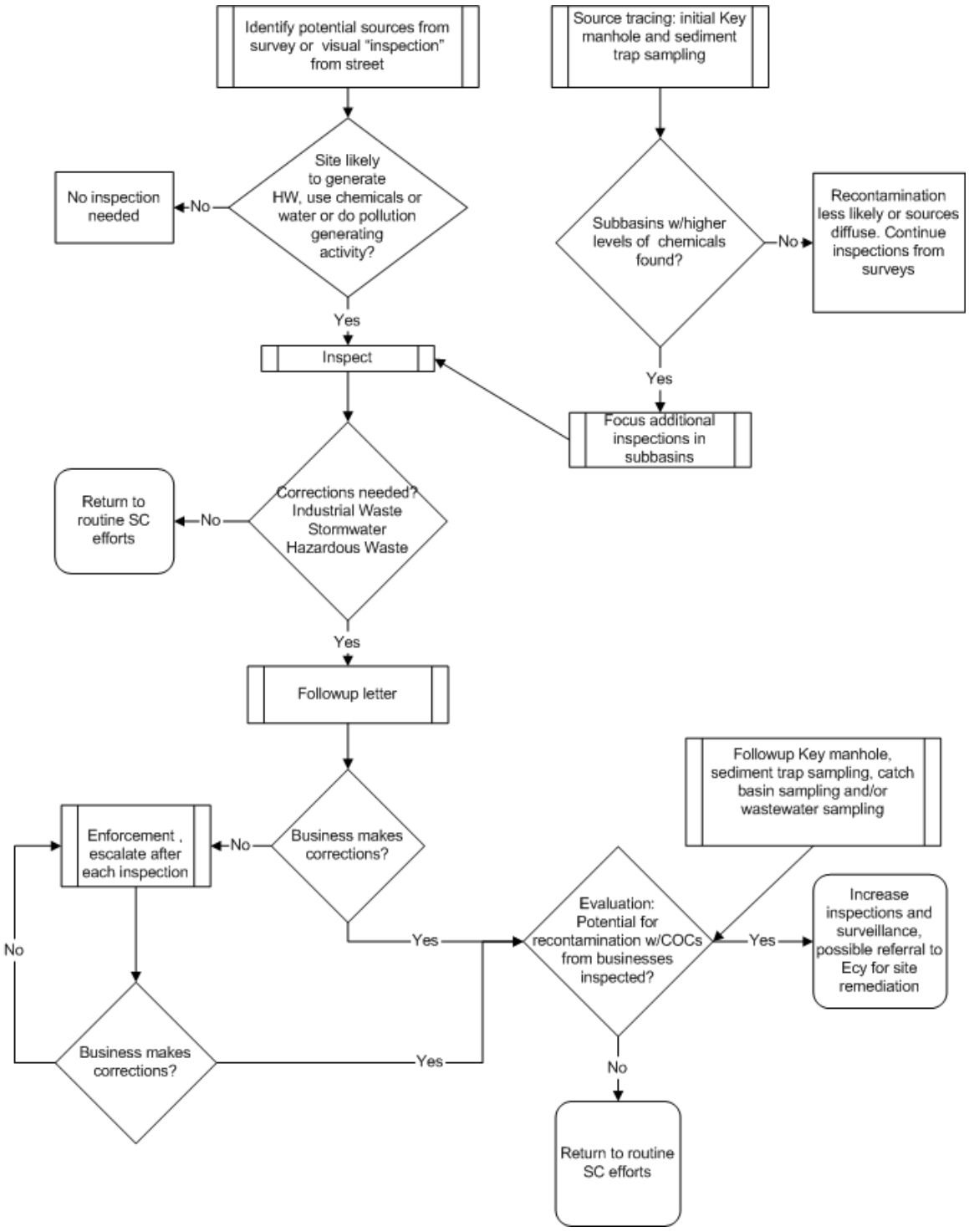

Figure 12: Business Inspection Process.

The sediment trap consists of a bracket mounted to the wall of the pipe or inside a manhole. This holds a wide-mouth Teflon bottle to collect samples of suspended sediment present in stormwater discharges. The trap is a passive device that simply traps sediment that deposits in the bottle. Two sampling devices are installed at each location to ensure that adequate amount of sediment is collected for chemical analyses. The traps remain in place for several months. The traps have been deployed 3 times:

- March 2003-August 2003
- October 2003 to February-March 2004
- February-March 2004 to August 2004.

They will be deployed again in August 2004 and removed in February-March 2005 to collect samples during the wet season.

Samples are analyzed for PCBs, semi-volatile organic compounds, metals (arsenic, copper, lead, mercury, and zinc), total organic carbon, and grain size. The results will be used to identify areas in the basin with higher than average levels of chemicals of concern for additional investigations and sampling.

Wastewater sampling. King County Industrial Waste regularly samples three pump stations in the Duwamish industrial area (Duwamish, East Marginal Way, and West Marginal Way) as part of its routine key manhole project that tracks levels of chemicals in wastewater (see Figure 6 for Duwamish station). In September 2003, a suite of phthalates (bis(2 ethylhexyl)phthalate, diethyl phthalate, dimethyl phthalate, di-n-butyl phthalate, and di–n-octyl phthalate) and polynuclear aromatic hydrocarbons were added to the usual heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc) analyzed in these samples. For comparison sake, the same suite of phthalates and polynuclear aromatic hydrocarbons were also added to the analyses done at a station in a separated sewer area (Matthews Beach Park) in northeast Seattle.

The purpose of these analyses was to identify the base level of phthalates in sanitary sewers in combined areas. If the Duwamish samples had high levels of chemicals of concern, additional key manhole monitoring would have been performed in the Duwamish Diagonal basin in order to trace sources. Although the levels of bis(2-ethylhexyl)phthalate were somewhat higher at the West Marginal Way Pump Station than at other stations, none of the chemicals were at a level as to warrant further source tracing in the Duwamish Diagonal Basin.

Onsite inspections. Onsite inspections of high-risk businesses are conducted by teams of 1 or 2 inspectors using a common inspection form developed jointly by all four groups (see Attachment B). Inspectors look at the following issues:

Industrial wastewater. Inspectors look for industrial processes using water and/or generating wastewater, inspect any pretreatment systems, and note chemicals expected to be discharged. Companies required to have industrial waste permits or other authorizations are referred to King County Industrial Waste for permitting.

Wastes/materials disposal. Inspectors review a long list of wastes and ensure they are being disposed of properly. These include acids, antifreeze, fluorescent light tubes, oils, solvents, phthalate containing materials, and PCB containing materials.

Spill Prevention. Inspectors check for proper spill prevention and cleanup both inside and outside.

Stormwater. Inspectors check outdoor areas for activities that have a high risk of polluting stormwater. These high-risk, pollution-generating activities include fueling operations, vehicle/equipment maintenance and washing, outside storage (liquids in above ground or portable containers, vehicles/equipment, and non-containerized materials, by-products, or finished products), manufacturing, equipment/vehicle/building/ship maintenance and repair, painting or finishing of vehicles/boats/buildings/equipment, landscape maintenance/construction, and construction activities.

Catch basins. Inspectors examine catch basins and other stormwater structures. They look for accumulations of materials in catch basins and discuss maintenance and cleaning schedules.

Practices. Inspectors review and discuss a list of practices and provide information on best management practices. Practices include general maintenance, "housekeeping", washwater, equipment storage and maintenance, fueling, and outdoor storage.

Because of overlapping and different authorities between the City and County regarding discharges to combined areas, project staff developed specific guidance for inspecting businesses in the combined areas. The goal for inspecting stormwater dischargers in combined areas is to minimize the discharge of chemicals of concern to the combined sewer by preventing the accidental or deliberate discharge of concentrated products or wastes to the combined sewer.

Onsite sampling. Depending on what is found during the inspection, samples may be collected to confirm whether chemicals of concern in the waterway sediment are present on a particular site. Onsite sampling involves collecting sediment samples from catch basins on the property. Grab samples are collected and analyzed for PCBs, semi-volatile organic compounds (SVOC – includes PAHs, phthalates), metals (arsenic, copper, lead, mercury, and zinc), total organic carbon, and grain size. This information will be used to confirm the presence/absence of chemicals of concern at a particular site. In addition, before and after sampling of catch basin sediment can be used to evaluate the effectiveness of corrective actions in reducing pollution discharged from the site via stormwater.

Inspectors may also call for onsite sampling of discharges to the sanitary sewer. To date none have been necessary.

Corrective actions and follow-up. Inspectors will review the results of the inspection with company representatives on site and will send follow up letters identifying corrective actions needed and the deadlines for those actions. After the deadline, the inspector will re-inspect. If the company has not made the necessary improvements at the time of the re-inspection, the inspector will then turn the issue over to the agency with authority (SPU for stormwater issues, King County for industrial pretreatment issues, and Ecology for contaminated site issues) in that area for follow up enforcement actions.

Businesses with the potential to recontaminate sediment offshore of the Diagonal Ave S CSO/SD following cleanup will be placed on more intensive inspection schedules than they would have received prior to the inspection project and may be monitored for specific chemicals of concern.

Database. Seattle Public Utilities has developed an Access database to assist in tracking the results and status of the inspection program. Inspectors submit inspection reports to SPU for entry into the database. The database is capable of generating standard reports to track various aspects of the inspection program (e.g., inspection summaries, types of problems found by sub basin and by SIC code, sites out of compliance, and referrals to other agencies). This database will allow the project to develop lists of companies at risk for discharging various types of chemicals as well as reports on numbers of inspections.

Future Actions. The efforts of the joint City/County Inspection Project are directed towards immediate identification and correction of activities generating pollutants to either the storm drains or the combined sanitary/storm sewers. The project will generate a database of businesses in the Duwamish Diagonal basin that will require follow up efforts to ensure the businesses continue to use best practices to prevent pollution. Once the joint inspection project is complete, ongoing inspections at these businesses will be added to the routine County or City inspection programs.

Phthalate Study

Because of the potential for recontamination of sediments at the Duwamish/Diagonal cleanup site with phthalates, King County and SPU have set up a special work group to deal with phthalate issues.

Members of the phthalate work group include staff from King County Industrial Waste, King County Hazardous Waste, King County Environmental Laboratory, and Seattle Public Utilities. The objectives of the work group are:

- Collect and share existing information on sources of phthalates to the sewer system and storm drain.
- Leverage resources by working cooperatively with the City of Tacoma in their Phthalate Source Study (see below).
- Develop lists of business types or specific businesses to sample and inspect as potential phthalate sources.
- Develop lists of BMPs and product substitutes to assist businesses and residents in reducing phthalate discharges to sanitary/combined sewers and storm drains.
- Assure consistent high quality sampling and analyses for phthalates.

From literature reviews and consultations with other researchers the work group learned that the most prevalent type of phthalate is bis(2-ethylhexyl)phthalate, or BEHP. Known and suspected sources of BEHP include hydraulic cutting fluids, auto detailing products (such as tire and dashboard cleaners and waxes); detergents; PVC piping and other plastics; inks and dyes; personal care and hygiene products; floor sealers and finishers among others.

Some pesticides contain phthalates as an inert ingredient. These include, but are not limited to, pesticides for vegetable crops, fungicides, insect traps, marine and non-marine coatings, floor finishers (one floor finisher was registered with EPA as a pesticide), flea collars, and others. The majority of these pesticides contain butyl benzyl phthalate, while three of these products contain di-butyl phthalate.

Phthalate Source Study

This effort is being conducted by a joint King County, Seattle Public Utilities and City of Tacoma taskforce. The study is testing a variety of products and materials used in Thea Foss Waterway and/or the Lower Duwamish Waterway for the presence of phthalates and/or polynuclear aromatic hydrocarbons (PAHs).

The source study materials and overall approach have been presented in a sample and analysis plan prepared by the City of Tacoma (*Phthalate Source Study Phase II, Thea Foss Waterway Sub-Watershed Sampling and Analysis Plan*, April 2003). The joint task force has added additional materials to test above those cited in the plan to account for the different sewerage/stormwater conveyance systems and industry base that exist in the Duwamish Waterway basin versus the Thea Foss Waterway basin.

King County and Tacoma laboratories will use EPA Method 8270C to analyze all product materials. They will measure the amount of phthalates and PAHs at levels exceeding 1-10 ppm in source materials. The laboratories will adhere to standard EPA protocols as much as possible, which includes implementing standard quality assurance practices such as analysis of method blanks, spikes, and surrogates.

The King County Laboratory and the Tacoma Laboratory will each analyze samples from one matrix type. Tacoma will test all the solids from the list; King County will test the liquids. Although phthalates and PAHs are the target analytes, the laboratories will also report up to the top five Tentatively Identified Compounds in the GC/MS analysis. The specific target parameters will be:

Table 12. *Phthalate Source Study Phase II* Target Parameters.

Polycyclic aromatic hydrocarbons (PAHs)		**Phthalates**
2-Methylnaphthalene	Acenaphthene	Benzyl butyl phthalate
Acenaphthylene	Anthracene	Bis(2-ethylhexyl) phthalate
Benzo(*a*)anthracene	Benzo(*a*)pyrene	Di-*n*-butyl phthalate
Benzo(*b*)fluoranthene	Benzo(*g,h,i*)perylene	Di-*n*-octyl phthalate
Benzo(*k*)fluoranthene	Chrysene	Diethyl phthalate
Dibenzo(*a,h*)anthracene	Fluoranthene	Dimethyl phthalate
Fluorene	Indeno(1,2,3-*cd*)pyrene	
Naphthalene	Phenanthrene	
Pyrene		

The labs analyze at least three brands or samples for each product types (as outlined in the SAP). The specific product or sample types each lab agreed to analyze were as follows:

King County Environmental Lab	Tacoma Laboratory
Carwash soap (and liquid wax)	Atmospheric dust
Windshield washer fluid (and defoggers)	Tires
Dish soap (commercial & household)	Cigarette butts
Boat effluents (graywater or bilge)	Break pad dust
Oils (new and used)	Plastic bottles
Armor All (or equiv.)	Vehicle undercoating
Tire dressing (cleaner)	Asphalt binder
Inks and dyes (to include printing inks)	Roofing tar
Asphalt sealer	Plastic wrap/packaging peanuts

Where literature data are available, the project will use these data in lieu of local analyses whenever possible.

So far the laboratories have tested oils, detergents, inks, auto care products, asphalt sealers, tires, brake pads, brake dust, cigarette butts, and packing peanuts. Results are inconclusive but seem to indicate that transportation related products (e.g. brake dust, automotive belts, and some types of used motor oil) are potentially significant sources of one of the phthalates – bis(2-ethylhexyl)phthalate. High levels of chemicals of concern were not found in detergents or inks. Work is continuing.

These analyses will be evaluated and additional studies undertaken on those products or materials with high levels of phthalates in order to determine their potential to enter the sediment.

Port of Seattle Actions

Terminal 106/108 Stormwater Protection

In August 2002, representatives of Seattle Public Utilities Surface Water Quality section and Ecology's Hazardous Waste section conducted a joint inspection of the Port of Seattle's Terminal 106/108 complex. The Port leases this complex to a single tenant, Container Care International Ltd. Under the terms of the lease, the tenant is responsible for following all applicable environmental laws and regulations. During the inspection, numerous discrepancies of Washington's Dangerous Waste and the City's surface water quality regulations were observed. Among the discrepancies were improper labeling, segregation and storage and manifesting. The facility was also found to be conducting pressure-washing operations outside of a designated area. The facility has a permanently installed, closed loop, pressure-washing system designed to capture and treat all wastewater from washing freight containers. Other issues included the general cleanliness of the grounds, employee's awareness training, spill readiness, and contingency planning.

In January 2003, the facility was re-inspected and the majority of the discrepancies had been corrected. Container Care designated an employee to monitor environmental compliance and the regulations applicable to the operation. The company was still working on four items. By May 2003, Container Care had addressed all of the discrepancies.

Terminal 108 Groundwater Pathway Investigations

The T-108 property has a history of use as a sewage treatment facility and an area used to treat and dispose of sediments contaminated with PCBs. Several studies have documented that PCBs remain in the soils of the site.

Given the chemistry of PCBs, the level of PCBs present in the soils, and the properties of tidally fluctuating groundwater, the Port of Seattle believes it is very unlikely that the soils on T-108 are a source of PCBs or other chemicals to the Lower Duwamish Waterway sediments. Ecology feels it is prudent to collect new data to ensure that this property is not a source of potential recontamination, especially with the completion of the Duwamish/Diagonal sediment cleanup in March 2004. The Port will conduct a groundwater study in the later part of 2004. This work will be done in cooperation with the Department of Ecology.

The objectives of this study are to:

- Quantify the levels of potential chemicals of concern (COCs) in the groundwater along the shoreline of T-108.
- Obtain information about the groundwater flow along the shoreline of the site.
- Assess any potential for the groundwater to be a recontamination source to the Lower Duwamish Waterway sediments.

The scope of the study includes these phases:

- Phase 1: The existing wells on site will be located and assessed for usability (earthquake or other damage), and suitability (location, depth of well screen, etc.). Existing data will be used to provide a map of potential well locations required to assess the groundwater flow toward the Lower Duwamish Waterway.

- Phase 2: Based on the existing usable, suitable wells and the existing soils and groundwater data, additional groundwater wells will be proposed. After review by Ecology, the groundwater wells will be installed.

- Phase 3: The groundwater wells will be monitored for tidal fluctuation. Based on the tidal information, and the known site chemistry, the wells will be sampled for an approved list of COCs at the timing of the tidal fluctuation designed to provide the most accurate understanding of the potential for the groundwater to be a pathway of concern to the Lower Duwamish Waterway. This sampling plan will be reviewed and approved by Ecology prior to the initiation of sampling.

- Phase 4: A report will be written providing the data and summarizing the findings.

Ecology Actions

Upland Contaminated Sites/LUSTs

Ecology will evaluate the contaminated and LUST sites presented in section 4.3.3 to determine if any of them have the potential to cause recontamination of the Duwamish/Diagonal Way sediment cleanup site.

Determinations on the potential of the site to recontaminate sediments will be done for sites:

- That are close to the Lower Duwamish Waterway,
- With groundwater contamination,
- With high potential to discharge directly to the waterway or infiltrate stormwater or CSO systems, and
- Involve chemicals that have the potential to partition into sediments.

Where there is insufficient information to make a determination, Ecology will work with the property owner to obtain it. Ecology is evaluating the use of procedures for assessing the potential risk to sediments from contaminants in groundwater that have been used at other sites. Ecology will also use best professional judgment to determine which of these sites and LUSTs will require a determination on the potential for sediment recontamination.

Ecology's initial focus will be on three sites:

Port of Seattle on the Terminal 108: Ecology will work with the Port of Seattle on the Terminal 108 groundwater assessment. The Port has allocated funds to conduct the assessment in 2004.

Federal Center South: Ecology will further investigate the Federal Center South facility as a potential source of sediment recontamination. Based on a review of available files, additional information is needed to determine whether groundwater contamination is a potential source of sediment recontamination. Ecology will work with EPA, the General Services Administration, and SPU.

Union Pacific Railroad, Argo Yard: Ecology will review existing information to assess this site as a potential source. Ecology will work with UPRR and SPU.

JANCO-United: Ecology will review existing information from EPA criminal investigation and King County files, as well as conduct a site inspection to assess this site as a potential source.

Sites listed in Tables 8, 9, and 10 will be screened using the criteria listed above according to the schedule in Attachment A.

Sites determined to be a potential source of sediment recontamination will be addressed using MTCA, the voluntary cleanup program or other authorities as needed.

Underground Storage Tank Leak Prevention

While leak prevention inspections are normally conducted by Ecology on a regular 7-year cycle, the active underground storage tank sites in the Duwamish/Diagonal basin have been the focus of a more intensive effort. Over the past year, 20% of these facilities have been inspected. The goal is to complete inspections of the remaining sites by the fall of 2005.

NPDES Permits

Toxics Cleanup program staff will review individual NPDES, stormwater and municipal permits to identify dischargers who have a potential to recontaminate sediments with chemicals of concern. TCP staff will work closely with Water Quality Program permit writers to address those concerns.

Monitoring

Source Identification and Tracing

King County and SPU monitoring efforts are intended to assist in identifying and tracing ongoing sources of the chemicals of concern present in the waterway sediments. This information will be used to focus source control efforts on specific problem areas within the Duwamish/Diagonal drainage basin and to track the progress of the source control program. As described in the section on joint King County/SPU actions, the following types of samples will continue to be collected:

- In-line sediment trap samples from the Diagonal Ave S CSO/SD storm drain system
- Onsite catch basin sediment samples
- Wastewater samples from key manholes in the combined sewer service area that could discharge to the Duwamish/Diagonal cleanup site.

Post Cleanup Sediment Monitoring

With the completion of the sediment cleanup, long term monitoring is required at the site to determine if the clean sediments are being recontaminated and the integrity of the cap is maintained. Sampling at eight stations on the remediation site will monitor if chemicals of concern are being deposited and if levels will exceed sediment cleanup objectives. Distribution of the sample locations will help identify any likely sources of the recontamination to help target source control activities if warranted. Detailed bottom depth surveys will monitor any change in cap thickness over time. The first post-cleanup sampling occurred in March 2004. Sampling will be conducted annually for the first five years. The data collected during this period will be used to determine whether the frequency of sampling should be modified.

Tracking and Reporting of Source Control Activities

Ecology is the lead for tracking, documenting and reporting the status of source control to EPA. In turn, all source control activities will be documented by the appropriate agency performing the source control work. The agencies will provide reports to Ecology, who will provide waterway-wide and basin-specific reports.

The management of information and data is divided into two levels. The first level is documentation and tracking, where information is organized so that Ecology can track and manage source control activities at a given source or within a given basin. The second level is reporting to EPA. Please refer to the Lower Duwamish Source Control Strategy for further details (Ecology 2004).

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Appendix A: Duwamish/Diagonal Early Action Sediment Cleanup - Source Control Actions

Activity		Responsible Agency	Completion Date	Comments
Application	Task Name			
D/D EA	SPU Business Inspections	King Co./Seattle	2001 *Complete*	Inspections completed.
D/D EA only	Diagonal Storm Drain Cleaning	Seattle	Summer/Fall 2004	Project is complete as of 9/04
D/D EA only	Duwamish/Diagonal SD/CSO Joint Business, Hazardous, Industrial Waste Inspections	King Co./Seattle	July 2004	The first round of the King Co. /Seattle joint business inspection program was completed in July 2004. This includes problem referral to other agencies/programs for correction, technical or compliance assistance, education. Re-inspection of facilities will be done where necessary and will continue until compliance is achieved.
D/D EA only	Nevada Street SD	Seattle	Investigation – 2004 Further action – 2005 depending on nature and extent of work needed	Re-locate outfall, add to maintenance schedule for video. Determine further needs/actions pending results of maintenance inspections
D/D EA only	Diagonal Ave. South SD	Seattle	Investigation – 2004 Further action – TBD depending on nature and extent of work needed	Is on maintenance schedule, determine further needs/actions pending results of maintenance inspections
D/D EA only	Container Care stormwater inspection (T106 & T108)	Seattle/Ecology	Completed May 2003	T106 & T108: Poor BMPs and housekeeping at Container Care affected both Terminals. Resolved by city and state joint inspection.
D/D EA only	General Services Administration/ Federal Center South	Ecology	Initial inspection: June 2004 Final assessment: Fall 2005	Initial inspection complete. Assessment of discharges to surface water and soil & groundwater as potential sources of sediment contamination ongoing.
D/D EA only	T108 Assessment for Potential On-going Source (groundwater)	Port of Seattle	Spring 2005	Additional soil & groundwater sampling needed to determine if groundwater is contaminated (historic site use) and an on-going source of sediment contamination. Additional soil remediation (historic use) may be needed.

Appendix A: Duwamish/Diagonal Early Action Sediment Cleanup - Source Control Actions

Activity		Responsible Agency	Completion Date	Comments
Application	Task Name			
D/D EA only	Union Pacific RR Diesel Spill (Argo St Rail Yard)	City/ Ecology	Summer 2005	Feb 1999 Diesel spill from locomotive refueling station was cleaned up but residual product remains in groundwater. City has observed & responded to oily sheens in LDW - suspect residual contamination follows stormwater utility corridor to LDW. Site is an independent cleanup under MTCA with no Ecology oversight. Review available data; refer to King County for Site Hazard Assessment. Determine if formal oversight is needed.
D/D EA only	Janco United site	Ecology	February 2005	Conduct initial investigation. Determine if wastes dumped on ground have been investigated and removed. Determine if site is ongoing source of phthalates.
D/D EA only	Upland Contaminated Sites	Ecology	March 2005	Review files for 37 identified sites. Determine potential as source of sediment contamination and need for additional action.
D/D EA only	LUST	Ecology	April 2005	Review files for identified LUST sites. Determine potential as source of sediment contamination and need for additional action.
throughout Lower Duwamish Waterway	UST	Ecology	January 2008	UST inspections occur every 7 years. Inspections in D/D EA are on an accelerated schedule.
throughout Lower Duwamish Waterway	Spills Emergency Response	All Agencies	Continuous	All agencies maintain emergency response preparedness, and respond as appropriate depending on the situation.
throughout Lower Duwamish Waterway	Phthalate Study	King Co./Seattle/Tacoma	Phase 1 complete, Phase 2 complete Phase 3 In progress	Phase 1= general land use relationship to phthalates, Phase 2 = source material sampling & analyses Phase 3 = Air pathway, additional source material sampling & analyses
throughout Lower Duwamish Waterway	Tenant Inspections at Port of Seattle Terminals	Port of Seattle	Continuous	Tenant compliance/SW protection programs

Attach

Business Card

Joint Inspection Program
Lower Duwamish Waterway
King County Industrial Waste
Seattle Public Utilities,
Local Hazardous Waste
Management Program

Date _____ Initial Inspection Follow-Up Inspection Screening Visit

Lead Inspector_____ Agency and Team_____

Other Inspector_____ Agency and Team_____

Legal Business Name_____ DBA_____

Business Type_____

SIC Code_____ NAICS Code_____ Observed SIC Code_____

Site Address:

Street_____ City_____ Zip_____

Site Guide_____ Position / Title_____

Phone No. _____ Cell No. _____ Fax No._____

Drainage Basin:_____ Drainage Sub-basin_____

Sewer Class: Combined, Separated, Partially Separated

Property Manager/Owner_____ Phone No. _____

Mail Address:

Same as Site Address Home Based Business Multiple sites in Area?

Street /P.O. Box_____

City_____ Zip _____

Owner / Manager_____

Phone No. _____ Cell No._____ Fax No._____

Recommend for CB sampling? Y / N CB sampling date_____

Date of Completed Inspections:

HW_____ IW_____ Stormwater_____

Date Corrective Action Requested:

HW_____ IW_____ Stormwater _____ Spill Mgmt._____

Date of Agency Referrals:

Hazardous Waste_____ Industrial Waste_____ SPU_____

Date Corrective Action Achieved:

HW_____ IW_____ Stormwater _____ Spill Mgmt._____

DATE OBSERVED OVERALL COMPLIANCE ACHIEVED_____

General Abbreviation Guide:

Y	=	Yes
N	=	No
U	=	Unknown
NA	=	Not Applicable
SS	=	Sanitary Sewer
SD	=	Storm Drain

Disposal Code Guide:

Air	=	Air Release
B	=	Burned on site for energy recovery
BIO	=	Disposed in biohazardous waste
HHW	=	Household Hazardous Waste drop-off site
SOIL	=	Disposed of onto the ground (an impervious surface)
REC	=	Recycled On-Site
SD	=	Discharged to storm drain or surface water
SEP	=	Discharged to septic system
SS	=	Discharged to sanitary sewer
SW	=	Solid waste
TBG	=	Treated by generator (specific method)
TSDR	=	Off-site treatment, storage, disposal or recycler/reclaimer
ND	=	Never disposed of / accumulating
UN	=	Unknown

Use only these codes for Volume, Mass or Unit of Product or Waste

G	=	Gallons
LB	=	Pounds
EA	=	Each

Use only these codes for Time (for use in rate for disposal)

D	=	Day
W	=	Week
M	=	Month
Q	=	Quarter
Y	=	Year

BUSINESS NAME_____

INDUSTRIAL WASTEWATER – Select any industrial processes or activities generating wastewater discharged to sanitary sewer

- ❑ Is industrial wastewater discharged to the sewer? Y / N / U

❑ Industrial process/activity generating wastewater	Quantity / Time (Use Codes)	Method O.K.?
Cleaning & rinsing manufactured parts		Y / N / U
Cleaning production equipment	_____	Y / N / U
Cleaning & sanitation of production area		Y / N / U
Photo processing wastewater	_____	Y / N / U
Parts tumbler / deburr	_____	Y / N / U
Non-contact cooling water	_____	Y / N / U
Contact cooling water	_____	Y / N / U
Boiler feed/blow down	_____	Y / N / U
Silk screen washing	_____	Y / N / U
Water jet cutting	_____	Y / N / U
Aqueous Parts Cleaning	_____	Y / N / U
Other _____	_____	Y / N / U

Observations: _____

_____

_____

PRETREATMENT - Describe wastewater pretreatment system(s) for discharges to sanitary/combined sewers

- ❑ Is pretreatment provided for industrial wastes discharged to sewer? Y / N / U

❑ Pretreatment System	Purpose	Maintenance schedule Use Codes
1. Oil/Water Separator		
2. pH Neutralization	_____	_____
3. Filtration	_____	_____
4. Chemical Precipitation	_____	_____
5. _____	_____	_____

Observations regarding condition/operation/maintenance: _____

_____

_____

Pollutants expected to be discharged to the sanitary sewer following pretreatment:

None Oils Heavy metals (specify below) Solids BTEX

Solvents PCBs Acidic solutions Caustic solutions Detergents

Phthalates Other (Specify) _____

Notes: _____

_____

BUSINESS NAME:_____

<u>WASTES/MATERIAL DISPOSAL</u> - Describe liquid wastes and sludges removed by means other than sanitary / combined sewers (e.g., temporarily stored onsite and shipped offsite for disposal)?

Type of Waste / Substance	Quantity / Time (use codes)	Manifests	Labeling	Disposal Method (use codes)	Method O.K. ?
Acids		Y / N	Y / N		Y / N / U
Antifreeze		Y / N	Y / N		Y / N / U
Batteries		Y / N	Y / N		Y / N / U
Caustic Bases		Y / N	Y / N		Y / N / U
Dyes and Inks		Y / N	Y / N		Y / N / U
Fluorescent Light Tubes		Y / N	Y / N		Y / N / U
Metals		Y / N	Y / N		Y / N / U
Paints / Coatings		Y / N	Y / N		Y / N / U
Pesticides / Herbicides/ Fertilizers		Y / N	Y / N		Y / N / U
Petroleum / Oils (e.g., hydraulic, cutting, motor oil)		Y / N	Y / N		Y / N / U
Photochemicals / X-ray Fixer		Y / N	Y / N		Y / N / U
Solvents		Y / N	Y / N		Y / N / U
Toxics / Poisons		Y / N	Y / N		Y / N / U
Phthalate Containing Materials		Y / N	Y / N		Y / N / U
PCB Containing Materials		Y / N	Y / N		Y / N / U
Other:		Y / N	Y / N		Y / N / U

<u>SPILL PREVENTION</u> - Describe spill prevention measures at each area below:

Area	Inside/ Outside	Interior floor drains to sewer	Secondary Containment	Notes
Fueling	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	
Chemical Storage	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	
Waste Storage	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	
Pretreatment	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	
Loading / Unloading	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	
Manufacturing / Processing	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	
Other:_____ _____	In	SS / SD / None / U	Y / N / NA	
	Out		Y / N / NA	

BUSINESS NAME_____

OUTDOOR ACTIVITIES

HIGH RISK POLLUTION GENERATING ACTIVITES (check all that are appropriate)

- Fueling operations
- Vehicle, equipment, or building washing or cleaning
- Truck or rail loading or unloading of liquid or solid materials
- Liquid storage in stationary aboveground tanks
- Outside portable container storage of liquids, food wastes, or dangerous wastes
- Outside storage of non-containerized materials, by-products, or finished products
- Outside manufacturing activity
- Vehicle and equipment maintenance and repair
- Parking or storage of vehicles and equipment
- Building, repair, and maintenance of ships and boats
- Painting or finishing of vehicles, boats, buildings, or equipment
- Commercial animal handling
- Landscape construction or maintenance business
- Active onsite construction operations with excavated/exposed soil that could be eroded/transported to storm drains

SPILL PREVENTION **N / A**

Is there a Spill Plan for the facility? Y / N

Is the plan posted in a suitable location? Y / N

Are employees trained and aware of the Spill Plan? Y / N

Circle closest to frequency of training Monthly Quarterly Annually

Are spill clean-up materials kept on-site? Y / N

Select materials kept on-site from the following list:

sorbent booms sorbent pads granular sorbent kitty litter
drip pans drain cover acid/base neutralizer solvent absorbent,

Are cleanup materials appropriate for the chemicals stored on-site? Y / N

Are cleanup materials stored in a container clearly labeled “SPILL KIT”? Y / N

Are spill kits located near high-risk spill areas? Y / N

STORMWATER RELATED STRUCTURES

Are catch basins (CBs) on site? Y / N

If yes, how many? _____

Are CBs equipped with outlet traps? Y / N

Select outlet trap type PVC Elbow Metal Elbow

Has material accumulated to fill over 60% of the capacity of the CB? Y / N

Select material(s) in CB Sediment Plants Trash

Is there evidence of contaminants in CBs? Y / N

Select contaminant Oil/Grease Paint Solvent Sewage Unknown

Other:_____

Are catch basins regularly inspected and cleaned? Y / N

Circle closest to frequency of inspection Monthly Quarterly Annually As needed

Circle closest to frequency of cleaning Monthly Quarterly Annually As needed

BUSINESS NAME:_____

GENERAL MAINTENANCE PRACTICES

Are the outdoor paved areas regularly swept? Y / N

Are the outdoor paved areas washed? Y / N

What is the frequency of sweeping/washing? Daily Weekly Monthly As Needed

WASHWATER PRACTICES

Are vehicles or equipment washed outside? Y / N

Select Type of Vehicles? Passenger 10-ton truck >10-ton trucks

Select Type of Equipment Forklifts Backhoes Other:_____

What is the frequency of washing? Daily Weekly Monthly Annually

What is the number of units washed per period indicated above?_____

Where does washwater drain to? Sanitary Sewer Storm System Infiltration

What cleaning materials are used? Liquid Wax, Brand_____ Soap, Brand_____
Detergent, Brand_____ Other, Brand_____

Does facility conduct auto detailing? Y / N

VEHICLE AND HEAVY EQUIPMENT STORAGE AND MAINTENANCE

Are trucks and heavy equipment parked outside? Y / N.

Select Type of Vehicles? Passenger 10-ton truck >10-ton trucks

Select Type of Equipment Forklifts Construction Related Other_____

Are there signs of leaking vehicles? Y / N

Is there repair and maintenance of vehicles outside? Y / N

STATIONARY FUELING OPERATIONS

Is there a fixed location for vehicle fueling on-site (i.e. permanent fuel pumps / tanks)? Y / N

Select type of fuel used. Diesel Gasoline

Where are tanks located? Underground Aboveground

Is there a fuel pad? Y / N

Is the fueling area covered? Y / N

Does the fuel pad have a separate drainage system? Y / N

MOBILE FUELING OPERATIONS

Is a truck mounted diesel tank or tanker truck used to fuel other vehicles on site? Y / N

Where is refueling performed? Single Location Wherever Vehicles Parked

Are CBs in vicinity of fueling location(s) Y / N

Are required cleanup materials for mobile fueling present on the fueling vehicle? Y / N

Non-water absorbents capable of absorbing 16 gallons of diesel

A storm drain cover / plug kit A minimum 10-foot length containment boom

OUTDOOR STORAGE AREAS

Circle types of materials stored outside Containerized Products Stockpiled Material New Equipment
Used Equipment Equipment/Materials Awaiting Disposal/Recycling Other_____

Are storage areas paved? Y / N

Are storage areas and materials covered? Y / N

Are storage areas protected from stormwater run-on/run-off (i.e., berms or other barriers installed?) Y / N

Does yard area have oil staining or visible sheen? Y / N Signs of distressed vegetation? Y / N

Rate General Housekeeping in Storage Areas Unacceptable Needs Some Work Good