Phase I Report for City of Portland Priority 1 Basins

Prepared for

City of Portland
Bureau of Environmental Services
Portland Harbor Program

May 2006

Prepared by

Groundwater Solutions, Inc.

Printed on Recycled and Recyclable Paper

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Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4-Db	2,4-dichlorophenoxybutyric acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
DDD	4,4′ tetrachlorodiphenylethane
DDE	4,4′ dichlorodiphenyldichloroethane
DDT	4,4′ dichlorodiphenyltrichloroethane
DDT (total)	sum of DDD, DDE, and DDT concentrations
BEHP	bis(2-ethylhexyl)phthalate
BES	Bureau of Environmental Services
bgs	below ground surface
BNSF	Burlington Northern Santa Fe Railroad
BTEX	benzene, toluene, ethylbenzene, and xylene
CBWTP	Columbia Boulevard Wastewater Treatment Plant
CCC	chronic criterion
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
City	City of Portland
cm	centimeter(s)
CSM	conceptual site model
CSO	combined sewer overflow
DEQ	Oregon Department of Environmental Quality
ECSI	Environmental Cleanup Site Information
EDIR	environmental data interpretive report
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
ft	foot/feet
HPAH	high molecular weight polynuclear aromatic hydrocarbon
IDEP	Illicit Discharge Elimination Program
IGA	intergovernmental agreement
ISA	initial study area
LPAH	low molecular weight polynuclear aromatic hydrocarbon
LWG	Lower Willamette Group
MCB	monochlorobenzene

µg/kg	microgram(s) per kilogram
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
MGP	manufactured gas plant
NEC	No Exposure Certification
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OFC	On-site Containment Facility
ODOT	Oregon Department of Transportation
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCOI	potential contaminant of interest
PCP	pentachlorophenol
RI	remedial investigation
RI/SCM	remedial investigation/source control measure
SC/RI	site characterization/remedial investigation
SVOC	semivolatile organic compound
TCE	trichloroethylene
TOC	total organic carbon
TPH	total petroleum hydrocarbon(s)
TSCA	Toxic Substances Control Act
UST	underground storage tank
VCP	Voluntary Cleanup Program
VOC	volatile organic compound

SECTION 1

Introduction

The City of Portland's (City's) stormwater collection system serves as a conduit for stormwater draining from industrial, commercial, residential, municipal, and undeveloped lands located in Portland, Oregon. The system is also utilized for discharge of other waters, such as non-contact cooling water and remediated groundwater, for which municipal wastewater treatment is not considered necessary. Twenty City outfalls discharge stormwater to the reach of the Willamette River that has been identified as the Portland Harbor Superfund Site initial study area (ISA); see Figure 1-1. Upland sources located within the stormwater drainage basins associated with the outfalls have the potential to contribute sediment-laden stormwater runoff containing a variety of chemicals, depending on the land use, to the stormwater conveyance system. On August 13, 2003, the Bureau of Environmental Services (BES) and the Oregon Department of Environmental Quality (DEQ) entered into a remedial investigation/source control measure (RI/SCM) intergovernmental agreement (IGA) to evaluate and control potential upland sources of discharges to the City stormwater conveyance system that might adversely affect sediment and surface water quality in the Portland Harbor.

Pursuant to the IGA, a *Programmatic Source Control Remedial Investigation Work Plan for the City of Portland Outfalls Project* was prepared (CH2M HILL, March 2004). The document is referred to as "the Programmatic Work Plan" in this Phase 1 Report. The Programmatic Work Plan describes the weight-of-evidence approach that will be used to evaluate the potential for past and current discharges to the City stormwater conveyance system to contribute to Willamette River sediment contamination within the ISA (via the City outfalls). The Programmatic Work Plan outlines a structured evaluation sequence by prioritizing each of the drainage basins that currently discharge stormwater to the ISA.

Each drainage basin was categorized in one of four priorities (Priorities 1 through 4) using surface sediment data collected by BES near the associated outfalls, harbor-wide sediment data compiled by the Lower Willamette Group (LWG), and known upland conditions. Priority 1 basins were considered the highest priority and were assigned as the first group to undergo the site characterization/remedial investigation (RI) process discussed in the Programmatic Work Plan. On the basis of samples collected by BES, Priority 1 basins were defined as having considerably elevated concentrations of contaminants in the surface sediments near the respective outfalls that may be associated with upland sources located within the drainage basin. The Priority 1 basins are: M-1, M-3, 18, 19/19A, 22B, and 22C. Basins M-1 and 18 were evaluated as part of the Source Control Pilot Project (CH2M HILL, November 2005). Evaluations of the remaining Priority 1 basins are discussed in this report and will be referred to as the "subject basins" (M-3, 19/19A, 22B, and 22C).

Development of this Phase 1 Report is the first step in meeting the City objective of initiating basin-specific RIs for all Priority 1 basins, as proposed in the Programmatic Work Plan.

The primary objective of this Phase 1 Report is to identify basin-specific potential contaminants of interest (PCOI) that can be used to focus source investigation activities. These PCOIs may be updated as additional in-river sediment data or in-river target concentrations are developed through the CERCLA process. The second objective is to identify potential sources of these PCOIs and recommend next steps for source investigation work.

The process to meet these objectives is as follows:

- Present the results of the initial basin assessment activities, such as the basin background information included in the *Preliminary Evaluation of City Outfalls – Portland Harbor Study Area* (Notebooks 1 and 2), (CH2M HILL, July 2000, and CH2M HILL, December 2000).
- Evaluate the in-river surface sediment data collected near the outfalls associated with each of the subject basins (M-3, 19/19A, 22B, and 22C) to determine which constituents should be included in the initial lists of basin-specific PCOIs.
- Prepare conceptual site models for each of the subject basins to summarize the current understanding of past and current potential sources, site contaminants, and migration pathways associated with each basin.
- Present a complete basin-specific PCOI list that takes into account the information obtained from the in-river surface sediment data and the conceptual site models.
- Identify data gaps and recommend additional actions or next steps for each of the subject basins.

The following elements are addressed in subsequent sections of this Phase 1 Report:

- Basin Background (Section 2)
- Evaluation of In-River City Sediment Data (Section 3)
- Basin Conceptual Site Models (Section 4)
- Recommended Actions (Section 5)
- References (Section 6)

Most of the materials used for developing this report were compiled in late 2004, when the DEQ/EPA Joint Source Control Strategy (JSCS) was not available. These include the facility lists for each basin (see the tables in Section 2), the comparison tables for sediment exceedances (see Section 3), and the comparison of upland site soil and groundwater data contained in Appendix A. Facility lists were taken from Notebooks 1 and 2 (CH2M HILL, July 2000, and CH2M HILL, December 2000), and thus represent the facilities that were in operation at that time. While some tables have been partially updated, high occupancy turnover is common. Information contained in Section 2 tables may not reflect current operations or permit status.

After discussion of the level of effort to update these materials, DEQ and BES agreed that these materials would not be updated, but that subsequent reports and comparison would address JSCS screening levels. The City cross-checked the conclusions based on earlier screening levels to verify that they would not significantly change if the JSCS screening levels were used and confirmed that the PCOI lists and recommended actions would be the same.

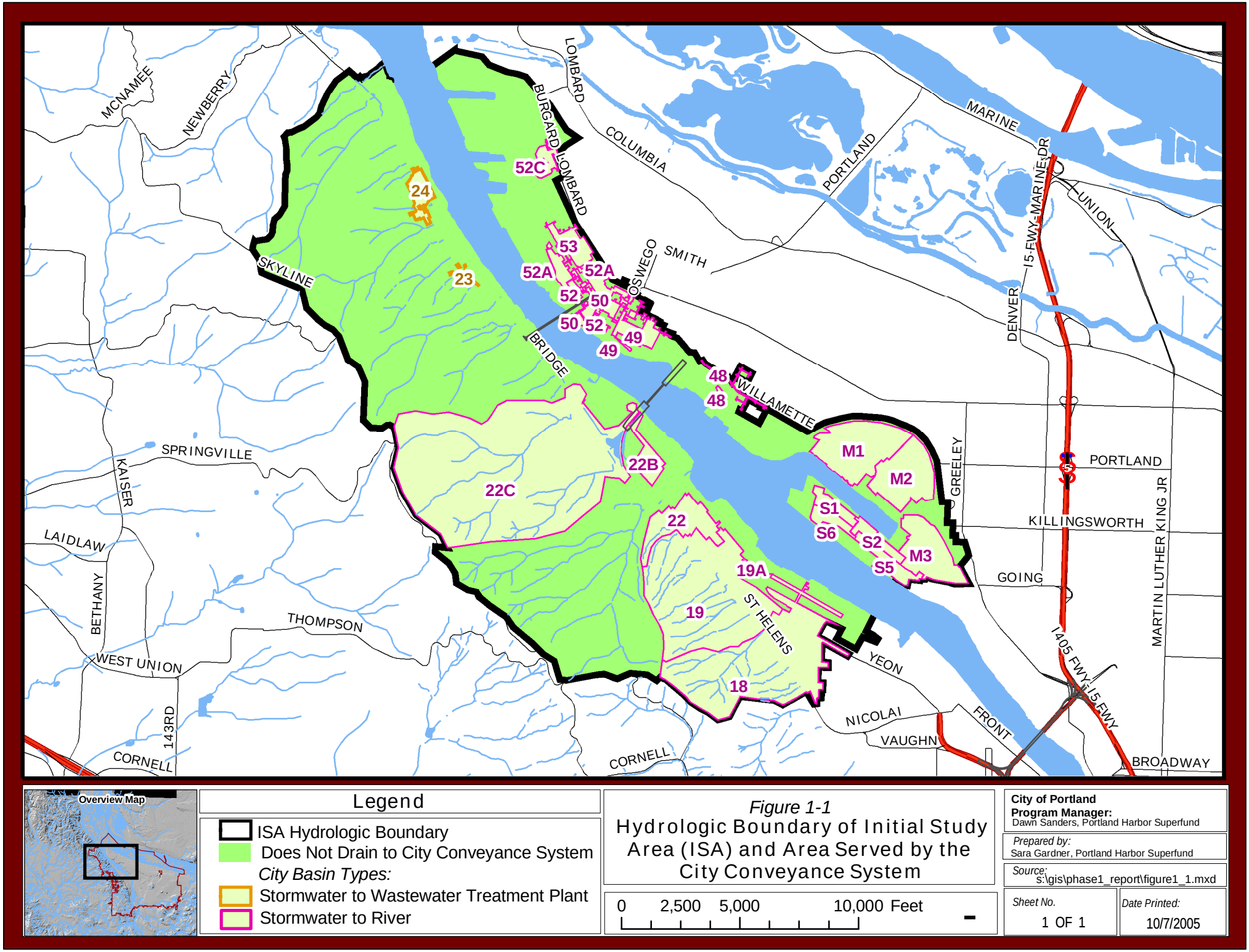

Figure 1-1
Hydrologic Boundary of Initial Study Area (ISA) and Area Served by the City Conveyance System

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Date Printed:
10/7/2005

SECTION 2

Basin Background

The hydrologic basin boundary associated with the Portland Harbor ISA is shown in Figure 1-1. The hydrologic boundary represents the entire area that drains into the Willamette River within the bounds of the ISA. Figure 1-1 also shows the approximate basin delineation for each of the City outfalls that drains stormwater to either the Willamette River or the Columbia Boulevard Wastewater Treatment Plant (CBWTP)[1]. As shown in Figure 1-1, the City's stormwater conveyance system transports stormwater to the river from approximately 35 percent of the hydrologic basin.

This Phase 1 Report focuses on the subject basins: M-3, 19/19A, 22B, and 22C. Each of these stormwater basins and associated outfalls is discussed in further detail in the following sections.

2.1 Basin M-3

2.1.1 Outfall M-3 Characteristics

Outfall M-3 (a 60-inch-diameter pipe) is located in the southeastern corner of the Swan Island Lagoon (on the east side of the river) at river mile 8.9; see Figure 2-1. This outfall was constructed in 1989. At low and high river stage, the outfall discharge is below the low tide water line and river water may back up into the outfall. Riprap has been placed along both sides of the outfall pipe. Outside the riprap zone, the bank is generally sandy with a gentle slope. On October 15, 2002, during the City's sampling event that was conducted at low river stage, the outfall was partially submerged at low tide and appeared to be three-fourths submerged at the apparent high tide water line.

Sediment trend analysis in the lagoon adjacent to Outfall M-3 indicated that the general sediment trend in the area is "total deposition I" (i.e., the sediment bed is not mobile and is a zone of accretion) (GeoSea Consulting, 2001). According to the GeoSea Consulting report, most occurrences of "very fine-grained sediment (mud)" in the lower Willamette River appear in lagoon-type settings where water flow is minimal. "Very fine-grained sediments" in a fluvial setting are transported predominantly in suspension and tend to settle out where water velocity decreases to a point so that the sediment cannot be held in suspension. In the lower Willamette, "very fine-grained, muddy sediment" is present in primarily three locations where water flow is minimal: the basin between Ross Island and Hardtack Island, Swan Island basin, and Terminal 4 (GeoSea Consulting, 2001). Material that is transported from the mainstem or within Swan Island Lagoon may be transported and redeposited within the lagoon, including the head of the lagoon. This could affect the interpretation of spatial patterns in sediment concentrations.

[1] Outfall basin boundaries are estimated based on system mapping and upland site information. Modifications to basin boundaries are made as more specific facility information becomes available. Future boundary revisions may alter the land use percentages included in the drainage basin descriptions in this section.

The riverbank is generally sandy and bends at a right angle at the outfall location. There is a small public boat launch and dock located 100 feet to the south of the outfall, with a pier that extends approximately 50 feet into the lagoon. Prop wash from boat activity along the dock may affect sediment transport in the area.

2.1.2 Drainage Basin M-3 Characteristics

The stormwater drainage basin served by Outfall M-3 originally was estimated to be approximately 106 acres of land. This basin was redelineated in 2003 and now is estimated to be 111 acres. A small portion of the basin lies within approximately 100 feet of the lagoon shoreline, with the majority of the basin more than 500 feet from the shoreline. On the basis of 2003 estimates, approximately 72 percent of the basin is zoned for industrial land use and approximately 14 percent is zoned as an employment district[2]. Rights-of-way[3] are approximately 14 percent of the basin (15 acres of City roads). No residences are located within this basin. Table 2-1 shows the industries located in the basin.

2.2 Basins 19/19A

The embayment adjacent to Outfalls 19 and 19A is likely a depositional area for upstream sediments. Redeposition and transport of contaminated sediment occur as the prop wash from tugboats creates sediment plumes in the water column when the boats enter and leave this area (see Figure 2-2). For this reason, it is unlikely that the pattern of sediment concentrations can be attributed to a specific upland or overwater source including Outfalls 19 and 19A. Therefore, Outfalls 19 and 19A sediment data are evaluated together and the PCOIs that are identified for further source investigation are based on potential sources within each basin (see Section 3).

2.2.1 Outfall 19 Characteristics

Outfall 19 (a 42-inch-diameter pipe) is located on the west side of the river at river mile 8.2. The outfall is located in the western (downriver) corner of a cove that is used to dock tugboats and barges (see Figure 2-2). The outfall extends into the river and discharges underwater. The Federal Housing Authority originally constructed this outfall as a combined system in the mid-1940s. Discharge from this outfall was converted from combined stormwater/sanitary flow to a stormwater-only flow in about 1970.

Sediment trend analysis in the river adjacent to Outfall 19 indicated that the general sediment trend in the cove is "dynamic equilibrium" (i.e., there is a grain-by-grain replacement along the transport path without accumulation) (GeoSea Consulting, 2001). The downstream shoreline adjacent to Outfalls 19 and 19A is perpendicular to the river flow and is likely an area of deposition for sediment being transported from upstream. This depositional nature likely is offset by the high disturbance from boat traffic, which can

[2] The employment district allows a wide range of employment opportunities without potential conflicts from interspersed residential uses. The emphasis of the district is on industrial and industrially related uses. Other commercial uses are allowed to support a wide range of services and employment opportunities.

[3] Rights-of-way (ROW) acreage estimates are quantified as the undeeded area between tax lots, as defined by the Multnomah County tax assessor. The ROW acreage includes land uses such as railroad tracks and locally and state-owned roads, and includes both pervious and impervious roads.

resuspend material that is either transported downstream or redeposited within the same general area.

2.2.2 Drainage Basin 19 Characteristics

Outfall 19 drains approximately 491 acres of land and discharges to the Willamette River. The nearest edge of the basin lies more than 800 feet from the shoreline. On the basis of 2003 estimates, 27.4 percent of the basin is zoned for industrial land, 0.3 percent is zoned low-density residential, and 65 percent is zoned rural and open space. Rights-of-way are 7.3 percent of the basin[4]. Table 2-2 shows the industries within the basin.

2.2.3 Outfall 19A Characteristics

Outfall 19A (a 60-inch-diameter pipe) was built about 1977. It is located on the west side of the river at river mile 8.2, approximately 150 feet south of Outfall 19 (see Figure 2-2). The outfall is located in the northwestern (downriver) corner of a cove that is used to dock tugboats and barges. At low river stage, the outfall is above the high tide water line. At high river stage, the outfall is below the high tide water line and river water may back up into the outfall. On October 15, 2002 (during a sampling event that was conducted at low river stage), the low tide water line was approximately 10 feet from the outfall and the high tide water line was at the base of the outfall, but below the bottom of the outfall pipe. Riprap was observed along the side and directly in front of the outfall. The riverbank to the southeast (upriver) was generally sandy, with a gradual slope. The riverbank to the north (downriver) was sandy up to the high tide water line, then changed to a silty material with a gradual slope.

Sediment trend analysis in the river adjacent to Outfall 19A indicated that the general sediment trend in the cove is "dynamic equilibrium" (i.e., there is a grain-by-grain replacement, without accumulation, along the transport path) (GeoSea Consulting, 2001). The downstream shoreline adjacent to Outfalls 19 and 19A is perpendicular to the river flow and is likely an area of deposition for sediment being transported from upstream. This depositional nature likely is offset by the high disturbance from boat traffic, which can resuspend material that is either transported downstream or redeposited within the same general area.

2.2.4 Drainage Basin 19A Characteristics

Outfall 19A drains approximately 1.5 acres of land and is predominantly NW Front Avenue right-of-way, with some industrial driveway drainage. *[Note: the drainage acreage for Basin 19A has been refined since the Programmatic Work Plan was developed, based on plumbing records, topography, and field observations.]* The basin lies more than 400 feet from the shoreline. On the basis of 2005 estimates, nearly 100 percent of the basin is right-of-way. According to City records, no industries currently are connected to the stormwater conveyance system. Some driveway drainage from adjacent industries may sheet flow to right-of-way inlets (e.g., Shaver Transportation Company and Lakeside Industries). Table 2-3 shows the industries within the basin.

[4] Right-of-way estimates for Basin 19: 14 acres of City paved roads, 13 acres of state highway, 4 acres of unpaved roads or undeveloped property, and 4 acres of railroad property.

2.3 Basin 22B

2.3.1 Outfall 22B Characteristics

Outfall 22B (a 48-inch-diameter pipe) is located on the west side of the river at river mile 6.8, just upstream of the railroad bridge; see Figure 2-3. This outfall was constructed in 1968 as an emergency overflow point for the Guilds Lake sanitary sewer pump station. In 1980, the City installed a stormwater conveyance system in the area and used this existing structure for the stormwater outfall. At low and high river stage, the outfall is located above the apparent high tide water line. On October 16, 2002 (during a sampling event that was conducted at low river stage), the low tide water line was approximately 250 feet from the outfall and the high tide water line was not recorded. A shallow erosional channel extended from the outfall terminus to the low tide water line. The upper 50 feet of the channel below the outfall were approximately 0.5 foot deep, 2 feet wide, and lined with a thin (approximately 1 inch deep) silt layer, gravel, small cobbles, and woody debris. The lower 200 feet of the channel were approximately 0.5 foot deep, 1 foot wide, and lined with a thin layer of silt, which ended at the apparent high tide water line.

Sediment trend analysis in the river adjacent to Outfall 22B indicated that the general sediment trend in the area is "dynamic equilibrium" (i.e., there is a grain-by-grain replacement along the transport path, with no accumulation) (GeoSea Consulting, 2001). With the exception of footings from the railroad bridge, the bank is generally parallel to river flow, without large structures or obvious features that may create localized sediment shoaling or scouring near the outfall.

2.3.2 Drainage Basin 22B Characteristics

Outfall 22B provides drainage for industrial sites and NW Front Avenue. The drainage basin served by Outfall 22B is approximately 37 acres and is approximately 300 feet from the shoreline. On the basis of 2003 estimates, 81 percent of the basin is zoned industrial and rights-of-way are 19 percent of the basin[5]. Table 2-4 shows the industries located within the basin. Before Outfall 22B was constructed in 1980, surface drainage from this area flowed to the river in the same general location as the current Outfall 22B via a drainage ditch starting at the north end of West Doane Lake, running parallel to the railroad tracks, then to the river. In 1980, a berm was constructed near the Guilds Lake pump station to prevent West Doane Lake discharges into the ditch and river (AMEC, 2003).

2.4 Basin 22C

2.4.1 Outfall 22C Characteristics

Outfall 22C (an 84-inch-diameter pipe) is located on the west side of the river at river mile 6.75, just downstream of the railroad bridge; see Figure 2-4. This outfall was constructed in 1980. At low and high river stages, the outfall is located above the apparent high tide water line. On October 17, 2002 (during a sampling event that was conducted at low river stage), the low tide water line was approximately 250 feet from the outfall and the high tide water

[5] Right-of-way estimates for Basin 22B: 6 acres of City paved roads and 1 acre of railroad property.

line was not recorded. The outfall discharged into a large plunge pool, which drained via a shallow erosional channel from the outfall terminus to the low tide water line. The channel was approximately 1 foot wide and 0.5 foot deep and lined with a thin layer of silt, which ended at the apparent high tide water line.

Sediment trend analysis in the river adjacent to Outfall 22C indicated that the general sediment trend in the area is "dynamic equilibrium" (i.e., there is a grain-by-grain replacement along the transport path; the bed is neither accreting nor eroding) (GeoSea Consulting, 2001). The outfall is located at the south corner of the Wacker Siltronic property just upstream from Doane Point (see Section 3, Figure 3-3). Because the outfall discharges into a small bay, this area is likely an area of deposition for material that discharges from the outfall or shoreline material transported from upstream.

2.4.2 Drainage Basin 22C Characteristics

Outfall 22C provides drainage for upland wetlands, a remnant of Doane Lake (North Doane Lake), Doane Creek and several unnamed Forest Park streams, a few industrial sites, and a portion of State Highway 30. The drainage basin served by Outfall 22C is approximately 1,009 acres. On the basis of 2003 estimates, approximately 5 percent of the basin is zoned industrial, and 88 percent of the basin is zoned rural and open space. Rights-of-way are approximately 7 percent of the basin[6]. Table 2-5 shows the industries within the basin. Note that there are a number of facilities listed in Table 2-5 whose drainage to Outfall 22C is uncertain. Sites located west of NW St. Helens Road are not served by City-constructed stormwater conveyance systems, but may sheet flow to roadside ditches that eventually may discharge to North Doane Lake.

Before Outfall 22C was constructed in 1980, drainage from this area appears to have flowed through Doane Creek to the river downstream of the current Outfall 22C through a non-City 96-inch-diameter pipe (which was partially abandoned as part of the Outfall 22C construction). This abandoned outfall was located approximately 200 feet downstream of the current Outfall 22C location.

[6] Right-of-way estimates for Basin 22C: 52 acres of unpaved or undeveloped property, 17 acres of railroad property, 9 acres of state highway, and 1 acre of City paved road.

TABLE 2-1
Outfall M3 Facility List

Aquarius Search: April 2004
Basin Reconn: April 2004

RNO	Business Name	Address	Occupant Status	SIC Number	Drainage	Permit Type	Permit No.	Business Type	Exposure	Comments
R941210870	Floor Supply Distributing Company	3002 N Wygant	Current	NI	MS4			NI	NI	
R941210870	Tile Distributors, Inc.	3002 N Wygant	Former	5032	MS4			Distribution	No	Now Floor Supply
R941210870	Northwest Parts Distr. Company	3004 N Wygant	Former	NI	MS4			Distribution	No	Now Vacant
R941210870	Service Paper	3006 N Wygant	Current	5113, 5084, 5087	MS4			Paper Prod.	No	
R941210870	Joint Way International	3010 N Wygant	Current	7319, 5063	MS4			NI	NI	
R941210870	Seawest Distributors, Inc.	3010 N Wygant	Former	5023	MS4			Distribution	No	Now Joint Way Int'l
R941210870	Air Data Express, Inc.	3014 N Wygant	Former	NI	MS4			NI	NI	
R941210870	Bingham	3014 N Wygant	Former	3069, 5085	MS4			NI	NI	Now West Coast Ship Supply
R941210870	Wells Fargo Bank	3014 N Wygant	Former	6022	MS4			NI	NI	Now West Coast Ship Supply
R941210870	West Coast Ship Supply	3014 N Wygant	Current	NI	MS4			NI	NI	
R941210870	Western Parcel Express	3014 N Wygant	Former	4213*	MS4			Trucking*	Yes*	Now West Coast Ship Supply
R649746970	Engineering Design Consultants	3449 N Anchor, 100	Current	7373, 1541, 8732	MS4			Office	NI	
R649746970	Miso Hapi	3449 N Anchor, 200	Current	5812	MS4			Restaurant	No	
R649746970	Floral Supply Syndicate	3449 N Anchor, 400	Current	NI	MS4			NI	NI	
R649746970	Concerta Med. Center	3449 N Anchor,300A	Current	8011*	MS4			Office	No	
R649746970	Cascade Occupational Medicine	3449 N Anchor,500	Current	NI	MS4			NI	NI	
R649746970	Drop Anchor Café	3627 N Anchor	Former	5812	MS4			Restaurant	No	Now Air Wair USA LLC
R649746970	Air Wair Usa LLC	3627 N Anchor,100	Current	NI	MS4			Distribution	No	
R941211010	Cummins Northwest Inc	4711 N Basin	Current	5084, 7538, 7699*	MS4			Truck Service Center*	Yes*	
					Sanitary	Pretreatment	400.037	NI	NI	
R941211010	Thermo King Sales & Service	4711 N Basin	Former	5013	MS4			Service	No	Now Cummins Northwest
R941200900	Wells Fargo Bank	4717 N Lagoon	Former	6022	MS4			Bank	No	Now Vacant
R941211000	Vend Products Distributing	4730 N Lagoon	Current	5145	MS4			Distribution	NI	
R941211110	Sea-Pac Sales	4805 N Basin	Former	5023, 5713	MS4			Distribution	No	
R941211110	DSU Peterbilt & GMC Truck Inc.	4810 N Basin	Current	5511, 5013	MS4			Service/Mfg.	Yes	
R649746980	Shibata Floral Company	4810 N Lagoon, 200	Current	NI	NI			NI	NI	
R649746970	AT Systems Northwest, Inc.	4810 N Lagoon,500	Current	7381	NI			Armored Car Services	NI	Former ORG ID 16940
R941211110	Cronin Trims & Adhesives	4825 N Basin	Current	5023, 5087	MS4			Distribution	No	
R941200620	Franco Diamonds, Inc.	4855 N Lagoon	Former	5094, 5944, 7631	MS4			NI	NI	Now Vacant
R941200620	Swan Island Marine	4855 N Lagoon	Former	5551, 5941, 5944	MS4			Sales	No	Now Vacant
R941200680	Boise Cascade	4859 N Lagoon	Current	NI	MS4			Distribution	No	
R941200740	Mar-Dustrial	4865 N Lagoon	Current	5999	MS4			Wholesale Distribution	NI	Now Mariners Supply
R941200740	Mariners Supply Co. Inc.	4865 N Lagoon	Former	5088	MS4			NI	NI	
R941210610	Fred Meyer Swan Island Dairy Plant	4950 N Basin	Current	2023, 2024, 2026*	MS4	NPDES	1200Z	Dairy Products Processing*	Yes*	
					Sanitary	Pretreatment	405.003			
R941210550	Carpet Services Inc (CSI)	5000 N Basin	Current	4255*	MS4	NPDES	NEC		No*	
R941171100	Pacific Pride Gas Station	5000 N Basin	Current	5541	MS4			Gas Station	NI	
R941210550	Quality Insulation	5000 N Basin	Former	1742	MS4			NI	NI	Now Carpet Services
R941210550	Rose City Moving & Storage Co	5130 N Basin	Current	5041*, 7389*, 4214*	MS4	NPDES	1200Z	Moving & Storage*	Yes*	
R941171260	Freightliner	5220 N Basin	Current	NI	MS4			Distribution	No	
R941210570	Bar Supply Brokerage (BSB) Inc.	5230 N Basin	Former	5087	MS4			Distribution	No	
R941210560	Freightliner Corp-Parts Mfg	5400 N Basin	Current	3714*, 3465*	MS4	NPDES	100J	Truck Mfg.*	Yes*	
					MS4	NPDES	1200Z			
					Sanitary	Pretreatment	433.013			
R941170570	Freightliner - Pre-Delivery	5550 N Basin	Current	NI	MS4			NI	NI	
R941170570	Nationsway Transport Service	5550 N Basin	Former	4212*, 4231*	MS4	NPDES	1200Z	Trucking*	Yes*	
R941170570	P I E Nationwide Inc	5550 N Basin	Former	4213	MS4			Service	Yes	
R941170570	United Parcel Service	5550 N Basin	Current	4215*	MS4	NPDES	1200Z	Courier Service*	Yes*	
R941171250	Northwest Paper Box Mfrs Inc-Corrug.	5617 N Basin	Current	2653*	WR-16, WR-17	NPDES	NEC	Corrugated Paper Box Man.*	No*	

NI = No information available. Facility has not been formally inspected to verify SIC, business activity or exposure.
RNO = Record Number Tax ID
* Indicates SIC, business type, or exposure has been verified via site inspection

TABLE 2-2
Outfall 19 Facility List

Aquarius Search : April 2004
Basin Reconn: April 2004

RNO	Business Name	Address	Occupant Status	SIC Number	Drainage	Permit Type	Permit No.	Business Type	Exposure	Comments
R697400830	Christenson Oil	3821 NW St Helens	Current	2992*, 5170*, 5171*	MS4	NPDES	1200Z	Oil Distributor	Yes	
R941190141	Bingham Construction Inc.	3939 NW St. Helens	Current	1541	MS4			Construction	No	
R941190950	Western Wire Works	3950 St. Helens	Current	3496*	MS4			Metal Fabrication	Yes	
R941190200	Consolidated Sawmill Machinery International Inc	4000 NW St Helens	Former	3441, 3559	MS4			NI	NI	Now GTS
R941190200	GTS	4000 NW St. Helens	Current	NI	MS4			NI	NI	
R941190200	McDowell Welding & Pipe Fitting, Inc	4000 NW St. Helens	Former	3441*, 3559*	MS4	NPDES	1200L	Metal Fabrication	Yes	May discharge to drywells - unconfirmed, now GTS
R941190200	USNR Portland	4000 NW St. Helens	Former	5085*	MS4			Distribution	No	Now GTS
R941190150	Anderson Roofing Inc	4015 NW St. Helens	Former	1761	MS4			NI	NI	
R941190150	Baker Transport	4015 NW St. Helens	Current	4212*, 4213*, 4231*	MS4	NPDES	Tenant	Trucking	No	Covered under Portland Truck & Diesel NEC.
R941190150	Portland Truck and Diesel	4015 NW St. Helens	Current	7538*, 7699*	MS4	NPDES	NEC	Auto service	Yes	Covered under Portland Truck & Diesel NEC.
R941190150	PTD	4015 NW St. Helens	Current	5012*	MS4	NPDES	NEC	Automobiles and Motor Vehicles		Covered under Portland Truck & Diesel NEC.
R941190150	American Transport	4015 NW St. Helens	Former	4212, 4213, 7353	MS4	NPDES	1200Z	Transportation	Yes	Inactive permit. Formerly Wilhelm Truck Leasing
R941190150	Northwest Fleet Products	4015 NW St. Helens	Current	5012*, 5013*	MS4	NPDES	Tenant	Motor Vehicle Parts		Covered under Portland Truck & Diesel NEC. Same owner as PTD, Baker, and
R941190150	Wilhelm Truck Leasing	4015 NW St. Helens	Former	4212*, 4213*, 7353*	MS4	NPDES	1200Z	Transportation	Yes	
					Sanitary	Pretreatment	400.047			
R941190911	Western Wire Works	4025 NW Express	Current	3496*	MS4	NPDES	1200Z	Metal Fabrication	Yes	
R941190710 R941190720 R941190690	Greenway Recycling	4135 NW St. Helens	Current	NI	MS4			NI	NI	
R941190710	Multnomah Disposal & Recycling	4135 NW St. Helens	Former	4953	MS4			NI	NI	Now Greenway Recycling
R941190190	Chapel Steel	4200 NW Yeon Avenue	Current	5051*	MS4			Steel Distribution	Yes	
R941190190	High Reach Inc	4200 NW Yeon Avenue	Former	7359*	MS4			Equipment Rental	Yes	Now Chapel Steel
R941190190	Service Steel Inc.	4200 NW Yeon Avenue	Former	3499*, 5050*, 5051*	MS4			Metal Fabrication	Yes	Now Chapel Steel
R941190190	A&P Logistics	4240 NW Yeon Avenue	Current	NI	MS4			NI	NI	
R941190190	Michelin Tire Corp	4240 NW Yeon Avenue	Former	5014	MS4			Warehouse	No	Also to drywell according to 2/18/77 plumbing card. Now A&P Logics
R941190290	Lacey-Harmer Supply & Mfg Co	4270 NW Yeon Avenue	Current	5085	MS4			NI	NI	
R941190290	Laclede Chain Mgr Company	4270 NW Yeon Avenue	Former	5013*, 5085*	MS4			Distribution	No	
R941190130	ABF Freight Center	4285 NW Yeon Avenue	Former	4213*	MS4	NPDES	1200Z	Transportation	Yes	Now FTL Inc.
R941190130	FTL Inc	4285 NW Yeon Avenue	Current	4214*	MS4	NPDES	1200Z	Trucking	Yes	
R941190130	S and H Trucking	4285 NW Yeon Avenue	Current	NI	MS4			NI	NI	Surveyed 12/2003
R941190060	iPower	4301 NW St. Helens	Former	5051	MS4			Office/warehouse	No	Formerly Lagrand Steel, now Mason Brothers
R941190060	Lagrand Steel Corp	4301 NW St. Helens	Former	5051	MS4			NI	NI	Now Mason Brothers
R941190060	Mason Brothers Construction	4301 NW St. Helens	Current	NI	MS4			NI	NI	
R941190060	Cabinet Factories Outlet	4305 NW St. Helens	Current	5712	MS4			Distribution	No	
R941190060	Electripac	4307 NW St. Helens	Current	NI	MS4			NI	NI	
R941190060	US Tsubaki Inc	4307 NW St. Helens	Former	5063	MS4			NI	NI	Now Electricpac
R941190060	Western Fluid Power Corp.	4309 NW St. Helens	Current	3492*, 3559*, 3594*, 5084*, 5085*	MS4	NPDES	NEC	Manufacturing	No	
R941190860	Brazil Electric Motors	4315 NW St. Helens	Current	5063	MS4			Equipment repair	No	
R941190860	PGE Excavation Site	4315 NW St. Helens	Former	9999	MS4			NI	NI	7/13/2000 spill of "toxic" at excavation site. ECSI 2406
R649704660	Best Western Heritage Inn	4319 NW Yeon Avenue	Former	7011	MS4			NI	NI	Now La Quinta
R649704660	Hawthorne Inn & Suite	4319 NW Yeon Avenue	Former	5812, 7011	MS4			Hotel	No	Now La Quinta
R649704660	La Quinta Inn & Suite	4319 NW Yeon Avenue	Current	7011	MS4			NI	NI	
R941191100	Lacey-Harmer Supply & Mfg Co	4320 NW St. Helens	Former	5085	drywell			Distribution	No	Now at 4270 NW Yeon, current site vacant
R649704640	Food S.A.K. Deli / Subway	4325 NW Yeon Avenue	Current	5411, 5812	MS4			Convenience Store	No	
R941190290	First Tech Communications	4330 NW Yeon Avenue	Current	NI	MS4			NI	NI	
R649704640	Kelly Goodwin Co.	4332 NW Yeon Avenue	Current	5031	MS4			Distribution	No	
R941190290	Performance Mobility Inc.	4337 NW Yeon Avenue	Current	7352, 5047, 5013	MS4			Office/distribution	No	
R649704640	Carpet Resource Center	4338 NW Yeon Avenue	Former	5023	MS4			Distribution	No	Formerly Commercial Affiliates Carpet, now Pacific Courier
R941190290	Commercial Affiliates Carpet	4338 NW Yeon Avenue	Former	5023	MS4			NI	NI	Now Pacific Courier
R941190290	Pacific Courier/Cargo Services	4338 NW Yeon Avenue	Current	NI	MS4			NI	NI	
R941190480	Mount Hood Chemical	4444 NW Yeon Avenue	Current	2841*	MS4	NPDES	1200Z	Manufacturing	Yes	
					Sanitary	Pretreatment	400.087			
R941191030	Thompson Tile Co.	4456 NW Yeon Avenue	Current	5032	MS4			Distribution	No	
R941191030	Dura Industries Inc.	4466 NW Yeon Avenue	Current	1721*, 3471*, 3479*	MS4	NPDES	NEC	Metal finisher/painter	No	
				NI	Sanitary	Pretreatment	413.019			Permit inactive
				NI	Sanitary	Pretreatment	433.028			Permit inactive
				NI	Sanitary	Pretreatment	433.038			
R941191060	Western Graphics Data	4468 NW Yeon Avenue	Current	2752, 2789, 2796	MS4			Printing/Distribution	No	Formerly Western Lithograph
R941191040	Color Magic Inc.	4488 NW Yeon Avenue	Current	2752*, 2759, 2799	MS4	NPDES	NEC	Photo processor	No	
R941191040	McKesson Chemical	4488 NW Yeon Avenue	Former	2899	MS4			NI	NI	Now Color Magic
R941190280	Electrical Distributing	4600 NW St. Helens	Current	5013*, 5099*, 4215*, 4225*	MS4	NPDES	NEC	Electronics Warehouse	No	Interior floor drain to drywell (10/28/57 plumbing card)
R941190280	West Coast Paper Co.	4600 NW St. Helens	Former	5085*/5111*	MS4			Distribution	No	
R941190280	Power Rents Inc	4621 NW St. Helens	Former	6749, 7513	MS4			Heavy Equipment Rental	Yes	Now United Rentals
R941190730 R941190740 R941190790	United Rentals	4621 St. Helens Avenue	Current	6749, 7513	MS4			NI	NI	
R941190280	Basco	4650 NW St. Helens	Current	4215*, 4225*	MS4				No	Also drywells
R941190280	Cascade Solutions	4650 NW St. Helens	Former	8742	MS4			Offices	No	Also drywells, now Basco
R941190280	Madden Fabrication	4670 NW St. Helens	Current	3441*, 3444*,3446*	MS4			Metal Fabrication	No	
R941191140	Shaver Transportation Co.	4900 NW Front Avenue	Current	4449*, 4492*, 3693	Sheetflow			Tugboat and Barge	Yes	Process discharge from barge
R941190451	ACME Trading & Supply	4927 NW Front Avenue	Former	5093*	MS4	NPDES	1200Z	Metal recycler	Yes	Now Allied Movers
R941190451	Allied Movers	4927 NW Front Avenue	Current	4213	MS4			Transportation	Yes	
R941190450	NW Fleet Repair	4927 NW Front Avenue	Former	7538*	MS4			Auto service	No	
R941190450	O'Neill Transfer & Storage	4927 NW Front Avenue	Current	4214*, 5099*	MS4	NPDES	NEC	Trucking	No	NEC issued 5/6/03
R941190500	Centric Elevator	4931 NW Front Avenue	Current	NI	MS4			NI	NI	
R941190501	Color Systems International	4931 NW Front Avenue	Former	NI	MS4			Distribution	No	Now Centric Elevator

TABLE 2-2
Outfall 19 Facility List

Aquarius Search : April 2004
Basin Reconn: April 2004

RNO	Business Name	Address	Occupant Status	SIC Number	Drainage	Permit Type	Permit No.	Business Type	Exposure	Comments
R941190500	MCI	4937 NW Front	Current	NI	MS4			NI	NI	
R941190501	O4 Controls Inc.	4943 NW Front Avenue	Former	3829	MS4			Distribution	No	
R649741630	Hampton Distribution Center	4950 NW Front Avenue	Current	2411, 2421, 5031	WR-256/WR-257			Distribution	Yes	
R649741630	Honsander Lumber	4950 NW Front Avenue	Current	NI	MS4			NI	NI	
R941190500	Asset Recovery Inc	4959 NW Front Avenue	Former	1629*, 5093*	MS4	NPDES	1200R	Scrap and Waste Material		
R941190500	Oregonian Insert Facility	5015 NW Front Avenue	Current	2711/5192	MS4			NI	No	
R649741610	Glacier Northwest	5034 NW Front Avenue	Current	3273*	drywell			Concrete plant	Yes	The concrete plant formerly known as Lone Star Northwest.
R941190500	Midwest Sign and Screen Printing	5035 NW Front Avenue	Current	2396, 5063, 5084	MS4			Printing/Distribution	Yes	
R941190500	Applied Industrial Technology	5041 NW Front Avenue	Current	5085	MS4			Distribution	No	
R649741620	Tube Forgings of America Inc	5200 NW Front Avenue	Current	3462*, 3498*	MS4	NPDES ADCM Batch	1200Z	Metal Fabrication	Yes	
R649741620	Zidell Valve Corp	5200 NW Front Avenue	Former	5074	MS4			NI	NI	Now Tube Forging
R941190400	Charles W. Belle & Associates	5275 NW St. Helens	Former	2400, 2448	MS4			Offices/storage yard	No	
R941190400	Occupied but unknown	5275 NW St. Helens	Current	NI	MS4			NI	NI	
R941190840	Young Mechanical Services	5315 NW St. Helens	Former	1790, 1791	MS4			Repair	No	Formerly NW Field Services
R941190840	Northwest Field Services Inc	5315 NW St. Helens	Former	1791	MS4			NI	NI	
R941190300	Occupied but unknown	5315 NW St. Helens	Current	NI	MS4			NI	NI	ECSI #970 Anderson Brothers, alias Berry Transport, Northwest Field Services
R941190640	Chevron Asphalt	5501 NW Front Avenue	Current	2911*, 2951*	MS4	NPDES	100J	Asphalt refinery	Yes	Also drains to 22
					MS4	NPDES	1200Z			
					Sanitary	Pretreatment	419.001			
R941180041	Conocophillips Company - Portland Terminal	5528 NW Doane Avenue	Current	5171*	MS4	Batch		Bulk Petroleum Dist	Yes	
					MS4	NPDES	1300J		Yes	
					MS4	NPDES	Individual		Yes	Storm water
					Sanitary	Pretreatment	400.137			
R941180041	UNOCAL Terminal	5528 NW Doane Avenue	Former	2869*, 2911*, 2992*, 5171*, 5172, 5983*	MS4	NPDES	1200T	Petroleum terminal	Yes	Now Conoco Phillips
					MS4	NPDES	Individual	"	"	
					Sanitary	Pretreatment	400.012	"	"	
R941190510	Burlington Northern & Santa Fe Railroad Co.	5814 NW Doane Avenue	Current	4011*, 4013*	MS4	NPDES	1200Z	Transportation	Yes	
R941190530	Northern Pacific Railroad		Current	4011	MS4			Railyard	NI	

NI = No information available. Facility has not been formally inspected to verify SIC, business activity or exposure.
RNO = Record Number Tax ID
* Indicates SIC, business type, or exposure has been verified via site inspection

TABLE 2-3

Outfall 19A Facility List

Aquarius Search: Jul-2000

Basin Reconn: Jul-2000

RNO	Business Name	Address	SIC Number	Drainage	Permit Type	Permit No.	Business Type	Exposure	Comments
R941191120	Lakeside Industries	4850 NW Front Ave.	1611*, 2879*, 2951*	drywell Sanitary			Asphalt manufacturing	Yes	

RNO = Record Number Tax ID

* Indicates SIC # has been verified via site inspection

TABLE 2-4
Outfall 22B Facility List

Aquarius Database Search: Jul-2000
Basin Reconnaissance: Jul-2000

RNO	Business Name	Address	SIC Number	Drainage	Permit Type	Permit No.	Business Type	Exposure	Comments
R961130350	Gould Battery - AKA Canonie	5909 NW 61st Ave.	9999	WR-6	NPDES		Superfund site	Yes	Discharges under RPAC ind. NPDES
R961130130	Metro Central Transfer Station	6161 NW 61st Ave.	4212*, 4953*	MS4	NPDES	1200Z	Solid waste transfer	Yes	
				Sanitary	Pretreatment	400.088			
R961130310	Rhone Poulenc AG Co.	6200 NW St. Helens Rd.	2879*	WR-6	NPDES	Individual	Manufacturing	Yes	
R961130360	ATOFINA Chemicals Inc.	6400 NW Front Ave.	2812*, 2819*, 5169*	MS4			Manufacturing	Yes	
				WR-95 to WR-101	NPDES	Individual		Yes	
				Sanitary	Pretreatment	300.01			
R961130360	Pilcher O'Leary Construction	6400 NW Front Ave.	1541	WR-95 to WR-101			Construction yard	Yes	
R961130360	Washore Mechanical Inc.	6400 NW Front Ave.	1629	WR-95 to WR-101			Construction yard	Yes	
R961130330	Air Liquide	6529 NW Front Ave.	2813*	MS4	NPDES	1200Z	Manufacturing	Yes	
R961130420	City of Portland Pump Station	7110 NW Front Ave.		MS4			Pump Station	Yes	

RNO = Record Number Tax ID
* Indicates SIC # has been verified via site inspection

TABLE 2-5

Outfall 22C Facility List

Aquarius Database Search: Jul-2000
Partial Aquarius Update: Apr-2006
Basin Reconnaissance: Jul-2000

RNO	Business Name	Address	SIC Number	Drainage	Permit Type	Permit No.	Business Type	Exposure	Comments
R915501440	Coffee Express	6115 NW St. Helens Rd.	5499	Unknown[1]			Coffee stand	No	
R915501440	Interstate Sandblasting	6115 NW St. Helens Rd.	1799, 5561, 3479	Unknown[1]			Equipment cleaning	Yes	
R915501440	Lee & Eastes Tank Lines	6115 NW St. Helens Rd.	4212	Unknown[1]			Transportation	Yes	Out of business
R915501440	Situs Inc.	6115 NW St. Helens Rd.	5712	Unknown[1]				Yes	vacant
R915501440	New Delco Service Station	6215 NW St. Helens Rd.	5541	Unknown[1]			Service station		
R915501360	Landstar Gemini Transportation	6215 NW St. Helens Rd.	4212	Unknown[1]/UIC			Transportation	Yes	Out of business
R915501360	Performance Publishing Inc. - Sales office	6215 NW St. Helens Rd.	2731	Unknown[1]/UIC			Office	No	Out of business
R915501360	U-Haul Company	6215 NW St. Helens Rd.	7513	Unknown[1]/UIC			Vehicle storage	Yes	Out of business
R915501360	Union 76	6215 NW St. Helens Rd.	5541	Unknown[1]/UIC			Gas station	Yes	
R915501360	WWS Trucking Inc.	6215 NW St. Helens Rd.	4212	Unknown[1]/UIC			Transportation	Yes	Out of business
R915502650	Accurate Meter	6423 NW St. Helens Rd.	5063	Unknown[1]/UIC			Equipment repair	Yes	
R915502650	Ray's Truck Service	6423 NW St. Helens Rd.	7538	Unknown[1]/UIC			Vehicle repair	Yes	Out of business
R915503230 R915501270 R915502890	Portland Junk Company	6485 NW St. Helens Rd.	5093	Unknown[1]			Scrap handling		
R915502950	Kinder Morgan	6565 NW St. Helens Rd.	4613	MS4			Substation	Yes	
R915502950	Santa Fe Pacific Pipeline Co.	6565 NW St. Helens Rd.	4613*	MS4	NPDES	1500A	Transportation	Yes	
R961130150	A & C Foundry	6720 NW St. Helens Rd.	5084, 3559	MS4			Metal fabrication	Yes	
R961130190 R961130200	Imperial Trucking Inc.	6834 NW St. Helens Rd.	4212	MS4					Out of business
R961130190 R921130200	Total Western	6834 NW St. Helens Rd.	1711?	MS4			Metal fabrication	No	Out of business
R961130190 R921130200	Reinhard Petroleum Shop	6834 NW St. Helens Rd.	7699	MS4			Repair shop		
R961130190 R921130200	Superior Performance	6834 NW St. Helens Rd.	7532	MS4			Repair and paint shop		
R961130010	Wacker Siltronic Corp.	7200 NW Front Ave.	3674*	MS4, WR-287			Manufacturing	Yes	
				WR-66, WR-67	NPDES	1200Z			
				WR-66	NPDES	Individual			
				Sanitary	Pretreatment	469.001			
R961130040	City of Portland Police Impound Yard	7027 NW St. Helens Rd.	4226	MS4			Vehicle salvage	Yes	
R961121110	Koppers Industries	7540 NW St. Helens Rd.	2865*, 4491*, 5169*	MS4	NPDES	Individual	Bulk organic	Yes	
				Sanitary	Pretreatment	314.001			

* Indicates SIC # has been verified via site inspection

[1]Drainage unknown; facilities west of NW St. Helens Road sheet flow or drain to ditches that may eventually drain to North Doane Lake

CEG = Conditionally Exempt Generator
RNO = Record Number Tax ID
SQG = Small Quantity Generator

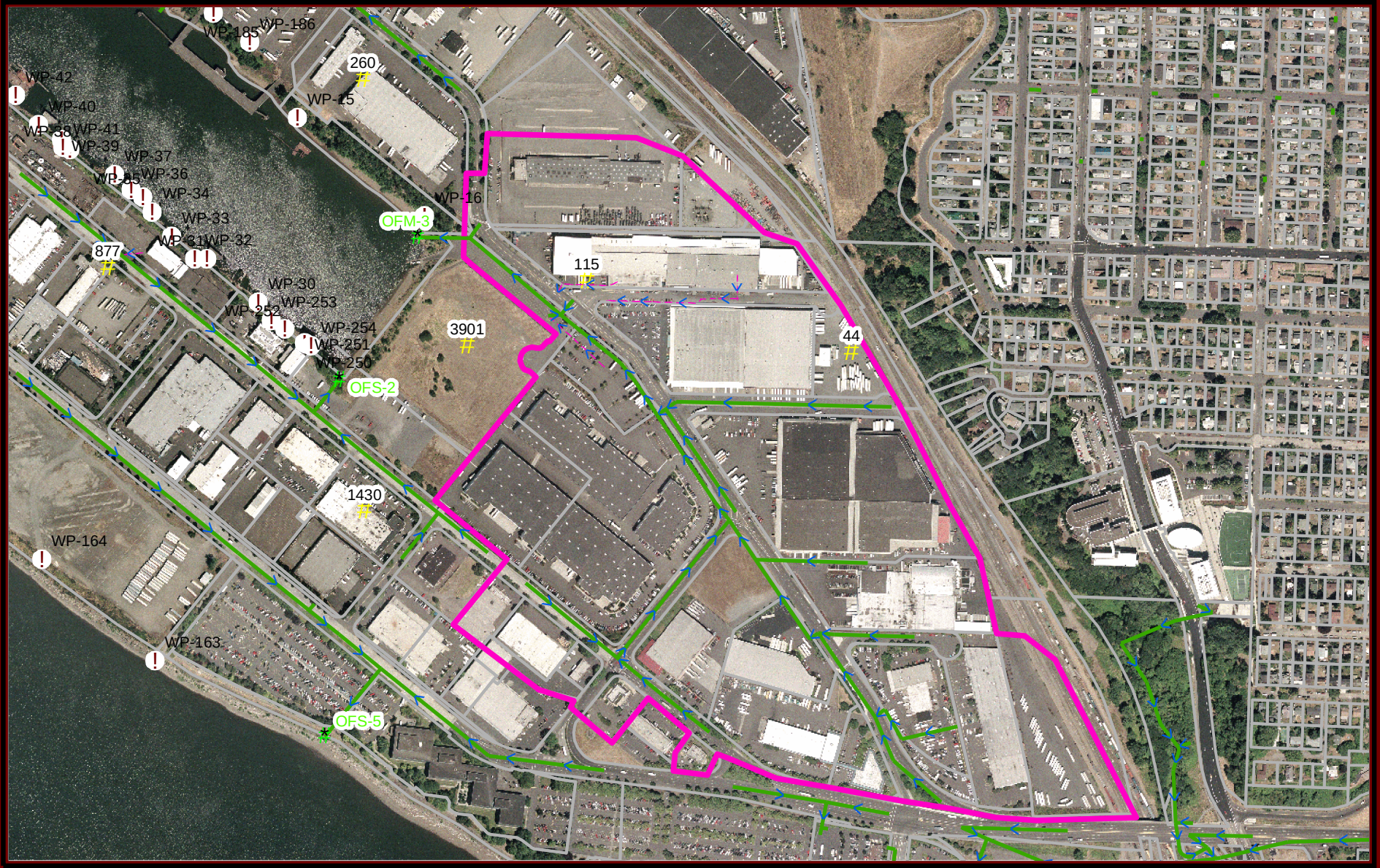

Figure 2-1

Basin Boundary for Outfall M-3

City of Portland
Program Manager:
Dawn Sanders, Portland Harbor Superfund

Prepared by: Sara Gardner, Portland Harbor Superfund

Source: s:\gis\phase1_report\figure2_4.mxd

Sheet No. 1 OF 1

Date Printed: 10/7/2005

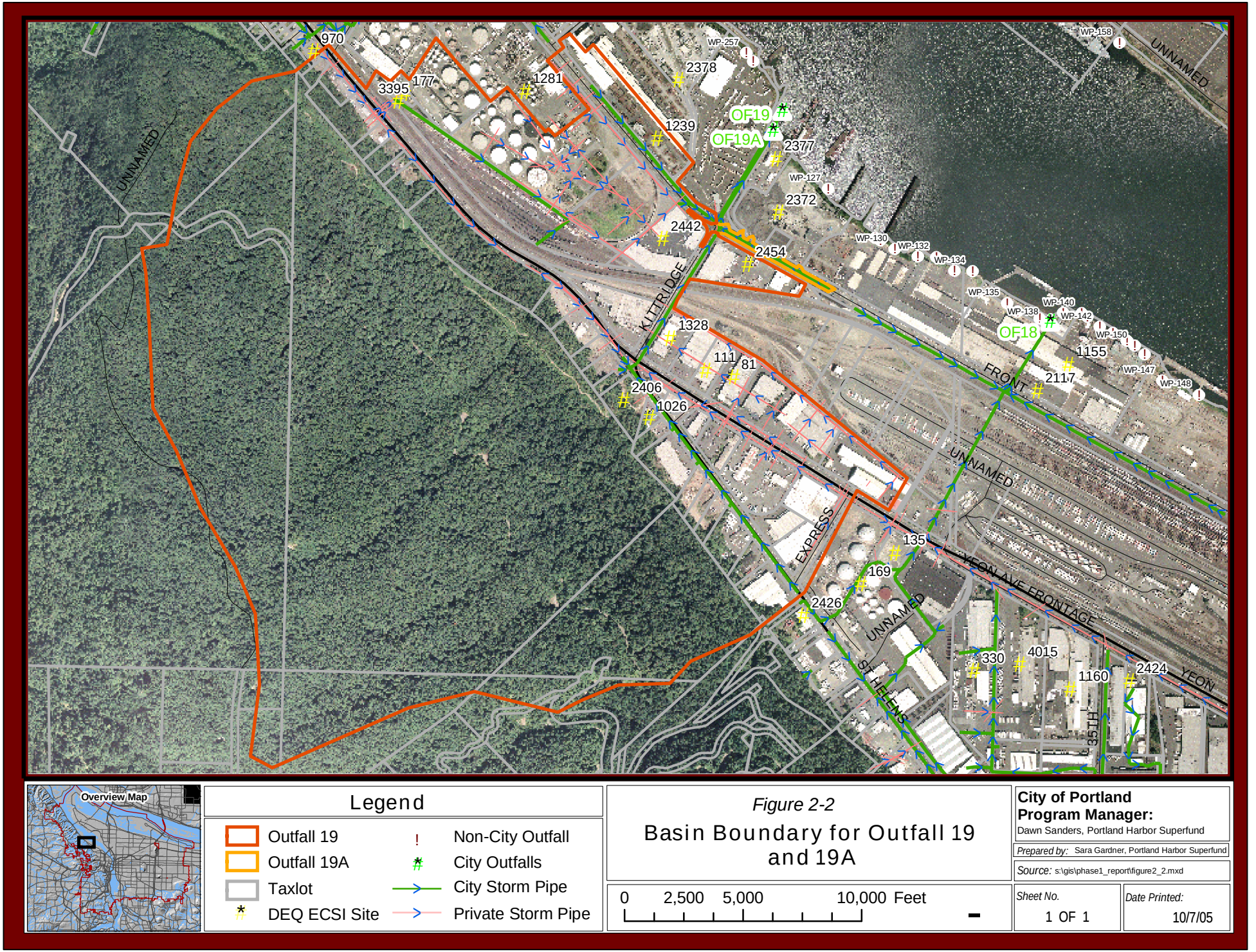

Figure 2-2

Basin Boundary for Outfall 19 and 19A

City of Portland
Program Manager:
Dawn Sanders, Portland Harbor Superfund

Prepared by: Sara Gardner, Portland Harbor Superfund

Source: s:\gis\phase1_report\figure2_2.mxd

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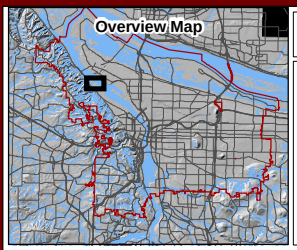
Date Printed: 10/7/05



Legend

- 22B Basin Boundary
- Taxlot
- DEQ ECSI Site
- Non-City Outfall
- City Outfall
- Storm Pipe

Figure 2-3

Basin Boundary for Outfall 22B

0 2,500 5,000 10,000 Feet

City of Portland
Program Manager:
Dawn Sanders, Portland Harbor Superfund

Prepared by: Sara Gardner, Portland Harbor Superfund

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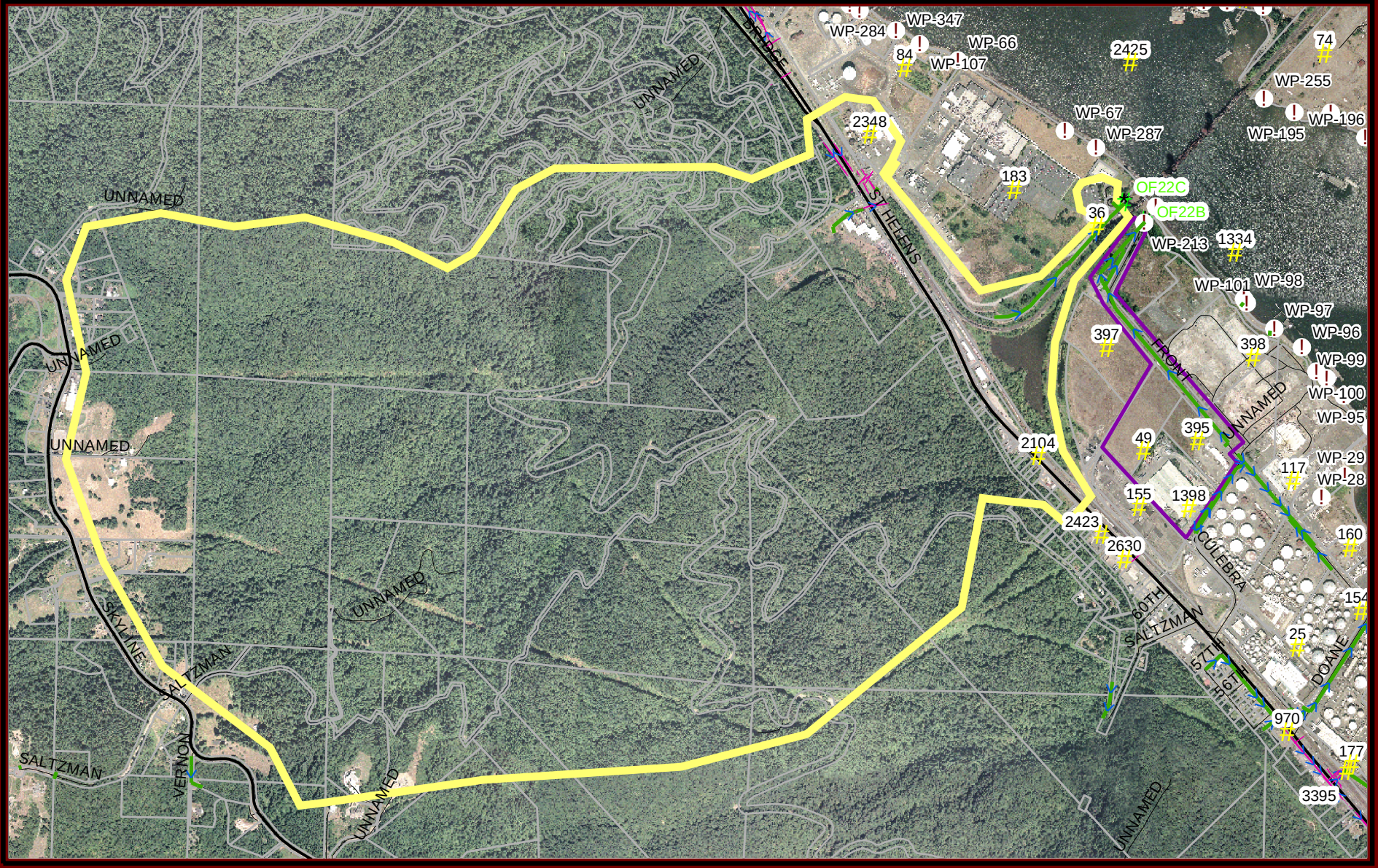

Overview Map

Legend

- 22C Basin Boundary
- Taxlot
- DEQ ECSI Site
- Non-City Outfall
- City Outfall
- Storm Pipe
- Private Storm Pipe

Figure 2-4

Basin Boundary for Outfall 22C

0 2,500 5,000 10,000 Feet

City of Portland
Program Manager:
Dawn Sanders, Portland Harbor Superfund

Prepared by: Sara Gardner, Portland Harbor Superfund

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SECTION 3

Evaluation of In-River City Sediment Data

In October 2002, BES conducted a Source Control Sediment Investigation at the City outfalls located within the Portland Harbor Superfund Site ISA. The purpose of this investigation was to evaluate sediment quality during dry weather conditions (July to October 2002) in the Willamette River near the City's stormwater and combined sewer overflow (CSO) outfalls.

During the BES investigation, surface sediments were sampled near 18 City outfalls. Sampling protocols followed the procedures described in the *Work Plan – Source Control Sediment Investigation for the City of Portland Outfalls* (CH2M HILL, October 2002a) and in the *Work Plan Appendix A, Field Sampling Plan for Source Control Sediment Investigation for the City of Portland Outfalls* (CH2M HILL, October 2002b). This section focuses on the sampling results of the 2002 investigation for the subject basins. These sediment data are used to develop initial PCOIs for each drainage basin. A complete PCOI list for each basin, based on the initial PCOI list, potential contaminant sources, and migration pathways, is presented in Section 4.

3.1 Sampling Locations

Sediment sample locations focused on nearshore areas in the immediate vicinity of the outfalls associated with each subject basin. Sampling strategies were developed at each outfall based on the following factors: (1) results from Phase 1 of the City of Portland Source Control Pilot Project (CH2M HILL, April 2003; CH2M HILL, April 2004), (2) historical sediment sampling data, (3) the physical setting of the outfall, and (4) physical characteristics of the river at each outfall location. Generally, sampling locations were spaced 50 to 100 feet apart and distributed around the outfall. Sampling patterns were developed to collect samples within the probable discharge plume area and to collect at least one sample upstream of the discharge point of each outfall. The sampling grids generally consisted of the following types of sample locations:

- One sample at the outfall terminus
- One nearshore sample at the discharge confluence point with the river (if not the same as above)
- One nearshore upstream sample
- One nearshore downstream sample
- One offshore downstream sample

Nearshore samples were collected at locations approximately 5 feet offshore from the low tide water line. If river bottom conditions (e.g., rocks or riprap) inhibited sample collection, the nearshore samples were collected as close to the shoreline as possible.

Offshore samples were collected approximately 50 feet downstream of the discharge confluence with the river and approximately 50 feet perpendicular to the nearshore sample. These sample locations were intended to help define the extent of the presumed depositional plume and were modified in the field to achieve this goal.

At outfall locations where there was no clear flow pattern (such as in the Swan Island Lagoon and within river inlets), sample locations were selected to be inside the presumed depositional area.

Figures 3-1 through 3-3 show the sampling locations specific to Outfalls M-3, 19/19A, 22B, and 22C.

3.2 Laboratory Analysis

Laboratory analysis was performed in accordance with *Work Plan – Source Control Sediment Investigation for the City of Portland Outfalls* (CH2M HILL, October 2002a). Sediment samples were analyzed for metals, semivolatile organic compounds (SVOC), organochlorine pesticides, heavy oil and diesel range hydrocarbons, and polychlorinated biphenyls (PCB). Chlorinated herbicides were analyzed at one sampling location per outfall, generally adjacent to or near the outfall; the Field Sampling Coordinator selected this sample location. Additionally, chlorinated herbicide samples were collected at all four sampling locations near Outfall 22B; initially, one sample was analyzed and the other three were extracted and held pending results of the initial sample. On the basis of detection of 2,4-dichlorophenoxybutyric acid (2,4-Db) in the first sample, chlorinated herbicides were analyzed in the other three samples as well.

Conventional parameters, such as percent moisture, sediment particle size, and total organic carbon (TOC), also were measured.

3.3 Laboratory Results and Interpretation

The laboratory results for this investigation are presented in Appendix B of the Programmatic Work Plan. In the Programmatic Work Plan, the results were used to prioritize the outfalls and associated drainage basins. Concentrations of selected constituents were plotted by river mile to evaluate whether surface sediment chemistry near each City outfall was distinctly different from harbor-wide data. The plots are presented in Section 4 of the Programmatic Work Plan. The main consideration used during prioritization was the relative magnitude of contamination in sediments measured by BES (looking at the average concentration and data range) in comparison with the harbor-wide data collected in earlier events by the U.S. Environmental Protection Agency (EPA) and various other public and private entities. Other qualitative factors included outfall proximity to known contaminant sources, river hydrodynamics, and upland institutional issues, such as property ownership and the presence and status of DEQ cleanup sites. It is important to note that the sediment chemistry evaluation was a comparative process; the evaluation was not a statistically based quantitative analysis.

During the sediment chemistry evaluation, it was determined that considerably elevated concentrations of one or more constituents were detected in the sediments collected near

outfalls associated with the subject basins. These basins were assigned to the Priority 1 category because of the potential that these considerably elevated concentrations may be related to upland sources located within the associated drainage basin.

As a result of the high priority assigned to these basins, Priority 1 basins are the first group that will undergo the site characterization/remedial investigation (SC/RI) process discussed in the Programmatic Work Plan. As part of the SC/RI process, the sediment data at each outfall were evaluated on a basin-specific basis (as opposed to the river-wide comparison in the Programmatic Work Plan). The basin-specific sediment evaluation was key to the development of an initial PCOI list for each basin (step 1 of the site characterization process). During the basin-specific sediment evaluation, the following factors were considered:

- Exceedance of comparison level values
- The factor of exceedance
- Spatial concentration trends in the chemicals exceeding comparison values

In developing the initial PCOI list for the individual Priority 1 outfalls, the analytical results were compared to the DEQ High Sediment Comparison Level Values (DEQ High)[7]. Tables were developed for each of the subject basins listing detected concentrations (and detection limits) of all constituents that exceeded the comparison values (see Tables 3-1 through 3-4). Tables 3-1 through 3-4 show the Portland Harbor Baseline Sediment Values (PH Baseline) for comparison purposes.

All of the rows for each table (chemicals) have been sorted by the maximum factor of exceedance in descending order from top to bottom. The columns (sample location IDs) are sorted geographically from the approximate upstream to downstream when moving to the right across the table. Evaluations of the exceedance tables for each of the remaining Priority 1 outfalls are provided in the following sections.

3.3.1 In-River Sediment Results for Basin M-3

Five samples were collected near Outfall M-3 (sample locations are presented in Figure 3-1). As shown in Figure 3-1, one sample (SI01M3010) was collected from the erosional channel directly below private outfall WR-16[8] above the high tide water line. The other four samples were collected below the low tide water line. SI01M3020 was a nearshore sample collected 10 feet from the outfall. SI01M3030, SI01M3040, and SI01M3050 were offshore samples collected approximately 50 feet from the low tide water line.

As discussed in the Programmatic Work Plan, when Basin M-3 City sediment results were compared with the other sediment data across the entire ISA, considerably elevated concentrations of high molecular weight polynuclear aromatic hydrocarbons (HPAHs), low molecular weight polynuclear aromatic hydrocarbons (LPAHs), and bis (2-ethylhexyl) phthalate (BEHP), as well as slightly elevated concentrations of 4,4' dichlorodiphenyltrichloroethane (DDT) were measured in the sediments near Outfall M-3.

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[7] DEQ Sediment Evaluation Guidance, External Review Draft, July 31, 2002.

[8] Note that the text references non-City outfalls with a "WR" prefix while the figures show them with a "WP" prefix. The City made a global change to designate all non-City outfalls on the Willamette River with a "WR" prefix; the figures have not been updated to reflect this change.

There is not a clear upstream or downstream flow direction associated with Outfall M-3 because of its location in the southeast corner of Swan Island Lagoon. Furthermore, because of Outfall M-3's location in the corner of the lagoon and boat prop wash from the adjacent public boat dock, the flow dynamics, and sediment transport and deposition in this area are complex. Additionally, the sediment data collected above the high water line adjacent to private outfall WR-16 (located about 100 feet upgradient from Outfall M-3) suggest that sediment data near the Outfall M-3 could be influenced by adjacent sources.

Because of the complexities, there is a high level of uncertainty to attributing elevated concentrations of constituents in this area to Basin M-3. The approach taken to identify PCOIs, for which additional source investigation will be conducted in Basin M-3, is to identify constituents that are not clearly associated with another source and then reviewing existing information within the basin (see Section 4) to refine the PCOI list.

Table 3-1 presents the list of detected and non-detected constituents that exceeded the DEQ High. Note that the sediment data associated with private outfall WR-16 are included even though the concentrations likely are not associated with Outfall M-3. For this reason, private outfall WR-16 sediment data were not included in the exceedance factor calculations. Private outfall WR-16 data are included in Table 3-1 to help understand this outfall as a potential source to sediment at the head of the Swan Island Lagoon.

On the basis of exceedance factors and spatial distribution of the data, the following observations were made:

- Chlorinated Herbicides — No chlorinated herbicides were detected at the one location (nearest the outfall at SI01M3020) where they were analyzed (see Appendix B of the Programmatic Work Plan for data). Chlorinated herbicides will not be included in the initial PCOI list for Basin M-3.
- Pesticides — 4,4' tetrachlorodiphenylethane (DDD) was the only constituent in this group detected above the DEQ High; this occurred in the sample adjacent to private outfall WR-16. At one Outfall M-3 sample (SI01M3040) located 70 feet southwest of the outfall, DDD was detected at a concentration of 1.85 micrograms per kilogram (µg/kg), well below the DEQ High of 30 µg/kg. DDT was detected at private outfall WR-16; however, it was below the DEQ High. 4,4' dichlorodiphenyldichloroethane (DDE) was not detected in any of the Outfall M-3 samples or the private outfall WR-16 sample. A few other constituents in this group (lindane, chlordane, heptachlor, and heptachlor epoxide) are shown in Table 3-1 because the detection limits at private outfall WR-16 exceeded the DEQ High. On the basis of these results, pesticides will not be included in the initial PCOI list for Basin M-3.
- Phthalates — Both Outfall M-3 and private outfall WR-16 samples had concentrations of BEHP and di-n-butyl phthalate greater than the DEQ High. Phthalate concentrations in the sample at private outfall WR-16 (SI01M3010) were an order of magnitude greater than the concentrations of BEHP in all of the Outfall M-3 samples, suggesting that private outfall WR-16 was the source of phthalates in this part of the lagoon. In fact, the sample closest to Outfall M-3 (SI01M3020) had the lowest concentration of all the samples collected near the City outfall and was below the DEQ High, suggesting that Basin M-3 likely is not the source of BEHP in the river sediments. However, both the

northwest and southwest Outfall M-3 samples (SI01M3050 and SI01M3040), and the sample collected 63 feet offshore from the City outfall (SI01M3030), had high concentrations. Because of the uncertainty in mixing dynamics in this area, it would be prudent to confirm that there are no significant sources of phthalates draining to Outfall M-3. For this reason, BEHP and di-n-butyl phthalate will be included in the initial PCOI list for Basin M-3.

- PAHs — Both Outfall M-3 and private outfall WR-16 samples had high concentrations of PAHs that exceed the DEQ High. The concentrations at the southwest Outfall M-3 sample (SI01M3040) were much greater than the private outfall WR-16 sample (SI01M3010). However, the samples nearest the City outfall (SI01M3020 and SI01M3030) had much lower PAH concentrations than the other Outfall M-3 samples and were below the DEQ High. The lack of a decreasing concentration gradient away from the City outfall may suggest that Outfall M-3 is not a current source of PAHs in the river sediments. Because of the uncertainty in mixing dynamics in this area, PAHs will be included in the initial PCOI list for Basin M-3 to confirm that there are no significant sources draining to Outfall M-3.

- Other SVOCs — Aside from PAHs and phthalates, there were no exceedances of the DEQ High for other SVOCs. No other SVOCs will be included in the initial PCOI list for Basin M-3.

- Metals — For most metals, the concentrations at private outfall WR-16 were much greater than the concentrations detected near Outfall M-3. Cadmium, copper, lead, nickel, and zinc at private outfall WR-16 were the only concentrations that exceeded the DEQ High. All of the Outfall M-3 samples were below comparison values for all of these metals and the sample nearest the City outfall (SI01M3020) was either non-detect for these constituents or was the lowest of the samples collected, suggesting that Basin M-3 is not the likely source of these metals. Metals will not be included in the initial PCOI list for Basin M-3.

On the basis of these observations, it is recommended that phthalates (BEHP and di-n-butyl phthalate) and PAHs be included in the initial PCOI list and carried forward in the evaluation of potential upland sources in Basin M-3.

3.3.2 In-River Sediment Results for Basins 19/19A

Six samples were collected near Outfalls 19 and 19A: three near Outfall 19 and three near Outfall 19A. All of the samples were collected below the low tide water line. Samples SI0119010 and SI0119A010 were collected near the terminus of Outfall 19 and Outfall 19A, respectively. Samples SI0119020 and SI0119A030 were intended to be the downstream samples for Outfall 19 and Outfall 19A, respectively. Samples SI0119030 and SI0119A020 were intended to be the upstream samples for Outfall 19 and Outfall 19A, respectively. Because of the sediment redistribution from tugboats discussed in Section 2, the upstream and downstream locations likely are not representative of deposition distribution. Sample locations are indicated in Figure 3-2.

As discussed in the Programmatic Work Plan, when compared with the other data across the entire ISA, considerably elevated concentrations of LPAHs, BEHP, chromium, copper, mercury, lead, and zinc (as well as slightly elevated concentrations of HPAHs, PCBs,

arsenic, and cadmium) were measured in the sediments near Outfalls 19 and 19A. Because there is no attributable upriver source for BEHP, mercury, chromium, or copper, Outfalls 19 and 19A were placed in the Priority 1 category.

Table 3-2 presents the list of detected and non-detected constituents that exceeded the DEQ High. On the basis of information in Table 3-2, the following observations were made:

- Chlorinated Herbicides — Chlorinated herbicides were not analyzed except at the sample locations nearest Outfalls 19 and 19A (SI0119010 and SI0119A010). No chlorinated herbicides were detected (see Appendix B of the Programmatic Work Plan for data). Chlorinated herbicides will not be included in the initial PCOI list for Basins 19/19A.

- Pesticides — Chlordane is the only constituent in this category that is shown in Table 3-2; the detection limit at one sample location (out of six samples) slightly exceeds the DEQ High. Pesticides will not be included in the initial PCOI list for Basins 19/19A.

- Total PCBs — All Outfall 19 and Outfall 19A samples were below the DEQ High for total PCBs (samples ranged from 46 to 322 µg/kg). However, because PCB congeners were analyzed instead of PCB Aroclors, the individual Aroclor screening level exceedances could not be evaluated. Because PCBs are elevated above baseline and are a likely risk driver under the CERCLA program, and there are known potential sources of PCBs in Basin 19, PCBs will be included in the initial PCOI list for Basins 19/19A.

- Phthalates — Samples near Outfalls 19 and 19A have concentrations of BEHP greater than the DEQ High. The only other phthalate shown in Table 3-2 is di-n-butyl phthalate, which was undetected, but had elevated detection limits. Because of the uncertainty of spatial distribution and sources, phthalate sources in Basins 19/19A should be evaluated. Therefore, phthalates will be included in the initial PCOI list for Basins 19/19A.

- PAHs — All samples near Outfalls 19 and 19A have concentrations of PAHs that exceed the DEQ High. One sample (SI0119020), located farthest downstream and adjacent to the Shaver Dock, generally has the highest concentrations of total HPAHs, total LPAHs, and individual PAH compounds compared to the other five samples. Because of the uncertainty of spatial distribution and sources, PAH sources within Basins 19/19A should be evaluated. Therefore, PAHs will be included in the initial PCOI list for Basins 19/19A.

- Other SVOCs — Aside from PAHs and phthalates, two SVOCs (hexachlorobenzene and phenol) are shown in Table 3-2 because the detection limits are greater than the comparison values. These will not be included in the initial PCOI list for Basins 19/19A.

- Metals — Chromium, copper, lead, nickel, and zinc were detected above the DEQ High in the samples near Outfalls 19 and 19A. Because of the uncertainty of spatial distribution and sources, metal sources within Basins 19/19A should be evaluated. Therefore, these metals will be included in the initial PCOI list for Basins 19/19A.

On the basis of these observations, it is recommended that phthalates, PAHs, PCBs, chromium, copper, lead, nickel, and zinc be included in the initial PCOI list and carried forward in the evaluation of potential upland sources in Basins 19/19A.

3.3.3 In-River Sediment Results for Basin 22B

Four samples were collected near Outfall 22B. As shown in Figure 3-3, two samples (SI0122B030 and SI0122B040) were collected from the erosional channel below Outfall 22B. Sample SI0122B030 was approximately 125 feet from Outfall 22B and below the high tide water line. Sample SI0122B040 was approximately 53 feet from Outfall 22B and above the high tide water line. The other two samples were collected in the river about 5 feet from the low tide water line. Sample SI0122B020 was collected upriver and sample SI0122B010 was collected directly in line with the observed discharge point of Outfall 22B (centered).

As discussed in the Programmatic Work Plan, when compared with the other data across the entire ISA, considerably elevated concentrations of DDT, arsenic, chromium, mercury, lead, and zinc (as well as slightly elevated concentrations of copper) were measured in the sediments near Outfall 22B. Because there is no attributable upriver source for chromium or zinc, Outfall 22B was placed in the Priority 1 category.

Table 3-3 presents the list of constituents that exceeded the DEQ High for Outfall 22B. On the basis of data presented in Table 3-3, the following observations were made:

- Chlorinated Herbicides — The only chlorinated herbicide detected was in the in-river centered sample (SI0122B010), where 2,4-Db was detected at 18.7 µg/kg. There is no DEQ High, but this concentration is above the baseline comparison value. However, 2,4-Db was well below PH Baseline in the two samples nearest Outfall 22B. Chlorinated herbicides will not be included in the initial PCOI list for Basin 22B.

- Pesticides — The three congeners DDD, DDE, and DDT were detected in all samples near Outfall 22B, and the DEQ High was exceeded for many of the samples. While there is a known source upstream (Arkema) that likely is affecting sediment adjacent to Outfall 22B, drainage from the Arkema site into the City's system has not been evaluated. Therefore, DDT and its metabolites will be included in the initial PCOI list for Basin 22B so that additional sources within the basin can be evaluated.

- Phthalates — The only phthalate that was detected in all the samples near Outfall 22B was BEHP, at concentrations well below the DEQ High. Phthalates will not be included in the initial PCOI list for Basin 22B.

- PAHs — The sample closest to Outfall 22B (SI0122B040) was below all the PAH (LPAH, HPAH, and individual PAH component) comparison levels. Two samples closer to the river did exceed the comparison levels; the sample located 125 feet from Outfall 22B in the erosional channel (SI0122B030) had some PAH concentrations higher than the upstream sample (SI0122B020). The sample closest to the river in the erosional channel (SI0122B010) did not exceed any PAH comparison levels. Overall, concentrations of PAHs in the samples were generally low (total estimated HPAHs only 2.7 times the DEQ High). Because PAHs were below comparison values closest to Outfall 22B and generally detected at low concentrations, they will not be included in the initial PCOI list for Basin 22B.

- Other SVOCs — No other SVOCs exceeded comparison values.
- Metals — Arsenic, chromium, copper, lead, nickel, selenium, and zinc were detected above the DEQ High in the samples near Outfall 22B. The greatest concentrations were observed consistently in samples SI0122B030 and SI0122B040, which both were sampled from the erosional channel below Outfall 22B. Sample SI0122B040 was collected from above the high tide water line. These results indicate that Basin 22B may have potential upland sources of arsenic, chromium, copper, lead, nickel, selenium, and zinc. These metals will be included in the initial PCOI list for Basin 22B.

On the basis of these observations, it is recommended that DDT and its metabolites, arsenic, chromium, copper, lead, nickel, selenium, and zinc be included in the initial PCOI list and carried forward in the evaluation of potential upland sources in or adjacent to Basin 22B.

3.3.4 In-River Sediment Results for Basin 22C

Four samples were collected near Outfall 22C. A duplicate sample (SI0122C031) was collected at the location of SI0122C030. Sample locations are indicated in Figure 3-3. As shown in Figure 3-3, two samples (SI0122C030 and SI0122C040) were collected from the erosional channel above the high tide water line. Sample SI0122C030 was collected approximately 110 feet from Outfall 22C, and sample SI0122C040 was collected approximately 20 feet from the outfall. The other two samples were collected in the river below the low tide water line. Sample SI0122C020 was collected straight out from the erosional channel, about 5 feet from the low tide water line. Sample SI0122C010 was collected downriver of the erosional channel, about 50 feet from the low tide water line. No upstream sample was collected specifically for Outfall 22C because the samples collected for Outfall 22B just upstream (see Table 3-3) and other historical samples were considered sufficient for evaluating upstream sources.

As discussed in the Programmatic Work Plan, when compared with the other data across the entire ISA, considerably elevated concentrations of DDT, HPAHs, LPAHs, and arsenic (as well as slightly elevated concentrations of chromium, copper, lead, and zinc) were measured in the sediments near Outfall 22C. Although potential upstream or nearby sources exist for all of the considerably elevated constituents (except PAHs), Outfall 22C was placed in the Priority 1 category to complete additional evaluations for potential sources of these contaminants within the basin.

Table 3-4 presents the list of constituents that exceeded the DEQ High. On the basis of data presented in Table 3-4, the following observations were made:

- Chlorinated Herbicides — No chlorinated herbicides were detected (see Appendix B of the Programmatic Work Plan for data). Chlorinated herbicides will not be included in the initial PCOI list for Basin 22C.
- Pesticides — The three congeners DDD, DDE, and DDT were detected in all samples near Outfall 22C (except at SI0122C040, where only DDD was detected), and congener concentrations exceeded the DEQ High. While pesticide concentrations adjacent to Outfall 22C are similar to upstream concentrations observed in the vicinity of Outfall 22B, and may represent contributions from upstream sources, there is a potential source

within the basin via North Doane Lake. Therefore, DDT and its metabolites will be included in the initial PCOI list for Basin 22C.

- Phthalates — All detected values are below the DEQ High for phthalates. A few phthalates are presented in Table 3-4 because their detection limits exceeded comparison values, predominately in the farthest downstream sample. Phthalates will not be included in the initial PCOI list for Basin 22C.

- PAHs — Outfall 22C had four samples (including the duplicate) that exceeded the DEQ High. The only sample that did not exceed the DEQ High was the sample closest to Outfall 22C (SI0122C040). The highest concentrations were observed in the downriver sample (SI0122C010), in many cases an order of magnitude higher than the samples closer to Outfall 22C. The downriver sample was located more in the main river flow, where less deposition might be expected compared with the other sample locations that are protected from river velocities. This suggests that PAHs in the general vicinity of Outfall 22C may be influenced by another source. But because of the high PAHs found closer to Outfall 22C and the known potential sources within the basin, PAHs will be included in the initial PCOI list for Basin 22C.

- Other SVOCs — No other SVOCs exceeded the DEQ High; those shown in Table 3-4 are presented because the detection limits at the farthest sample (SI0122C010) are greater than the DEQ High. All samples closer to Outfall 22C were non-detect and were below the DEQ High. No other SVOCs will be included in the initial PCOI list for Basin 22C.

- Metals — Arsenic, copper, lead, nickel, and silver were detected above the DEQ High in at least one sample near Outfall 22C. Copper, lead, and nickel exceedances occurred only for in-river samples, SI0122C010 and SI0122C020, not for samples in the erosional channel below Outfall 22C. The highest concentration of arsenic occurred at the sample closest to Outfall 22C (SI0122C020). Silver concentrations did not exceed the DEQ High except in the duplicate sample SI0122C030, where the duplicate sample was more than 42 times greater than the normal field sample and nearly 6 times greater than any of the other samples at Outfall 22C. In addition, the exceedance factor for the duplicate concentration of silver was low, only 1.2 times the DEQ High. On the basis of these observations, it does not appear that there are significant upland sources of metals in Basin 22C, other than possibly arsenic. Arsenic is the only metal that will be included in the initial PCOI list for Basin 22C.

On the basis of these observations, it is recommended that DDT and its metabolites, PAHs, and arsenic be included in the initial PCOI list and carried forward in the evaluation of potential upland sources in or adjacent to Basin 22C.

TABLE 3-1
Outfall M-3 - Exceedances of DEQ High Sediment Comparison Level Values for Freshwater Receptors
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Class	Analyte	Units	DEQ High Values	WR-16* SI01M3010 10/14/2002 Normal		Northwest SI01M3050 10/15/2002 Normal		Centered 10 ft SI01M3020 10/14/2002 Normal		Centered 63 ft SI01M3030 10/14/2002 Normal		Southwest SI01M3040 10/15/2002 Normal		DETECTS* Max factor of exceedance	DETECTS* Number of exceedances	NONDETECTS* Max factor of exceedance	NONDETECTS* Number of exceedances	Portland Harbor Baseline Values
HPAH	**Total Estimated HPAHs[1,3]**	µg/kg	1000	7510		1520		141		877		93000		93.0	2			2400
LPAH	**Total Estimated LPAHs[1,2]**	µg/kg	400	1034		356		51		201		13356		33.4	1			700
HPAH	Pyrene	µg/kg	1500	2310	J	411		28.3		226		29600	D10	19.7	1			700
HPAH	Fluoranthene	µg/kg	2200	1750	J	319		27.1		222		37400	D10	17.0	1			600
LPAH	Phenanthrene	µg/kg	1200	215	UJ	158		17.2		107		11300	D10	9.4	1			700
HPAH	Chrysene	µg/kg	1300	215	UJ	174		16.5		86.6		11100	D10	8.5	1			425
HPAH	Indeno (1,2,3-cd) pyrene	µg/kg	100	**215**	**UJ**	75.6		9.72		19	U	739		7.4	1			225
HPAH	Benzo (a) anthracene	µg/kg	1000	215	UJ	111		13.8		89		5570	D10	5.6	1			360
Phthalate	Bis(2-Ethylhexyl) Phthalate	µg/kg	800	33200	J	4210		71.4		1940		3030		5.3	3			390
LPAH+HPAH	**Total Estimated PAHs[1,4]**	µg/kg	23000	8544		1876		192		1078		106356		4.6	1			
Phthalate	Di-n-Butyl Phthalate	µg/kg	100	3790	J	**178**	**U**	17.9	U	**190**	**U**	359	J	3.6	1	1.9	2	20
HPAH	Benzo [g,h,i] perylene	µg/kg	300	215	UJ	124		8.71		19	U	854		2.8	1			250
HPAH	Benzo (a) pyrene	µg/kg	1500	215	UJ	101		13.1		85.7		2600		1.7	1			500
LPAH	Anthracene	µg/kg	800	215	UJ	60.5		3.41	J	43		1360		1.7	1			150
Other SVOC	Phenol	µg/kg	50	**2150**	**UJ**	**178**	**U**	17.9	U	**190**	**U**	**190**	**U**			3.8	3	20
PEST/PCB	Lindane	µg/kg	5	**23.6**	**UJ**	1.03	U	0.967	U	**9.91**	**UJ**	1.12	U			2.0	1	
Other SVOC	Hexachlorobenzene	µg/kg	100	**2150**	**UJ**	**178**	**U**	17.9	U	**190**	**U**	**190**	**U**			1.9	3	
PEST/PCB	Chlordane	µg/kg	20	**86.9**	**UJ**	3.8	U	3.56	U	**36.5**	**UJ**	4.14	U			1.8	1	
Total Metals	Cadmium	mg/kg	5	46.2		0.195	J	0.00172	U	0.0883	J	0.167	J					0.6
Total Metals	Lead	mg/kg	130	936		29	B2	14.6		31.9		31	B2					30
Total Metals	Zinc	mg/kg	459	2850		176	B2	80.1		236		179	B2					118
LPAH	Acenaphthylene	µg/kg	200	503	J	34.5	J	2.82	J	28.5	J	123						60
Total Metals	Copper	mg/kg	149	244		44.6	B2	21.2		72		43.3	B2					60
LPAH	2-Methylnaphthalene	µg/kg	200	309	J	19.6	J	2.86	J	19	U	27.9	J					150
PEST/PCB	4,4'-DDD	µg/kg	30	40.6	J C2	0.524	U	0.492	U	5.04	UJ	1.85	J C2					
Total Metals	Nickel	mg/kg	49	61.9		23.6		19.1		17.8		18.9						32
Other SVOC	1,3-Dichlorobenzene	µg/kg	300	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					
Other SVOC	1,4-Dichlorobenzene	µg/kg	300	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					
Other SVOC	Hexachlorocyclopentadiene	µg/kg	400	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					
Phthalate	Diethyl Phthalate	µg/kg	600	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					
Other SVOC	Hexachlorobutadiene	µg/kg	600	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					
Other SVOC	Pentachlorophenol	µg/kg	1000	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					97
PEST/PCB	Heptachlor	µg/kg	10	**21.3**	**UJ**	0.928	U	0.871	U	8.93	UJ	1.01	U					
Other SVOC	Carbazole	µg/kg	1600	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					100
Other SVOC	1,2-Dichlorobenzene	µg/kg	1700	**2150**	**UJ**	178	U	17.9	U	190	U	190	U					
PEST/PCB	Heptachlor Epoxide	µg/kg	20	**22.6**	**UJ**	0.985	U	0.925	U	9.48	UJ	2.63	J C1					

Notes:

DEQ high values are used here for comparison purposes only. Additional evaluation is needed to develop site-specific risk and/or cleanup concentrations. Portland Harbor baseline values are included for relative comparison only.
Sediment data have been sorted by the maximum factor of exceedance in descending order. The columns (sample location IDs) are sorted geographically from the approximate upstream to downstream when moving to the right across the table.

*Sample collected at WR-16 is not included in exceedance calculations. Also note that at the time of sampling, this outfall was referred to as WP-16.

bold The method reporting limit exceeds DEQ High Comparison Value.
shaded The reported value exceeds DEQ HIgh Comparison Value.

[1] Total parameters (I.e., LPAHs, HPAHs, PAHs, PCBs, and DDTs) were calculated based on detections only. Qualifiers are not included on total parameters as it is implied that these are estimated quantities.

[2] Total LPAHs: Low molecular weight polycyclic aromatic hydrocarbons include naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, and 2-methylnaphthalene.

[3] Total HPAHs: High molecular weight polycyclic aromatic hydrocarbons include fluoranthene, pyrene, benz[a]anthracene, chrysene, benzofluoranthenes, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylen

[4] Total PAHs: Represents the sum of Total LPAHs and HPAHs.

[5] Total PCBs: The list of PCB congeners is based on EPA recommendations provided in *OA/OC Guidance for Sampling and Analysis of Sediment, Water, and Tissues for Dredged Material Evaluations*, EPA 823-B-95-001 (April 1995).
This list can be used to estimate total PCBs in accordance with the NOAA method provided in NOAA Technical Memorandum NOA OMA 49 (August 1989). Calculations follow the Battelle method: Total PCB = 1.95 (Σ congeners listed) + 2.1

[6] Total DDTs: Sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.

Qualifiers:

B2	This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than 10 times the concentration reported in the blank)
C1	Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be < 40%
C2	Second column confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be > 40%. The higher result was reported unless anomalies were noted
D10	The analyte exceeded the linear calibration range and the sample was diluted and reanalyzed. The reported result for the analyte has been flagged with "D" and a number representing the additional dilution required to bring the analyte within the calibration range
J	The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity
U	The analyte was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Abbreviations/Definitions:

ug/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
Normal	indicates a normal field sample (not a duplicate)
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
SVOC	semi-volatile organic compound

TABLE 3-2
Outfalls 19/19A - Exceedances of DEQ High Sediment Comparison Level Values for Freshwater Receptors
Phase 1 Data Evaluation Report

Class	Analyte	Units	DEQ High Values	Upstream SI0119A020 10/18/2002 Normal		Centered 15 ft from 19A SI0119A010 10/18/2002 Normal		Centered 50 ft from 19A SI0119A030 10/18/2002 Normal		Centered 100 ft from 19A SI0119030 10/18/2002 Normal		Centered Adjacent to 19 SI0119010 10/18/2002 Normal		Centered 50 ft from 19 SI0119020 10/18/2002 Normal		DETECTS Max factor of exceedance	DETECTS Number of exceedances	NONDETECTS Max factor of exceedance	NONDETECTS Number of exceedances	Portland Harbor Baseline Values
HPAH	**Total Estimated HPAHs**[1,3]	µg/kg	1000	2745		7801		1340		1056		1702		12212		12.2	6			2400
LPAH	**Total Estimated LPAHs**[1,2]	µg/kg	400	799		2531		709		586		808		4870		12.2	6			700
Total Metals	Chromium	mg/kg	111	27.6		774		28.1		19.9		31.4		44.2		7.0	1			41
HPAH	Indeno (1,2,3-cd) pyrene	µg/kg	100	178		466	J	67.2		67.1		70.8	J	620	J	6.2	3			225
Phthalate	Bis(2-Ethylhexyl) Phthalate	µg/kg	800	479		4420	J	483		290	J	3050	J	3240	J	5.5	3			390
Total Metals	Copper	mg/kg	149	48.3	B2	772	B2	61.5	B2	62.3	B2	102	B2	266	B2	5.2	2			60
Total Metals	Nickel	mg/kg	49	21.1	B2	153	B2	21.1	B2	15.3	B2	23.2	B2	45	B2	3.1	1			32
Total Metals	Zinc	mg/kg	459	134	B2	1320	B2	138	B2	96.8	B2	213	B2	397	B2	2.9	1			118
Total Metals	Lead	mg/kg	130	31.7	B2	350	B2	33.7	B2	24.7	B2	88.5	B2	187	B2	2.7	2			30
HPAH	Benzo [g,h,i] perylene	µg/kg	300	182		554	J	76.4		104		86	J	666	J	2.2	2			250
HPAH	Pyrene	µg/kg	1500	591		1680	J	340		261		413	J	2870	J	1.9	2			700
LPAH	Phenanthrene	µg/kg	1200	304		1060	J	265		218		386	J	2170	J	1.8	1			700
LPAH	Acenaphthene	µg/kg	300	58		251	J	60.3		40.1	J	72	J	508	J	1.7	1			180
LPAH	2-Methylnaphthalene	µg/kg	200	75		182	J	76.5		44.2		60.3	J	314	J	1.6	1			150
HPAH	Fluoranthene	µg/kg	2200	523		1340	J	304		245		419	J	2980	J	1.4	1			600
LPAH	Fluorene	µg/kg	600	76.1		215	J	52.8		40.7	J	79.1	J	766	J	1.3	1			125
HPAH	Benzo (a) anthracene	µg/kg	1000	271		850	J	117		108		147	J	1210	J	1.2	1			360
LPAH	Anthracene	µg/kg	800	99.7		357	J	77.3		105		97.2	J	892	J	1.1	1			150
Other SVOC	Phenol	µg/kg	50	**231**	**U**	**202**	**UJ**	**214**	**U**	**217**	**U**	**182**	**UJ**	**223**	**UJ**			4.6	6	20
Phthalate	Di-n-Butyl Phthalate	µg/kg	100	**231**	**U**	**202**	**UJ**	**214**	**U**	**217**	**U**	**182**	**UJ**	**223**	**UJ**			2.3	6	20
Other SVOC	Hexachlorobenzene	µg/kg	100	**231**	**U**	**202**	**UJ**	**214**	**U**	**217**	**U**	**182**	**UJ**	**223**	**UJ**			2.3	6	
PEST/PCB	Chlordane	µg/kg	20	4.15	UJ	3.73	UJ	4.62	UJ	4.21	UJ	4.55	UJ	**36.1**	**UJ**			1.8	1	

Notes:
DEQ high values are used here for comparison purposes only. Additional evaluation is needed to develop site-specific risk and/or cleanup concentrations. Portland Harbor baseline values are included for relative comparison only.
Sediment data have been sorted by the maximum factor of exceedance in descending order. The columns (sample location IDs) are sorted geographically from the approximate upstream to downstream when moving to the right across the table.

bold The method reporting limit exceeds DEQ High Comparison Value.
shaded The reported value exceeds DEQ HIgh Comparison Value.

[1] Total parameters (I.e., LPAHs, HPAHs, PAHs, PCBs, and DDTs) were calculated based on detections only. Qualifiers are not included on total parameters as it is implied that these are estimated quantities.
[2] Total LPAHs: Low molecular weight polycyclic aromatic hydrocarbons include naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, and 2-methylnaphthalene.
[3] Total HPAHs: High molecular weight polycyclic aromatic hydrocarbons include fluoranthene, pyrene, benz[a]anthracene, chrysene, benzofluoranthenes, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene.
[4] Total PAHs: Represents the sum of Total LPAHs and HPAHs.
[5] Total PCBs: The list of PCB congeners is based on EPA recommendations provided in *QA/QC Guidance for Sampling and Analysis of Sediment, Water, and Tissues for Dredged Material Evaluations,* EPA 823-B-95-001 (April 1995).
This list can be used to estimate total PCBs in accordance with the NOAA method provided in NOAA Technical Memorandum NOA OMA 49 (August 1989). Calculations follow the Battelle method: Total PCB = 1.95 (Σ congeners listed) + 2.1.
[6] Total DDTs: Sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.

Qualifiers:
B2 This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than 10 times the concentration reported in the blank).
J The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.
U The analyte was not detected above the reported sample quantitation limit.
UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Abbreviations/Definitions:
ug/kg micrograms per kilogram
mg/kg milligrams per kilogram
Normal indicates a normal field sample (not a duplicate)
PAH polycyclic aromatic hydrocarbon
PCB polychlorinated biphenyl
SVOC semi-volatile organic compound
TPH total petroleum hydrocarbon

TABLE 3-3

Outfall 22B - Exceedances of DEQ High Sediment Comparison Level Values for Freshwater Receptors

Phase 1 Data Evaluation Report

Class	Analyte	Units	DEQ High Values	Upstream SI0122B020 10/16/2002 Normal		Centered (outfall channel) 53 ft SI0122B040 10/16/2002 Normal		Centered (outfall channel) 125 ft SI0122B030 10/16/2002 Normal		Centered (river) SI0122B010 10/16/2002 Normal		DETECTS Max factor of exceedance	DETECTS Number of exceedances	NONDETECTS Max factor of exceedance	NONDETECTS Number of exceedances	Portland Harbor Baseline Values
PEST/PCB	4,4'-DDD	µg/kg	30	121	C1	195	C1	250	C1	315	C1	10.5	4			
Total Metals	Nickel	mg/kg	49	91.9	B2	101	B2	138	B2	16.6	B2	2.8	3			32
HPAH	**Total Estimated HPAHs[1,3]**	µg/kg	1000	1253		658		2652		711		2.7	2			2400
HPAH	Indeno (1,2,3-cd) pyrene	µg/kg	100	89.6		46.4		248		48.7		2.5	1			225
PEST/PCB	4,4'-DDE	µg/kg	30	21.2	C1	67.9	C1	19.5	C1	52.2	C1	2.3	2			
Total Metals	Lead	mg/kg	130	102	B2	266	B2	197	B2	19.6	B2	2.0	2			30
Total Metals	Selenium	mg/kg	5	0.477	U	9.42		0.712	U	0.102	U	1.9	1			15
Total Metals	Copper	mg/kg	149	82.6	B2	116	B2	271	B2	17.2	B2	1.8	1			60
Total Metals	Chromium	mg/kg	111	101		74		199		16.7		1.8	1			41
Total Metals	Zinc	mg/kg	459	322	B2	689	B2	666	B2	62.4	B2	1.5	2			118
Total Metals	Arsenic	mg/kg	33	20.8		47.5		22.9		3.55		1.4	1			5
HPAH	Benzo [g,h,i] perylene	µg/kg	300	129		61.8		400		71.1		1.3	1			250
PEST/PCB	4,4'-DDT	µg/kg	60	36.6	C1	75.4	C2	58.8	C1	54.6	C1	1.3	1			
LPAH	**Total Estimated LPAHs[1,2]**	µg/kg	400	216		103		421		79		1.1	1			700

Notes:

DEQ high values are used here for comparison purposes only. Additional evaluation is needed to develop site-specific risk and/or cleanup concentrations. Portland Harbor baseline values are included for relative comparison only.
Sediment data have been sorted by the maximum factor of exceedance in descending order. The columns (sample location IDs) are sorted geographically from the approximate upstream to downstream when moving to the right across the table.

bold The method reporting limit exceeds DEQ High Comparison Value.
shaded The reported value exceeds DEQ HIgh Comparison Value.

[1] Total parameters (I.e., LPAHs, HPAHs, PAHs, PCBs, and DDTs) were calculated based on detections only. Qualifiers are not included on total parameters as it is implied that these are estimated quantities.

[2] Total LPAHs: Low molecular weight polycyclic aromatic hydrocarbons include naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, and 2-methylnaphthalene.

[3] Total HPAHs: High molecular weight polycyclic aromatic hydrocarbons include fluoranthene, pyrene, benz[a]anthracene, chrysene, benzofluoranthenes, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene.

[4] Total PAHs: Represents the sum of Total LPAHs and HPAHs.

[5] Total PCBs: The list of PCB congeners is based on EPA recommendations provided in *QA/QC Guidance for Sampling and Analysis of Sediment, Water, and Tissues for Dredged Material Evaluations,* EPA 823-B-95-001 (April 1995).
This list can be used to estimate total PCBs in accordance with the NOAA method provided in NOAA Technical Memorandum NOA OMA 49 (August 1989). Calculations follow the Battelle method: Total PCB = 1.95 (Σ congeners listed) + 2.1.

[6] Total DDTs: Sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.

Qualifiers:

B2 This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than 10 times the concentration reported in the blank).
C1 Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be < 40%.
U The analyte was not detected above the reported sample quantitation limit.

Abbreviations/Definitions:

ug/kg micrograms per kilogram
mg/kg milligrams per kilogram
Normal indicates a normal field sample (not a duplicate)
PAH polycyclic aromatic hydrocarbon
PCB polychlorinated biphenyl

TABLE 3-4
Outfall 22C - Exceedances of DEQ High Sediment Comparison Level Values for Freshwater Receptors
Phase 1 Data Evaluation Report

Class	Analyte	Units	DEQ High Values	Centered (outfall channel) 20 ft SI0122C040 10/17/2002 Normal		Centered (outfall channel) 110 ft SI0122C030 10/17/2002 Normal		Centered (outfall channel) 110 ft SI0122C031 10/17/2002 Duplicate		Centered (river) SI0122C020 10/16/2002 Normal		Downriver SI0122C010 10/16/2002 Normal		DETECTS Max factor of exceedance	DETECTS Number of exceedances	NONDETECTS Max factor of exceedance	NONDETECTS Number of exceedances	Portland Harbor Baseline Values
HPAH	**Total Estimated HPAHs[1,3]**	µg/kg	1000	596		6226		3761		2778		71270		71.3	4			2400
HPAH	Indeno (1,2,3-cd) pyrene	µg/kg	100	53.4	J	629	D10	338		148	J	5120		51.2	4			225
HPAH	Benzo [g,h,i] perylene	µg/kg	300	59.6	J	639	D10	381		195	J	6390		21.3	3			250
LPAH	**Total Estimated LPAHs[1,2]**	µg/kg	400	76		749		539		809		7936		19.8	4			700
PEST/PCB	4,4'-DDD	µg/kg	30	7.34	J C1	22.6	C1	45.7	C1	19.4	C1	296	C1	9.9	2			
HPAH	Pyrene	µg/kg	1500	95.9	J	962	D10	635	D10	596	D10 J	10800	D10	7.2	1			700
HPAH	Benzo (a) anthracene	µg/kg	1000	30	J	611	D10	321	D10	283	J	7050		7.1	1			360
HPAH	Chrysene	µg/kg	1300	59.1	J	584	D10	349	D10	297	J	7140		5.5	1			425
HPAH	Benzo (a) pyrene	µg/kg	1500	64.2	J	635	D10	355	D10	294	J	8220	D10	5.5	1			500
HPAH	Fluoranthene	µg/kg	2200	89.4	J	837	D10	548	D10	499	D10 J	10400	D10	4.7	1			600
LPAH	Acenaphthene	µg/kg	300	12.8	J	95.8		57.2		119	J	1380		4.6	1			180
PEST/PCB	4,4'-DDT	µg/kg	60	2.23	U	31.5	C1	258	C1	22.9	C1	48.2	C1	4.3	1			
LPAH	Phenanthrene	µg/kg	1200	28.8	J	411	D10	309		283	J	4300		3.6	1			700
LPAH+HPAH	**Total Estimated PAHs[1,4]**	µg/kg	23000	671		6993		4300		3586		79206		3.4	1			
HPAH	Dibenzo (a,h) anthracene	µg/kg	1300	17	J	109		77.6		65.7	J	2850		2.2	1			125
PEST/PCB	4,4'-DDE	µg/kg	30	1.98	U	18.9	C1	37	C1	20.3	C1	58	C1	1.9	2			
Total Metals	Nickel	mg/kg	49	7.03		15		12.2		75.5	B2	83.2	B2	1.7	2			32
Total Metals	Arsenic	mg/kg	33	53.7		5.6		4.92		19.7		27.7		1.6	1			5
LPAH	Anthracene	µg/kg	800	12.8	J	131		77.1		250	D10 J	1150		1.4	1			150
Total Metals	Lead	mg/kg	130	13.3	B2	18.9	B2	20.7	B2	122	B2	161	B2	1.2	1			30
Total Metals	Silver	mg/kg	5	0.573		0.141		6.14		0.744		1.3		1.2	1			1.4
Total Metals	Copper	mg/kg	149	18.3		22.6		19		123	B2	168	B2	1.1	1			60
LPAH	Acenaphthylene	µg/kg	200	7	J	37.8		40.1		71.2	J	201		1.0	1			60
Other SVOC	Phenol	µg/kg	50	**65**	**UJ**	16.2	U	15.3	U	15.3	UJ	**341**	**U**			6.8	2	20
Phthalate	Di-n-Butyl Phthalate	µg/kg	100	65	UJ	16.2	U	15.3	U	15.3	UJ	**341**	**U**			3.4	1	20
Other SVOC	Hexachlorobenzene	µg/kg	100	65	UJ	16.2	U	15.3	U	15.3	UJ	**341**	**U**			3.4	1	
Other SVOC	1,3-Dichlorobenzene	µg/kg	300	65	UJ	16.2	U	15.3	U	15.3	UJ	**341**	**U**			1.1	1	
Other SVOC	1,4-Dichlorobenzene	µg/kg	300	65	UJ	16.2	U	15.3	U	15.3	UJ	**341**	**U**			1.1	1	

Notes:
DEQ high values are used here for comparison purposes only. Additional evaluation is needed to develop site-specific risk and/or cleanup concentrations. Portland Harbor baseline values are included for relative comparison only.
Sediment data have been sorted by the maximum factor of exceedance in descending order. The columns (sample location IDs) are sorted geographically from the approximate upstream to downstream when moving to the right across the table.

bold The method reporting limit exceeds DEQ High Comparison Value.
shaded The reported value exceeds DEQ HIgh Comparison Value.

[1] Total parameters (I.e., LPAHs, HPAHs, PAHs, PCBs, and DDTs) were calculated based on detections only. Qualifiers are not included on total parameters as it is implied that these are estimated quantities.

[2] Total LPAHs: Low molecular weight polycyclic aromatic hydrocarbons include naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, and 2-methylnaphthalene.

[3] Total HPAHs: High molecular weight polycyclic aromatic hydrocarbons include fluoranthene, pyrene, benz[a]anthracene, chrysene, benzofluoranthenes, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene.

[4] Total PAHs: Represents the sum of Total LPAHs and HPAHs.

[5] Total PCBs: The list of PCB congeners is based on EPA recommendations provided in *QA/QC Guidance for Sampling and Analysis of Sediment, Water, and Tissues for Dredged Material Evaluations,* EPA 823-B-95-001 (April 1995).
This list can be used to estimate total PCBs in accordance with the NOAA method provided in NOAA Technical Memorandum NOA OMA 49 (August 1989). Calculations follow the Battelle method: Total PCB = 1.95 (Σ congeners listed) + 2.1.

[6] Total DDTs: Sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT.

Qualifiers:

B2	This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than 10 times the concentration reported in the blank).
C1	Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be < 40%.
D10	The analyte exceeded the linear calibration range and the sample was diluted and reanalyzed. The reported result for the analyte has been flagged with "D" and a number representing the additional dilution required to bring the analyte within the calibration range.
J	The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.
U	The analyte was not detected above the reported sample quantitation limit.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Abbreviations/Definitions:

ug/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
Normal	indicates a normal field sample (not a duplicate)
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
SVOC	semi-volatile organic compound

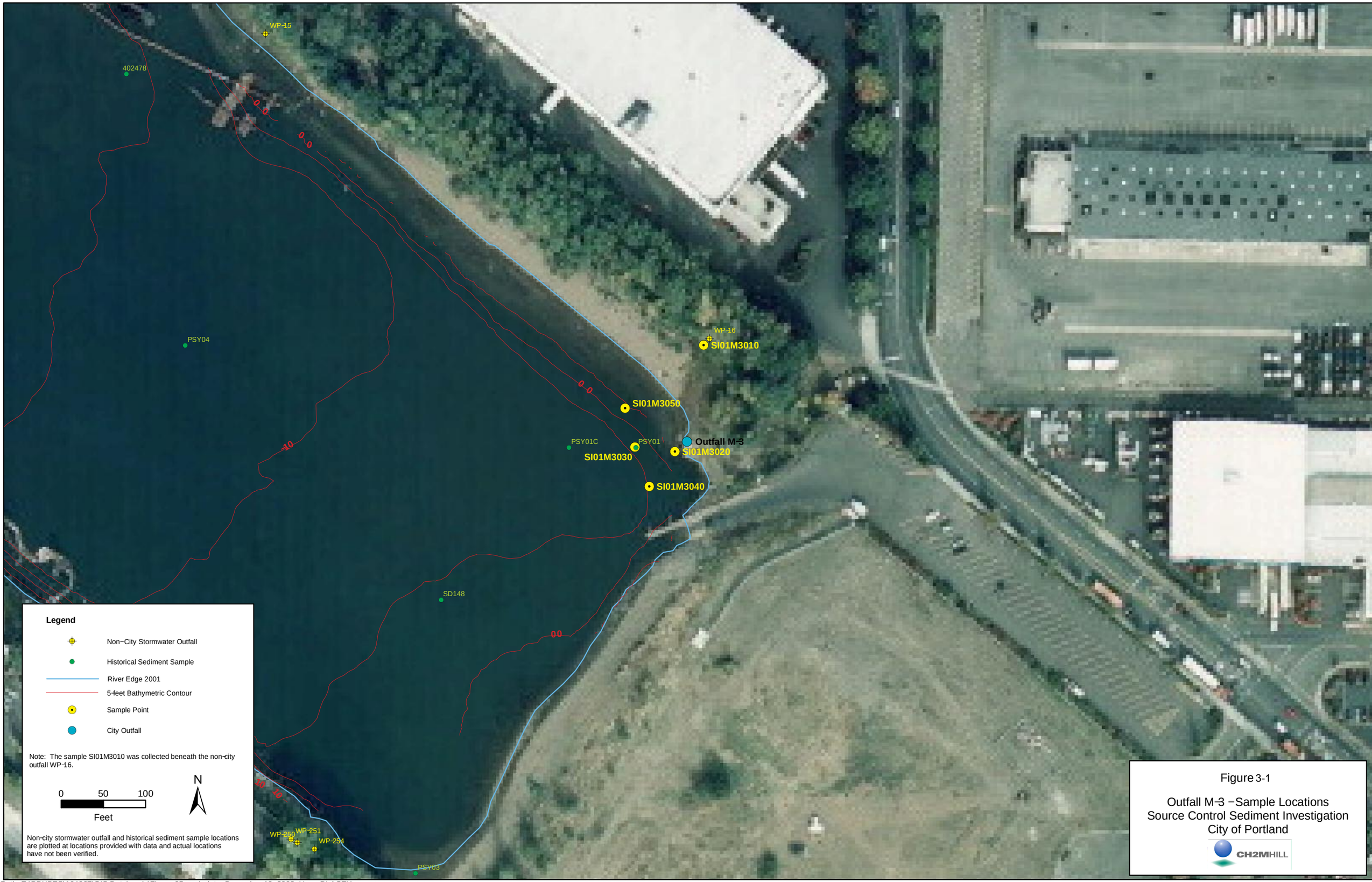

Figure 3-1

Outfall M-3 – Sample Locations
Source Control Sediment Investigation
City of Portland

CH2MHILL

WP-257
WP-256
SD135
SD137
SI0119020
Outfall 19
SI0119010
SI0119030
SI01190A30
Outfall 19A
SI0119A010
SI0119A020
-10
-20
-30
0
-10
-10
-10
0
0
-10
-10
0
0
0
0
0
-40

Legend

- Non−City Stormwater Outfall
- Historical Sediment Sample
- River Edge 2001
- 5-feet Bathymetric Contour
- Sample Point
- City Outfall

0 50 100
Feet

N

Non-city stormwater outfall and historical sediment sample locations are plotted at locations provided with data and actual locations have not been verified.

Figure 3-2

Outfall 19 and 19A −Sample Locations
Source Control Sediment Investigation
City of Portland

CH2MHILL

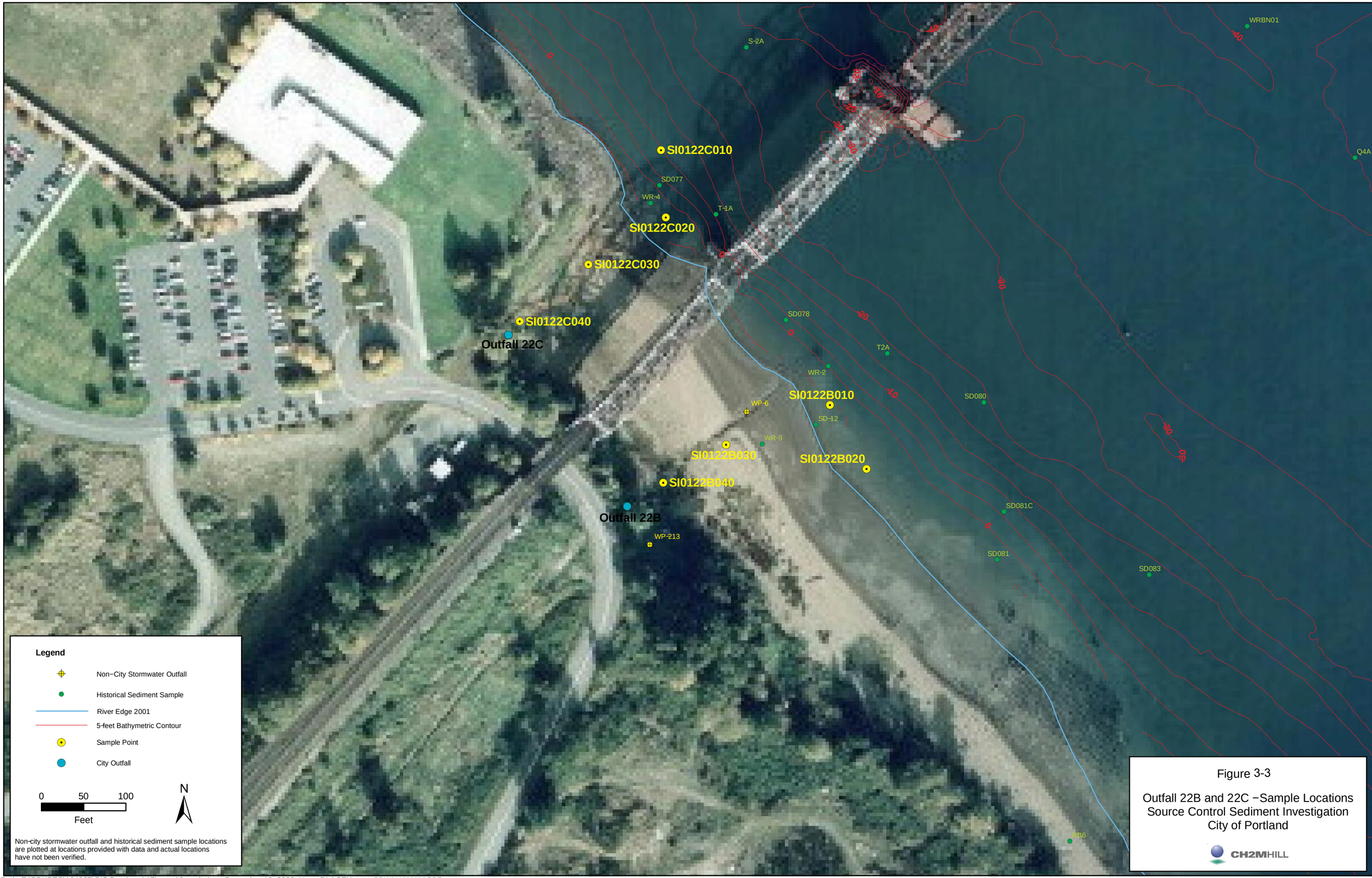

Figure 3-3

Outfall 22B and 22C −Sample Locations
Source Control Sediment Investigation
City of Portland

CH2MHILL

SECTION 4

Basin Conceptual Site Models

The Programmatic Work Plan describes the weight-of-evidence approach that will be used during the site characterization process to evaluate the potential for discharges (historical and current) to the City stormwater conveyance system that contribute to Willamette River sediment contamination within the ISA.

To apply the weight-of-evidence approach to the evaluation of the subject basins, conceptual site models (CSM) were developed for each basin. These CSMs summarize the current understanding of each basin and its corresponding outfalls in terms of potential sources, potential migration pathways, and PCOIs.

The identification of potential sources relies heavily on information developed by DEQ under its Cleanup Program, which focuses on upland sites contaminated with hazardous substances. Other contaminant sources could exist that have not been identified or characterized; these could include other upland sites with hazardous substances that have not been identified to date, general runoff from paved areas (e.g., parking lots and roads) that contain traffic-related contaminants, and air deposition contaminants. As additional source tracing is conducted, these additional sources will be identified and incorporated into the basin CSMs.

This section explains the process used to develop the CSMs and presents a CSM for each subject basin.

4.1 Process for Developing CSMs

As identified in the Programmatic Work Plan, CSMs were prepared by following the first three steps of the site characterization process: (1) identify an initial list of PCOIs (developed in Section 3), (2) identify potential upland sources of PCOIs, and (3) identify and evaluate potential migration pathways for PCOIs to the outfall areas. An initial PCOI list was developed for each subject basin on the basis of the in-river sediment data collected by the City. DEQ has identified sites with releases of hazardous substances and placed the sites on the DEQ Environmental Cleanup Site Information (ECSI) database. The upland facilities on the ECSI list that are located within or near a subject basin were considered during development of the CSMs to identify potential sources and migration pathways. A summary of the information from the ECSI database for these sites, as well as information from selected site-specific reports, are provided in Appendix A.

Based on information developed in the CSMs, complete PCOI lists were developed for each of the subject basins. The complete PCOI list represents basin-specific constituents that can be used to focus source investigation activities within the basins.

Potential sources and migration pathways considerations for the CSMs are discussed below.

4.1.1 Potential Sources

Potential sources within each subject basin and adjacent to the outfall were identified and evaluated in relation to the initial list of PCOIs. Potential sources considered in our evaluations include the following:

- Non-stormwater or wastewater discharges
- Surface or shallow soil contamination
- Overwater activities
- Upstream activities
- Private outfalls located near City outfalls
- Groundwater contamination from upland release

Potential sources were evaluated using information available in the ECSI database and in selected site-specific reports. For this initial effort, not all available data were reviewed. Soil and sediment data related to the potential source areas were compared to the PH Baseline and DEQ High. Groundwater and surface water data were compared to the freshwater chronic criteria ambient water quality standards.

4.1.2 Potential Migration Pathways

The next step was to identify potential migration pathways that link potential sources with in-river sediment contamination near the outfall associated with each subject basin. Potential migration pathways include the following:

- Overland migration of contaminated media into catch basins, through the City stormwater conveyance system or other private stormwater conveyance systems, and into the river
- Overland migration of contaminated media directly into the river
- Direct discharge of contaminated material from overwater activities
- Redeposition of upstream river sediment contamination
- Contaminated groundwater infiltration into or along the outside of the City or private stormwater conveyance system
- Erosion of riverbank materials adjacent to the outfalls
- Direct discharge of contaminated groundwater

4.2 Conceptual Site Model for Basin M-3

As developed in Section 3, the initial PCOI list consists of phthalates (BEHP and di-n-butyl phthalate) and PAHs for Basin M-3. The following subsections explore potential sources and pathways of these constituents. Summaries of the ECSI files for sites that are relevant to Basin M-3 are provided in Appendix A.

4.2.1 Potential Sources and Pathways

4.2.1.1 Upland Sites Located Within Basin M-3

All sites located within the basin (including those partially in the basin) potentially can contribute contaminated stormwater to the City conveyance system. Table 2-1 shows the facilities that are located in Basin M-3. As shown in Table 2-1, there are four facilities with 1200-Z National Pollutant Discharge Elimination System (NPDES) permits, two facilities with a No Exposure Certification (NEC), and one facility with a 100-J NPDES permit (cooling water discharge).

Many of the existing businesses are related to trucking, distribution, service, or sales. Industrial development is relatively young in this basin compared to many other basins outside of the Swan Island area. The area west of Basin Avenue was filled in the 1980s so all the facilities in this area have been in operation less than 25 years. East of Basin Avenue, industrial development began in the late 1950s, although the Kaiser Company used the area before then as part of its wartime activities.

Data gathered during a variety of investigations are inconclusive as to whether groundwater is migrating in or around the storm sewer piping associated with Outfall M-3. Consistent dry-weather flow has been observed in Basin M-3 as part of the City's Illicit Discharge Elimination Program (IDEP). However, Basin M-3 has a non-stormwater discharge (associated with the 100-J NPDES permit), and there has been no evidence of seeps or iron oxide around Outfall M-3.

Two ECSI sites are located within Basin M-3: Fred Meyer (ECSI #44) and Freightliner (ECSI #115). One ECSI site (ECSI #3901) owned by the City is partially located within the basin.

- **Fred Meyer (ECSI #44)**

  Potential Sources

  Historical uses at the site include reclamation of copper wire. Currently, the site is used as a parking lot and is paved. Site investigation indicated PCBs in soils, but only one of 23 samples had concentrations above the Toxics Substances Control Act (TSCA) cleanup standard. The samples also were analyzed for oil and grease, but apparently not for phthalates. DEQ and EPA have issued a No Further Action (NFA) determination for the site.

  Potential Migration Pathways to the Outfall

  The level of investigation regarding migration pathways, including stormwater conveyance systems, is unknown based on the files reviewed for this site.

- **Freightliner (ECSI #115)**

  Potential Sources

  Freightliner has used the property for truck assembly, painting, welding, machining, and finish detailing. Contaminants detected in soil and groundwater at the site include petroleum hydrocarbons, VOCs, phthalates, PAHs, and PCBs. DEQ issued Freightliner a 1200-L NPDES stormwater permit in 1992. This permit was renewed as a 1200-Z

NPDES permit in 1997. Monitoring data collected since BES began administering the NPDES permit in 1994 indicate that stormwater permit benchmark values for copper, lead, zinc, TSS, and oil and grease have been exceeded intermittently at the site since permit issuance.

Potential Migration Pathways to the Outfall

The DEQ has indicated that additional stormwater sampling is needed to assess the stormwater pathway at the site (DEQ, June 2005).

- **End of Swan Island Lagoon (ECSI #3901)**

  Potential Sources

  The site is owned by the City. Most of the site is undeveloped and unpaved, and is not located within Basin M-3. Only a small portion of the site is located in Basin M-3 and is used as a parking lot connected to a boat ramp (see Figure 2-1). Upland investigation of the site identified PAHs in the shallow soil at the site (BES, June 2003). These soil samples were collected in portions of the site that are located outside of the basin and away from the lagoon. This investigation did not include lagoon bank samples.

  Potential Migration Pathways to the Outfall

  Potential migration pathways to the Outfall M-3 area associated with PAHs in soil at the site are unlikely (BES, June 2003). Future evaluation of the stormwater pathway may be warranted.

4.2.1.2 Point Sources Located Adjacent to Outfall M-3

Private outfall WR-16, the only potential point source identified in the immediate vicinity of Outfall M-3, is located approximately 100 feet north of Outfall M-3 (see Figure 2-1). Private outfall WR-16 discharges at the top of the sloped shoreline and drains overland into Swan Island Lagoon approximately 50 feet from Outfall M-3. NW Paper Box Manufacturing (formerly Island Holdings, Inc. [ECSI #260]) has been designated as the adjacent owner/occupant of the private outfall (WR-16).

- **NW Paper Box Manufacturing (formerly Island Holdings, Inc.) (ECSI #260)**

  Potential Sources

  Data obtained from the ECSI file indicate known or potential arsenic, chromium, PCB, 2,4-D, and other pesticide contamination at the site. Data obtained from the ECSI file do not show that Island Holdings was a historical source of PAHs or phthalates to the river. No source of these contaminants to private outfall WR-16 has been identified. While NW Paper Box Manufacturing discharges to private outfall WR-16, (based on site activities, investigations, and dye testing), it is unlikely that PAHs and phthalates currently originate from this site. Remnant accumulations of inline solids, discharged historically to the on-site stormwater collection system, may be an ongoing source of sediment contamination from this private stormwater line that terminates at private outfall WR-16.

Potential Migration Pathways to Outfall M-3

Discharges from private outfall WR-16's stormwater pipe are a potential migration pathway to the Outfall M-3 area.

4.2.1.3 Nonpoint Sources and Pathways Located Near Outfall M-3

A variety of potential nonpoint sources could be adversely affecting the sediments near Outfall M-3. As discussed earlier, Outfall M-3 is located at the end of the Swan Island Lagoon and is in an area where sediment concentrations found near the outfall may be reflective of sources originating from sites adjacent to the lagoon. Adjacent overwater activities, bank erosion, and redeposition of contaminated sediment originating from more distant locations are discussed below as potential sources.

- Overwater Activities
  A wide variety of overwater activities occurs near the outfall, including traffic associated with private and public docks and ship repair work. Adjacent to Outfall M-3 is a public boat ramp (approximately 100 feet from Outfall M-3). Overwater boating activities are a potential source of fuels and PAHs that may affect the Outfall M-3 area. Farther from the outfall, one of the obvious sources within the lagoon (based on the historical sediment data) is the significant overwater activity at the Swan Island Ship Yard.

- Bank Erosion
  The Port of Portland and City own the property abutting the river adjacent to Outfall M-3. The small parcel located between the lagoon and the Island Holding site (ECSI #260) is owned by the Port of Portland and includes private outfall WR-16. Contaminants identified directly below private outfall WR-16 have the potential to migrate to the Outfall M-3 area via bank erosion. PAHs were detected in upland soil at the "End of Swan Island Lagoon" site. The riverbank material at this site has not been investigated.

- Redeposition of In-River Sediments
  Transport and redeposition of sediments occur in the lagoon as a result of minimal water flow conditions (GeoSea Consulting, 2001). In light of the flow dynamics, contaminants entering the lagoon have the potential to be transported to the head of the lagoon near Outfall M-3. The Swan Island Ship Yard (ECSI #271) has been identified as a historical source of contamination to the lagoon. The site has been used to maintain and repair ships and currently includes three dry docks located at the northern end of the island. In-water berths are arranged along the Willamette River and the lagoon. Historical site operations included overwater discharges of sandblast material. Contaminants of interest identified in overwater areas include metals (arsenic, copper, lead, and zinc), phthalates, tributyltin, and PAHs.

4.2.2 PCOI Evaluation for Basin M-3

Based on information developed in the CSMs, complete PCOI lists were developed for Basin M-3. A discussion of each PCOI is provided in this section.

Phthalates

Phthalates (BEHP and di-n-butyl phthalate) were included in the initial PCOI list for Basin M-3. A potential source of phthalates was identified at the Freightliner site (ECSI #115). Freightliner has not completed a stormwater pathway evaluation. While there are several potential sources of phthalates outside of Basin M-3 that could be affecting sediment concentrations near the outfall, phthalate sources within the basin cannot be ruled out. Therefore, phthalates were carried forward to the complete PCOI list for Basin M-3.

PAHs

PAHs were included in the initial PCOI list for Basin M-3. Freightliner has been identified as a potential source of PAHs. Freightliner has not completed a stormwater pathway evaluation. Other point and nonpoint potential sources of PAHs may be affecting PAH concentrations in the Outfall M-3 area, but because potential sources have been identified in the basin, PAHs were carried forward to the complete PCOI list for Basin M-3.

Several other facilities that are not listed in the ECSI database operate in Basin M-3. Table 2-1 lists all of the facilities located in Basin M-3. These facilities are also potential sources of PCOIs that may have migrated into the Outfall M-3 stormwater collection system.

4.3 Conceptual Site Model for Basins 19/19A

As developed in Section 3, the initial PCOI list consists of phthalates, PAHs, PCBs, and metals (chromium, copper, lead, nickel, and zinc) for Basins 19/19A. The following subsections explore potential sources and pathways of these constituents and other site-related constituents. Summaries of the ECSI files for sites that are relevant to Basins 19/19A are provided in Appendix A.

4.3.1 Potential Sources and Pathways (Basin 19)

4.3.1.1 Upland Sites Located Within Basin 19

All sites located within Basin 19 (including those partially in the basin) have some potential to contribute contaminated stormwater to the City stormwater conveyance system. Table 2-2 shows the facilities that are located in Basin 19. As shown in Table 2-2, there are seven facilities in Basin 19 with 1200-Z NPDES permits, seven facilities with NEC status, one facility with an individual NPDES permit, one facility with a 1300-J NPDES permit, and one facility with a 100-J NPDES permit.

Eight ECSI sites are located in Basin 19: Anderson Brothers Property (ECSI #970), Brazil & Co. (ECSI #1026), Calbag Metals (ECSI #2454), Dura Industries (ECSI #111), Mt. Hood Chemical Corp. (ECSI #81), Mt. Hood Chemical Property (ECSI #1328), Schnitzer Investment Corp. (ECSI #2442), and PGE-Forest Park (ECSI #2406).

- **Anderson Brothers Property (ECSI #970)**

  Potential Sources

  This site was used primarily by trucking firms to transport bulk oil and gas. Truck service and repair operations also were performed at the site. Known or potential

contamination at the site includes: oil, motor oil, Stoddard solvent, paint waste, and solvent wastes. Soil containing diesel was left in place after a remedial excavation.

Potential Migration Pathways to the Outfall

Available DEQ records indicate that potential migration pathways to the Outfall 19 area have not been evaluated.

- **Brazil & Co. (ECSI #1026)**

  Potential Sources

  Minimal site information was available in the ECSI file. During a DEQ survey of potential PCB sources in 1979, inspectors noted the storage of PCB transformers on site, and PCBs are now a suspected site contaminant: "Owner may have dismantled transformers on-site and routinely dumped their contents onto the ground" (DEQ, October 2003a).

  Potential Migration Pathways to the Outfall

  Available DEQ records indicate that potential migration pathways to the Outfall 19 area have not been evaluated.

- **Calbag Metals (ECSI #2454)**

  Potential Sources

  Historically, Calbag used the site for metal recycling activities (such as copper, aluminum, and lead recovery from coated wires). Wire coatings (potential source of phthalates and PCBs) and insulation were removed from the wire using an incinerator that generated recyclable ash. Currently, Calbag leases the site to a variety of trucking, transportation, and auto service businesses. Stormwater system assessments conducted at the site and downstream from the site in the Outfall 19 stormwater conveyance system indicate metals (chromium, copper, lead, and zinc) and possibly other contaminants (PCBs, PAHs, and phthalates) are present in inline solids likely originating from historical activities at the site. Subsequent source control actions were implemented including site repaving and filter media installations in the catch basins. However, the effectiveness of these source control efforts has not been adequately evaluated, especially in relation to sediment concentrations in the river (BES, August 2004; BES, November 2005).

  Potential Migration Pathways to the Outfall

  Offsite migration of metals and possibly other contaminants into the Outfall 19 stormwater conveyance system is likely and could be a current source to the river (BES, August 2004; BES, November 2005). Additional monitoring is required to determine if source control actions at the site have been effective.

- **Dura Industries (ECSI #111)**

  Potential Sources

  Minimal site information was available in the ECSI file. Apparently, the site owners have received notices of violation for improper hazardous waste management practices. Potential sources include a 1985 release possibly affecting soil. The released material contained cadmium, chromium, nickel, lead, and zinc. The private storm lines on-site may have accumulated sediments, which may be a current source of historical contamination.

  Potential Migration Pathways to the Outfall

  Available DEQ records indicate minimal investigation has been conducted at the site. Potential migration pathways to the Outfall 19 area have not been evaluated.

- **Mt. Hood Chemical Corp. (ECSI #81)**

  Potential Sources

  The facility produces specialty cleaning products for laundry, kitchen, housekeeping, custodial, and general industrial businesses. Contaminants identified at the site include methylene chloride and corrosive liquids. Methylene chloride has been detected in a water sample collected from a catch basin at the site. The private stormwater lines on-site may have accumulated sediments, which may be a current source of historical contamination.

  Potential Migration Pathways to the Outfall

  Available DEQ records indicate that potential migration pathways to the Outfall 19 area have not been evaluated.

- **Mt. Hood Chemical Property (ECSI #1328)**

  Potential Sources

  Until 1986, this facility was used for bulk chemical storage and distribution (including some hazardous waste, such as chlorinated solvent wastes). In 1992, the DEQ issued a RCRA "clean closure" determination after the facility was decommissioned. Color Magic currently uses the site for photo processing. A cross-connection at the Color Magic facility was identified through the City's Industrial Stormwater (ISW) Program monitoring and was removed in July 2000. The cross-connection included a floor drain, sink, and restrooms connected to the on-site stormwater lines (BES, 2000). After the cross-connection was removed, ISW monitoring results showed the average concentration of dissolved silver dropped from 0.4 to 0.1 µg/L and the total silver decreased from 17.1 to 0.31 µg/L.

  Potential Migration Pathways to the Outfall

  Although the site has been investigated and received closure from the DEQ, it appears that the stormwater pathway was not evaluated as part of the closure.

- **Schnitzer Investment Corp. (ECSI #2442)**

  Potential Sources

  Historically, the site was used for manufacturing acetylene. Waste products (slaked lime) were stored in on-site ponds. Two drain fields/septic systems and a drywell were located at the site. The site was redeveloped in 1996 and currently is used as a commercial and light industrial park. Contaminants identified at the site include PCBs, petroleum compounds, and metals (arsenic, chromium, lead, nickel, and zinc). The DEQ has identified the site as a possible historic source of contamination to the river via the stormwater migration pathway and determined that the site is no longer a potential current source (DEQ, June 2005).

  Potential Migration Pathways to the Outfall

  Redevelopment of the site has reduced the likelihood of overland transport of contaminated media migrating into the Outfall 19 stormwater conveyance system. However, a source control evaluation conducted at the site indicates possible historical sources migrating to the river via the Outfall 19 stormwater conveyance system (DEQ, June 2005).

- **PGE-Forest Park (ECSI #2406)**

  Potential Sources

  This property has never been developed. A suspected release of PCBs from electrical equipment stored on the site by the neighboring site (Brazil & Co.) was reported by PGE to DEQ in 1999. PCBs were identified in the surface soils across much of the site, and in the subsurface soil and groundwater. A remedial excavation was completed in August 2000 that removed soil with concentrations of PCBs above DEQ's generic remedy PCB cleanup level. Subsequently, DEQ issued an NFA determination for the site, though residual PCB levels at the site exceed the DEQ High.

  Potential Migration Pathways to the Outfall

  Although the site was not developed, a small on-site drainage structure, connected to the Outfall 19 stormwater conveyance system, was identified during site investigations. In August 2000, the drainage system components were excavated and disposed of, and the metal piping between the system and the street was cleaned and plugged at the end under the sidewalk (PGE, January 2001). A complete stormwater system investigation has not been completed at the site. However, stormwater flow from the site still likely discharges to the Outfall 19 stormwater conveyance system via infiltration to a perforated stormwater line that parallels the northeastern boundary of the site.

4.3.1.2 Upland Sites Located Partially Within Basin 19

Two ECSI sites are located partially within Basin 19: Front Avenue LP Properties (ECSI #1239) and Chevron USA Asphalt Refinery (ECSI #1281).

- **Front Avenue LP Properties (ECSI #1239)**

  Potential Sources

  The Front Avenue LP Properties site consists of four tax lots occupied by three separate business owners:

  - Glacier Northwest, Inc. (Parcel 1)
  - Tube Forgings of America (Parcel 2)
  - Construction Materials, Inc. (CMI) Northwest (Parcel 3)

  The fourth tax lot consists of a 3.32-acre strip of undeveloped land along the shoreline that is owned by Zidell trustees. Approximately half of Parcel 2 (occupied by Tube Forgings) is located within Basin 19. Parcel 3 (occupied by CMI Northwest) is not located in Basin 19; however, this parcel is located adjacent to the river and Outfall 19. Parcel 1 (occupied by Glacier Northwest) and Parcel 4 (owned by Zidell) are not located in or near Basin 19 and will not be discussed further.

  Many potential source areas have been identified on Parcel 2; contaminants of interest include petroleum hydrocarbons, PCBs, PAHs, VOCs, phthalates, and metals (chromium, copper, lead, mercury, nickel, and zinc). Slag material from former steel mill operations was used as fill along the Parcel 3 shoreline near Outfalls 19 and 19A.

  Potential Migration Pathways to the Outfall

  DEQ records indicate that the site's stormwater migration pathway and bank erosion pathway (slag material located on the shoreline near the Outfall 19) have not been evaluated.

- **Chevron USA Asphalt Refinery (ECSI #1281)**

  Potential Sources

  Contaminants detected at the refinery include petroleum hydrocarbons, VOCs, PAHs, and phenols. Free product has been observed on the groundwater surface in monitoring wells at the site.

  Potential Migration Pathways to the Outfall

  Available DEQ records indicate that potential migration pathways to the Outfall 19 area have not been evaluated.

4.3.1.3 Point Sources Located Adjacent to Outfall 19

There are only a few potential point sources in the immediate vicinity of Outfall 19. Outfall 19A is just upstream of Outfall 19. There are also private outfalls located upstream of Outfall 19. The nearest private outfall is WR-127, located approximately 600 feet from Outfall 19 (see Figure 2-2). Contaminants discharging from upstream outfalls have the potential to migrate to and accumulate in the embayment adjacent to Outfall 19.

Outfall 19A is located just upstream of Outfall 19. As discussed in Section 2, Outfall 19A drains primarily right-of-way and is not considered a major source.

4.3.1.4 Nonpoint Sources and Pathways Located Near Outfall 19

There are three potential nonpoint sources along the shoreline, adjacent to Outfall 19: Front Avenue LP Properties (ECSI #1239), Shaver Transportation (ECSI #2377), and Lakeside Industries (ECSI #2372).

- Overwater Activities
  Although the Shaver Transportation and Lakeside Industries sites include tugboat and barge operations in the Outfall 19 area, the DEQ has indicated that no further source control evaluation is necessary with respect to overwater activities (DEQ, June 2005).
- Bank Erosion
  At Parcel 3 of the Front Avenue LP Properties site, slag material from former steel mill operations historically was used as fill along the shoreline near Outfall 19. Slag contaminants have the potential to migrate to the Outfall 19 area via bank erosion.
- Redeposition of In-River Sediments
  The embayment adjacent to Outfall 19 is likely a depositional area for upstream sediments. Increased resuspension and redeposition of contaminated sediments in the embayment occurs as a result of boat traffic.

4.3.2 PCOI Evaluation for Basin 19

Based on information developed in the CSMs, complete PCOI lists were developed for Basin 19. A discussion of each PCOI is provided in this section.

PCBs

PCBs were included in the initial PCOI list. Potential sources of PCBs were identified at several sites located in Basin 19. These sites have not completed adequate assessments of their stormwater lines in relation to the Outfall 19 stormwater conveyance system. PCBs were carried forward to the complete PCOI list.

PAHs

PAHs were included in the initial PCOI list. While there are potential PAH sources outside of the basin that could affect sediments adjacent to Outfall 19, PAHs sources within the basin could not be ruled out at several facilities within the basin. Therefore, PAHs were carried forward to the complete PCOI list.

Phthalates

Phthalates (BEHP) were included in the initial PCOI list. Potential sources of phthalates were identified at several sites in Basin 19. Adequate assessments have not been completed of these sites' stormwater lines in relation to the Outfall 19 stormwater conveyance system. Phthalates were carried forward to the complete PCOI list.

Metals

Five metals (chromium, copper, lead, nickel, and zinc) were included in the initial PCOI list. Potential sources of metals were identified at several sites located in or adjacent to Basin 19. Adequate assessments have not been completed of these sites' stormwater lines in relation

to the Outfall 19 stormwater conveyance system. All five metals (chromium, copper, lead, nickel, and zinc) were carried forward to the complete list of PCOIs.

Several other facilities that are not listed in the ECSI database operate in Basin 19. Table 2-2 lists all of the facilities located in Basin 19. These facilities are also potential sources of PCOIs that may have migrated into the Outfall 19 stormwater collection system.

4.3.3 Potential Sources and Pathways (Basin 19A)

Upland Sites Located Adjacent to Basin 19A

Basin 19A is a small basin that primarily drains the NW Front Avenue right-of-way. City records show no facilities with permitted stormwater discharges or non-stormwater discharges to the conveyance system. Four ECSI sites are located adjacent to Basin 19A: primarily Calbag Metals (ECSI #2454) and Shaver Transportation (ECSI #2377); and to a lesser degree, Lakeside Industries (ECSI #2372) and Gunderson (ECSI #1155). At the request of DEQ, Lakeside Industries closed on-site stormwater drywells, and is in the process of characterizing stormwater for approval to discharge to the City stormwater system. Currently, the stormwater is discharged to the City's sanitary sewer system. Minimal discharges from the other three sites, if any, contribute to the Outfall 19A stormwater conveyance system. Most of the site boundaries adjacent to Basin 19A are paved and drain stormwater to on-site conveyance systems.

Consistent dry-weather flow was not observed during the City's IDEP or during any other City investigation. No seeps or staining have been identified around Outfall 19A. On the basis of this information, Outfall 19A does not appear to have groundwater intruding into or flowing along the outside of the outfall pipelines. Therefore, groundwater infiltration into the Outfall 19A stormwater conveyance system is an unlikely migration pathway.

4.3.4 PCOI Evaluation for Basin 19A

Based on a review of upland sites located adjacent to Basin 19A, the potential for overland transport of contaminated materials from upland sites into the Outfall 19A stormwater conveyance system is unlikely. Although PCOIs have been identified in sediments in the Outfall 19A area, the discharges from the basin are minimal and not likely the source of the PCOIs. Contaminated sediments present in the Outfall 19A area are attributed to sediment redeposition primarily caused by boat traffic. Therefore, no PCOIs were carried forward for further consideration for Outfall 19A.

4.4 Conceptual Site Model for Basin 22B

As developed in Section 3, the initial PCOI list for Basin 22B consists of pesticides (DDD, DDE, and DDT) and metals (arsenic, chromium, copper, lead, nickel, selenium, and zinc). The following subsections explore potential sources and pathways associated with these constituents. Summaries of the ECSI files for sites that are relevant to Basin 22B are provided in Appendix A.

4.4.1 Potential Sources and Pathways

All sites located within Basin 22B (including those partially in the basin) have some potential to contribute contaminated material to the City stormwater conveyance system. Table 2-5 shows the facilities that are located in Basin 22B. As shown in Table 2-5, there are two facilities within Basin 22B with 1200-Z NPDES permits and two facilities adjacent to the basin with individual NPDES permits. City records show no facilities with permitted non-stormwater discharges in Basin 22B.

On the basis of information gathered during a variety of investigations, contaminated groundwater is entering and being transported through the Outfall 22B stormwater conveyance system. In addition, reddish-brown stains observed in and around the Outfall 22B during a 2002 sediment sampling investigation indicate preferential migration along the outside of the piping.

4.4.1.1 Upland Sites Located Within Basin 22B

Three ECSI sites are located in Basin 22B: Gould, Inc./NL Industries, Inc. (ECSI #49), Schnitzer Investment–Doane Lake (Air Liquide) (ECSI #395), and Metro Central Transfer Station (ECSI #1398). Three ECSI sites with contamination are located partially within or adjacent to Basin 22B that potentially may be a source to the City's stormwater conveyance system: Arkema (ECSI #398), Rhone Poulenc (ECSI #155), and ESCO (ECSI #397).

- **Gould, Inc./NL Industries, Inc. (ECSI #49)**

  Potential Sources

  Historic operations included a secondary lead smelter and battery recycling facility. In 1983, the site was added to the National Priorities List (NPL). Extensive investigation indicated metals (lead, arsenic, cadmium, chromium, selenium, and zinc) in soil and groundwater. However, samples collected during the remedial investigation were not analyzed for copper and nickel (initial PCOIs for Outfall 22B). Rhone-Poulenc-related contamination historically was discharged to a portion of the site (former East Doane Lake) and is present in groundwater beneath the Gould site (refer to the Rhone Poulenc site for additional information). Remedial actions include contaminated soil/material excavation and construction of the On-site Containment Facility (OCF). In 2002, this site was delisted from the NPL.

  Potential Migration Pathways to the Outfall

  Leachate from the OCF collects in sumps and is transferred to the Rhone Poulenc pre-treatment system before discharge to private outfall WR-6 under the Rhone Poulenc NPDES permit. Stormwater collecting in perimeter drainage swales of the OCF discharge to the Outfall 22B stormwater conveyance system through a stormwater lateral.

  Currently, BES is conducting an investigation of the lateral to evaluate discharges into the stormwater conveyance system. In addition, a camera survey has confirmed groundwater infiltration discharging through cracks in the Outfall 22B system piping located downgradient from the Gould site as well as other portions of the system (refer to the Rhone Poulenc site for additional information).

- **Schnitzer Investment–Doane Lake (Air Liquide)(ECSI #395)**

  Potential Sources

  Historic operations include acetylene manufacturing and discharge of calcium hydroxide, generated by its manufacturing process, into the former East Doane Lake. Investigation and remediation have been conducted at the site mostly in relation to the Gould site because Gould waste discharges occurred on the Schnitzer Investment–Doane Lake site. Site investigation indicated calcium hydroxide, lead, arsenic, compressor oil, PCBs, and chlorinated solvents in the soil and groundwater. Rhone-Poulenc-related contamination historically was discharged to a portion of the site (former East Doane Lake) and is present in groundwater beneath the Schnitzer Investment–Doane Lake site (refer to the Rhone Poulenc site for additional information).

  Potential Migration Pathways to the Outfall

  Stormwater collecting in the developed portion of the site discharges to the Outfall 22B stormwater conveyance system via a stormwater lateral constructed in 2000. Stormwater collecting in the undeveloped portion of the site is not connected to the system. A camera survey has confirmed groundwater infiltration discharging through cracks in the Outfall 22B system piping located downgradient from the site as well as other portions of the stormwater conveyance system (refer to the Rhone Poulenc site for additional information).

- **Metro Central Transfer Station (Metro) (ECSI #1398)**

  Potential Sources

  A succession of steel companies operated a warehouse on the property. Current operations include waste recycling and management. Investigation has been conducted at the site mostly in relation to the Rhone Poulenc site because Rhone Poulenc groundwater plumes have migrated beneath the Metro site. The DEQ has requested that Metro conduct an expanded preliminary assessment of the site after Rhone Poulenc remediation has been completed to determine potential sources at the site.

  Potential Migration Pathways to the Outfall Area

  Stormwater collecting at the site discharges to the Outfall 22B stormwater conveyance system. Groundwater infiltration appears to occur in the Metro stormwater conveyance system. The Metro system is connected to the Outfall 22B stormwater conveyance system at NW Front Avenue via a pipe extending across the Schnitzer Investment–Doane Lake property.

4.4.1.2 Upland Sites Located Partially Within Basin 22B

The Arkema (ATOFINA Chemicals) site (ECSI #398) is located partially within Basin 22B and also along the shoreline, adjacent to Outfall 22B.

- **Arkema (ATOFINA Chemicals) (ECSI #398)**

  Potential Sources

  The property was used to manufacture inorganic chemicals including sodium chlorate, potassium chlorate, pesticides, and ammonium perchlorate. Investigation and remediation have been conducted at the site since the mid-1990s under the DEQ's Voluntary Cleanup Program (VCP). An RI was completed recently and indicated the presence of DDT and its metabolites—chlorine, hydrochloric acid, ammonia, sodium hydroxide, asbestos, sodium metabisulfite, sodium bichromate, sulfuric acid chlorobenzene, chromium (hexavalent), PCBs, and perchlorate at the site. A former transformer substation was located at the site adjacent to NW Front Avenue. BES currently is conducting an investigation of solids collected from a catch basin located near the former substation on NW Front Avenue. This catch basin is connected to the Outfall 22B stormwater conveyance system.

  Potential Migration Pathways to the Outfall Area

  Contaminated sediments, particularly DDT and its metabolites, located adjacent to the Arkema site may have been redistributed downstream to the Outfall 22B area.

  Although most site drainage is served by private outfalls discharging to the Willamette River, several City catch basins collect stormwater runoff from a right-of-way drainage swale that parallels property owned by Arkema. This drainage swale collects stormwater runoff from portions of the adjacent Arkema tax lots on the east side of NW Front Avenue between NW 61st Avenue and the Willamette River at Outfall 22B.

4.4.1.3 Upland Sites Located Outside Basin 22B

Two sites, Rhone Poulenc (ECSI #155) and ESCO Corp.-Willbridge Landfill (ECSI #397), are listed in the ECSI database located adjacent to the Basin 22B.

- **Rhone-Poulenc (ECSI #155)**

  Potential Sources

  From 1943 through 1990, herbicides and pesticides were produced at the site. Site investigation activities have indicated the presence of 2,4-D; 2,4,5-T; DDT and its metabolites, dioxins and furans; isomers of dichlorobenzene; phenolic compounds; creosols; trichloroethene; BTEX; PAHs; lead; and metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc). Historically, wastewater was discharged to West Doane Lake. Although this lake historically discharged to the river, a berm was constructed at the north end of the lake in 1980 to control drainage from the lake. Contaminated groundwater originating from the site has migrated offsite toward the Willamette River and appears to extend beneath several downgradient sites including Gould, Metro, ESCO, Schnitzer Investment–Doane Lake, and Arkema.

  Potential Migration Pathways to the Outfall Area

  Stormwater collecting at the site is treated then discharged to the Willamette River via private outfall WR-6. A camera survey has confirmed groundwater infiltration discharging through cracks of the Outfall 22B stormwater conveyance system located

downgradient from the Rhone Poulenc source areas. In addition, the Metro stormwater conveyance system also appears to have groundwater infiltration and is connected to the Outfall 22B stormwater conveyance system via a pipe located on the Schnitzer Investment–Doane Lake property. Another potential migration pathway for contaminated groundwater is the permeable backfill surrounding the piping associated with these stormwater conveyance systems.

- **ESCO Corp./Willbridge Landfill (ECSI #397)**

  Potential Sources

  Foundry waste was disposed at this privately owned landfill including foundry sand, slag, demolition debris, dust, and foundry yard debris (including zirconium sand). An investigation has been conducted at the site, mostly in relation to the Gould and Rhone Poulenc sites because lead and Rhone Poulenc contaminants have been observed in groundwater beneath the ESCO site.

  Potential Migration Pathways to the Outfall Area

  Potential migration pathways from the site are unlikely because the site is not connected to the Outfall 22B stormwater conveyance system.

4.4.1.4 Point Sources Located Adjacent to Outfall 22B

Two private outfalls (WR-6 and WR-213) are located near Outfall 22B.

Private outfall WR-6 is an underwater discharge just offshore from Outfall 22B and conveys treated groundwater from the Rhone Poulenc site and treated OCF leachate water from the Gould site. Rhone Poulenc has an NPDES permit for private outfall WR-6. The potential contribution of private outfall WR-6 to sediments near Outfall 22B has not been evaluated. However, NPDES permit monitoring requirements reduces the likelihood that private outfall WR-6 is a current source of contamination to the river.

Private outfall WR-213 is located approximately 50 feet upstream of Outfall 22B. This is a culvert that runs under NW Front Avenue and drains an undeveloped area between the railroad tracks and NW Front Avenue. Before construction of the Outfall 22B stormwater conveyance system in 1980, private outfall WR-213 conveyed occasional overflow water from West Doane Lake. The potential contribution of private outfall WR-213 to sediments near Outfall 22B has not been evaluated.

4.4.1.5 Nonpoint Sources and Pathways Located Near Outfall 22B

Contaminated sediments in the river have been identified adjacent to and associated with the Arkema site. Transport and redeposition of contaminated sediments originating from this site and other sites have the potential to adversely affect river sediments near Outfall 22B.

4.4.2 PCOI Evaluation for Basin 22B

Based on information developed in the CSMs, complete PCOI lists were developed for Basin 22B. A discussion of each PCOI is provided in this section.

Pesticides

DDT and its metabolites were included in the initial PCOI list for Basin 22B. Sources of these pesticide constituents have been identified at the Arkema and Rhone Poulenc sites. Contaminated sediments, particularly DDT and its metabolites, located adjacent to the Arkema site may have been redistributed downstream to the Outfall 22B area. Shallow soils at Arkema located near NW Front Avenue could contain pesticides and migrate via overland transport to the inlet(s) of the Outfall 22B stormwater conveyance system. Pesticide groundwater plumes originating from Rhone Poulenc have the potential to infiltrate the stormwater conveyance system. Thus, DDT and its metabolites were carried forward to the complete PCOI list.

Metals

Seven metals (arsenic, chromium, copper, lead, nickel, selenium, and zinc) were included in the initial PCOI list. Lead, arsenic, cadmium, chromium, selenium, and zinc were identified as metal sources at the Gould site (note that copper and nickel were not evaluated adequately during the RI).

Other sites within the basin identified with sources of metals include Arkema (total and hexavalent chromium) and Schnitzer Investment–Doane Lake (arsenic). Groundwater plumes with all seven metals originating from Rhone Poulenc source areas infiltrate the Outfall 22B stormwater conveyance system. Shallow soils at Arkema located adjacent to NW Front Avenue possibly could contain metals and migrate via the inlet(s) to the Outfall 22B stormwater conveyance system. Thus, all seven metals (arsenic, chromium, copper, lead, nickel, selenium, and zinc) were carried forward to the complete PCOI list.

4.5 Conceptual Site Model for Basin 22C

As developed in Section 3, the initial PCOI list for Basin 22C consists of pesticides (DDD, DDE, and DDT), PAHs, and metals (arsenic). The following subsections explore potential sources and pathways associated with of these constituents. Summaries of the ECSI files for sites that are relevant to Basin 22C are provided in Appendix A.

4.5.1 Potential Sources and Pathways

All sites located in Basin 22C (including those partially in the basin) have some potential to contribute contaminated stormwater to the City stormwater conveyance system. Table 2-5 shows the facilities that are located in the basin. This table has been partially updated to reflect facilities west of NW St. Helens Road that may sheet flow or drain to ditches that eventually drain to North Doane Lake.

As shown in Table 2-5, there are two facilities in Basin 22C with active NPDES permits: Wacker Siltronic Corp. and Koppers Industries. Wacker Siltronic operates under both an individual and a 1200-Z NPDES permit, although the majority of site stormwater is discharged directly to the river via private outfalls. Discharge from this site to the City system is limited to runoff from an office building and adjacent parking lot. Koppers Industries operates under an individual NPDES permit and discharges to the City system via a drainage ditch. City records show one facility with a former permitted non-

stormwater discharge in Basin 22C: Santa Fe Pacific Pipeline Co. was issued a 1500-A NPDES permit to discharge water associated with a tank cleanup. DEQ terminated the permit in 2005, although potential contributions from this site warrant further evaluation.

Consistent dry-weather flow has been observed as part of the City's IDEP; there is one non-stormwater discharge in Basin 22C and several Forest Park streams discharge to Outfall 22C. Iron (ferric hydroxide) staining observed around Outfall 22C during a 2002 sediment sampling investigation may indicate preferential migration along the outside of the piping. Groundwater plumes have been identified at sites near the Outfall 22C stormwater conveyance system including Wacker (VOCs, SVOCs, and PAHs) and Rhone Poulenc (chlorobenzenes and chlorinated herbicides).

4.5.1.1 Upland Sites Located Within Basin 22C

One ECSI site is located in Basin 22C: Santa Fe Pacific Pipeline Co. (ECSI #2104).

- **Santa Fe Pacific Pipeline Co. (ECSI #2104)**

  Potential Sources

  Current and historic uses of the site include the distribution of petroleum hydrocarbons along pipelines. In the 1990s, releases of gasoline and diesel affected subsurface soil and groundwater at the site. The contaminated groundwater reportedly extended offsite. The DEQ has indicated that additional investigation is required at the site, but not in relation to the Portland Harbor sediment investigation (DEQ, July 2004c).

  Potential Migration Pathways to the Outfall 22C Area

  A drainage ditch is located adjacent to this site that discharges into North Doane Lake and then into the Outfall 22C stormwater conveyance system. The length of the surface water pathway between the site and the river is approximately 0.5 mile. Although petroleum hydrocarbons migrated offsite and possibly into the ditch, the DEQ indicated that it is unlikely that the site has significantly affected river sediments based on the nature and distance of this surface water pathway (DEQ, July 2004c).

4.5.1.2 Upland Sites Located Partially Within Basin 22C

Two ECSI sites are located partially within Basin 22C: GASCO/Koppers Industries (ECSI #84) and Wacker Siltronic Corp. (Wacker) (ECSI #183).

- **GASCO/Koppers Industries (ECSI #84)**

  Potential Sources

  The property was used for manufactured gas plant (MGP) operations, coal tar pitch distillation, liquefied natural gas storage, coal tar pitch and pencil pitch distribution, and marine fuel storage and distribution. Koppers has leased a portion of the site since 1965 and built a coal tar distillation plant and cooled and solidified streams of creosote and pitch in on-site storage tanks. Contaminants identified at the site include tars, oil, creosote, phenols, PAHs, BTEX, cyanide, and metals (arsenic, chromium, copper, lead, nickel, and zinc). Some MGP wastes were disposed of on the adjacent Wacker property.

Potential Migration Pathways to the Outfall Area

Only the portion of the site operated by Koppers is connected to the Outfall 22C stormwater conveyance system. Shallow soils containing MGP waste in this portion of the site have the potential to discharge to the Outfall 22C stormwater conveyance system.

Groundwater containing MGP waste or other constituents located in the southern corner of the site have the potential to discharge into the nearby drainage ditch, which ties into the Outfall 22C stormwater conveyance system.

- **Wacker Siltronic Corp. (Wacker) (ECSI #183)**

  Potential Sources

  Site uses include fuel storage and dispensing, disposal of MGP wastes from the GASCO site, and silicon wafer manufacturing. MGP waste at Wacker includes VOCs, SVOCs, and PAHs. Releases of trichloroethylene (TCE) have been identified in the northern portion of the site, but do not appear to extend to or near Basin 22C.

  Potential Migration Pathways to the Outfall Area

  Only a small area of the site collects stormwater that discharges into the Outfall 22C stormwater conveyance system. Shallow soils containing MGP waste at the site have the potential to migrate into the open drainage ditch via overland migration discharging to the Outfall 22C stormwater conveyance system.

  Groundwater at the site containing MGP waste or other constituents has the potential to discharge into the drainage ditch or infiltrate the piping in the Outfall 22C stormwater conveyance system.

4.5.1.3 Upland Sites Located Outside Basin 22C

Rhone Poulenc (ECSI #155) is located adjacent to Basin 22C and also is discussed in the Basin 22B CSM.

- **Rhone-Poulenc (ECSI #155)**

  Potential Sources

  From 1943 through 1990, herbicides and pesticides were produced at the site. Site investigation activities have indicated the presence of 2,4-D, 2,4,5-T, DDT and its metabolites, dioxins and furans, isomers of dichlorobenzene, phenolic compounds, creosols, trichloroethene, BTEX, PAHs, lead, and metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc). Historically, wastewater was discharged to West Doane Lake, but site contamination has been found to have migrated to North Doane Lake, which is located in Basin 22C. Contaminants likely originating from Rhone Poulenc have been detected in North Doane Lake including pesticides (DDD and DDE), chlorinated herbicides, and arsenic.

Potential Migration Pathways to the Outfall Area

Although the Rhone Poulenc site is not connected to the Outfall 22C stormwater conveyance system, contaminants associated with Rhone Poulenc have been detected in North Doane Lake. This lake discharges to the Willamette River via the Outfall 22C stormwater conveyance system.

4.5.1.4 Point Sources Located Adjacent to Outfall 22C

A few point sources occur in the immediate vicinity of Outfall 22C. Basin 22B discharges at Outfall 22B, which is located directly upstream of Outfall 22C. Outfall 22B is located approximately 250 feet upstream of Outfall 22C and drains 37 acres of primarily industrial zoned land. As discussed earlier in this section, Basin 22B is potentially a source of pesticides (DDT and its metabolites) and arsenic. In addition, contaminated sediments containing pesticides are located adjacent to the Arkema site and may have been redistributed downstream to the Outfall 22B area. These contaminated sediments also may extend to the Outfall 22C area.

4.5.1.5 Nonpoint Sources and Pathways Located Near Outfall 22C

There are three potential nonpoint sources along the shoreline that could adversely affect the river sediments adjacent to Outfall 22C: Arkema (ECSI #398), the Burlington Northern Railroad and Railroad Bridge, and Wacker Siltronic Corp. (ECSI #183). The Arkema and Wacker sites are described in previous sections.

Burlington Northern Railroad and Railroad Bridge—This railroad bridge is located approximately 150 feet upstream of Outfall 22C and is actively used by Burlington Northern trains. There is not enough available information to fully understand this potential source.

4.5.2 PCOI Evaluation for Basin 22C

Based on information developed in the CSMs, complete PCOI lists were developed for Basin 22C. A discussion of each PCOI is provided in this subsection.

Pesticides

Three pesticide constituents (DDD, DDE, and DDT) were included in the initial PCOI list for Basin 22C. These same constituents were detected in sediment samples collected from the Outfall 22B area located just upstream and also adjacent to the Arkema site that may have been redistributed downstream. While the most likely migration pathway for the pesticides is redistribution of upstream sediments in the river, DDT and its metabolites are included in the complete PCOI list for Basin 22C because of the potential source from North Doane Lake.

PAHs

PAHs were included in the initial PCOI list for Basin 22C. Potential sources of PAHs include MGP waste located throughout the GASCO/Koppers and Wacker sites and the Santa Fe Pacific site. PAHs in shallow soils located in Basin 22C at these sites have the potential to migrate via overland transport to the drainage ditch located along the western border of the Wacker property. This ditch drains to the Willamette River via the Outfall 22C

stormwater conveyance system. PAHs were carried forward to the complete PCOI list for Basin 22C.

Metals

Arsenic was included in the initial PCOI list. Potential sources of arsenic include MGP waste located throughout the GASCO and Wacker sites. In addition, arsenic has been detected in surface water samples collected from North Doane Lake. Arsenic was carried forward to the complete PCOI list for Basin 22C.

SECTION 5

Recommended Actions

The Priority 1 basins CSMs and complete PCOI lists, which represent basin-specific sediment PCOIs that were further refined during development of the CSMs, are being used to focus the City source control investigation activities within the basins. Based on the CSMs and complete PCOI lists, several potential upland sources have been identified that either discharge into the City stormwater conveyance system or discharge directly to the river adjacent to a Priority 1 outfall. Following the identification and review of the potential sources for each basin, it is clear that additional actions are necessary to fully understand these potential sources, their associated constituents, and migration pathways.

Summarized below are the data gaps and recommended actions to pursue based on our review of the potential sources within each subject basin. For some of the basins, enough information currently exists to reduce the list of potential sources and migration pathways. However, most of the Priority 1 basins still have several data gaps that must be filled before this list can be reduced. Completion of the various recommended actions will require collaboration and cooperation from various federal, state, and local regulatory programs. It is anticipated that BES and DEQ will conduct most of the upland source investigation work, except where EPA is the lead agency for an upland site. A schedule for these recommended actions will be developed after BES, DEQ, and EPA have collaborated.

Future information developed from additional upland source control activities will be incorporated into the appropriate CSMs and used in refining the potential sources and PCOI lists through an iterative process. Future upland data will be available from additional City source control investigations, DEQ upland site stormwater pathway evaluations, and new in-river sediment data. These data will be used to further develop CSMs for each basin.

The following sections summarize each Priority 1 basin's PCOI list, identified data gaps associated with identified potential sources, and recommended actions for continuing upland source control activities.

5.1 Basin M-3

The complete PCOI list, developed from the initial PCOI list and the CSM for Basin M-3, is summarized below:

- Phthalates (BEHP and di-n-butyl phthalate)
- PAHs

5.1.1 Potential Sources Within Basin M-3

The Freightliner site was identified as a potential source of Basin M-3 PCOIs. Freightliner is an active site in the DEQ's cleanup program and the site's contaminants of interest include phthalates and PAHs.

DEQ Actions. As part of the upland site investigation, the DEQ has requested that Freightliner complete a stormwater pathway assessment. When the results of this investigation become available, BES will use this information as part of the overall assessment of Basin M-3.

BES Actions. BES will continue to provide support to DEQ cleanup sites as needed within the basin. BES will review the LWG Round 2 round sediment data relative to Outfall M-3. The City industrial stormwater inspection program will continue annual NPDES permit inspections and environmental surveys of facilities within the basin. The City also will conduct additional source tracking activities to evaluate other upland sources.

5.1.2 Point and Nonpoint Sources Located Adjacent to Outfall M-3

Transport and redeposition of sediments occurs in the Swan Island Lagoon and is a nonpoint source, which makes interpretation of contaminant sediment distribution data in the lagoon difficult. Point sources include current or historic inline contaminated solids in the private conveyance system associated with private outfall WR-16. Redeposition of these contaminants to the sediments in the lagoon is a potential migration pathway for identified PCOIs to the Outfall M-3 area. We understand that the LWG is conducting in-water work in coordination with the EPA that includes the development of a hydrodynamic model to evaluate this contaminant migration pathway. When completed, the results will be incorporated into the BES's CSM of Basin M-3.

The City requests that DEQ further investigate potential sources of contamination from private outfall WR-16 to assess the effects of this point source on lagoon sediments.

5.2 Basin 19

The complete PCOI list, developed from the initial PCOI list and the CSM for Basin 19, is summarized below:

- PCBs
- PAHs
- Phthalates (BEHP)
- Metals (chromium, copper, lead, nickel, and zinc)

5.2.1 Potential Sources Within Basin 19

Active DEQ cleanup sites in Basin 19 with ongoing assessment of stormwater pathways include Calbag Metals, Front Avenue LP Properties, and Chevron Asphalt. Offsite migration of metals and possibly other contaminants from Calbag Metals into the Outfall 19 stormwater conveyance system is likely and could be a current source to the river.

DEQ Actions. As part of the upland site investigation, the DEQ is overseeing stormwater pathway assessments conducted at Calbag Metals, Front Avenue LP Properties, and Chevron Asphalt. When the results of this investigation become available, BES will use this information as part of the overall assessment of Basin 19.

BES Actions. BES will continue to provide support to DEQ cleanup sites as needed within the basin. BES will review the LWG Round 2 round sediment data relative to Outfall 19. The City industrial stormwater inspection program will continue annual NPDES permit inspections and environmental surveys of facilities within the basin. The City is conducting further investigations at the PGE-Forest Park site as part of the Prospective Purchaser Agreement with DEQ. The City also will conduct additional source tracking activities to evaluate other upland sources.

5.2.2 Point and Nonpoint Sources Located Adjacent to Outfall 19

As part of the upland site investigation, the DEQ is overseeing the ongoing RI conducted at the Front Avenue LP Properties site, which includes assessments of the bank erosion and overland transport pathways. It is recommended that the RI include an assessment of the fill located in Parcel 3. The fill contains slag and has the potential to migrate to the Outfall 19 and Outfall 19A areas via overland transport and bank erosion.

5.3 Basin 19A

Contaminated sediments located near Outfall 19A are likely associated with other sources including those identified for Basin 19. Based on the lack of DEQ cleanup sites connected to Basin 19A and the small size of the basin, discharges from Basin 19A are not expected to affect sediment concentrations in the river. Therefore, it is recommended that Basin 19A be re-categorized from a Priority 1 basin to a Priority 4 basin.

5.4 Basin 22B

The complete PCOI list, developed from the initial PCOI list and the CSM for Basin 22B, is summarized below:

- Pesticides (DDD, DDE, and DDT)
- Metals (arsenic, chromium, copper, lead, nickel, selenium, and zinc)

5.4.1 Potential Sources Within Basin 22B

The Gould and Arkema sites are active cleanup sites connected to the Outfall 22B stormwater conveyance system and include potential sources of PCOIs. Although the Gould site has received an NFA determination from the EPA, only limited investigation of stormwater pathways was performed before the NFA determination. In 2005, BES initiated dry-weather flow sampling of the Gould site lateral connected to the City conveyance system. The Arkema site is located adjacent to NW Front Avenue and may contain contaminants in shallow soils near the inlets of the Outfall 22B stormwater conveyance system. In 2005, BES initiated an inline solids investigation along NW Front Avenue to assess potential contributions from upland sites.

DEQ Actions. As part of the upland site investigation, the DEQ is overseeing the stormwater pathway assessments conducted at the Arkema site. In addition, DEQ has indicated that Metro will be required to complete a site investigation after the Rhone Poulenc groundwater plumes (located beneath the Metro site) have been addressed by the owner of the Rhone

Poulenc site. When the results of these investigations become available, BES will use this information as part of the overall assessment of Basin 22B.

EPA Actions. EPA is responsible for overseeing investigations and source control actions that may be necessary as a result of the BES Gould dry-weather flow sampling results. BES will track further progress conducted at the site in relation to discharges from the lateral.

BES Actions. BES will submit reports to the EPA and DEQ with the results from the Gould dry-weather flow inlet sampling event and the catch basin solids investigation along NW Front Avenue. BES will continue to provide support to DEQ cleanup sites as needed within the basin. BES will review the LWG Round 2 round sediment data relative to Outfall 22B current CSM. BES will continue stormwater inspections at the Metro and Schnitzer Investment-Doane Lake sites to further assess potential sources into the stormwater conveyance system. The City industrial stormwater inspection program will continue annual NPDES permit inspections and environmental surveys of facilities within the basin.

5.4.2 Point and Nonpoint Sources Located Adjacent to Outfall 22B

Contaminated sediments, particularly DDT and its metabolites, located adjacent to the Arkema site may have been redistributed downstream to the Outfall 22B area. We understand that the LWG is conducting in-water work in coordination with the EPA to assess the distribution of contaminated sediments in this area. When completed, the results will be incorporated into the BES's CSM of Basin 22B. Rhone Poulenc has documented metals and pesticide groundwater plumes that extend offsite toward the Willamette River and that infiltrate into the Outfall 22B stormwater conveyance system along NW Front Avenue. The current owner of the Rhone Poulenc site has developed an Interim Remedial Action Measures (IRAM) Work Plan for the Outfall 22B stormwater conveyance system that involves sealing the stormwater pipe to limit groundwater infiltration. BES and DEQ are coordinating on this source control effort.

5.5 Basin 22C

The complete PCOI list, developed from the initial PCOI list and the CSM for Basin 22C, is summarized below:

- PAHs
- Pesticides (DDD, DDE, and DDT)
- Metals (arsenic)

5.5.1 Potential Sources Located Partially in Basin 22C

Although Basin 22C is relatively large, only a small portion of the stormwater that discharges to the Outfall 22C stormwater conveyance system originates from industrial properties. GASCO/Koppers Industries, Rhone Poulenc, and Wacker Siltronic are active DEQ cleanup sites near the basin. Most of the stormwater collecting from these sites does not discharge to the basin. PCOIs in shallow soils have the potential to migrate into the open drainage ditch that runs along the western portion of the Wacker site. The ditch discharges to the river via the Outfall 22C stormwater conveyance system. PCOIs in groundwater at the sites have the potential to discharge into or along the Outfall 22C stormwater conveyance system.

However, further refinement of the outfall basin boundary is needed, as facilities west of NW St. Helens Road may sheet flow or drain to ditches that eventually drain to North Doane Lake.

DEQ Actions. As part of the upland site investigation, the DEQ is overseeing stormwater and groundwater pathway assessments conducted at GASCO/Koppers Industries, Rhone Poulenc, and Wacker. When the results of these investigations become available, BES will use this information as part of the overall assessment of Basin 22C.

SECTION 6

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APPENDIX A

DEQ ECSI File Summaries

Appendix A

The Oregon Department of Environmental Quality (DEQ) maintains a database with Environmental Cleanup Site Information (ECSI). Upland sites on the ECSI list that are located in or near a subject basin were considered during development of the conceptual site models (CSM) to identify potential sources and migration pathways. Review of the ECSI database was performed before July 2004. A summary of the information from the ECSI database for these sites, as well as information from selected site-specific reports, are provided in this appendix.

Basin M-3

Fred Meyer (ECSI #44) is listed in DEQ's ECSI database, but is currently inactive since the DEQ and EPA issued a No Further Action (NFA) determination. Confirmed and potential site contaminants include polychlorinated biphenyls (PCB), organic solvents, phenols, 1,2-dichlorobenzene, BEHP, furans, and dioxins. The site was used for the reclamation of copper wire from 1960 to 1968. Some PCBs may have been disposed of onsite. Buildings were dismantled after operations ceased in 1968, and the site was abandoned. More fill was placed in the southern part of the site in the 1970s and 1980s. In 1987, a soil investigation was conducted on the site to determine whether PCBs were present. Soil samples were taken in 23 locations and were analyzed for PCBs and oil and grease. One sample indicated a PCB concentration of 32 milligrams per kilogram (mg/kg) (CH2M HILL, June 1987). The Toxic Substances Control Act (TSCA) cleanup standard for PCBs is 10-25 mg/kg for industrial areas, and the DEQ High Sediment Comparison Level Value (DEQ High) is 0.7 mg/kg[1]. The oil and grease results were not available in the ECSI database. The site was paved as of October 1988 and is being used as a parking lot for Pacific Fruit and Produce Co. As a result of paving the site, the overland migration of soils into catch basins pathway is no longer viable. DEQ and the U.S. Environmental Protection Agency (EPA) issued an NFA determination for the site (DEQ, June 2004a).

Freightliner (ECSI #115) is listed in DEQ's ECSI database as having known or potential contamination including: toluene, ethylbenzene, xylene, cis-1,2-dichloroethylene, vinyl chloride, and other solvent/thinner constituents. This is an active ECSI site where extensive soil and groundwater investigations have been performed. Soil and groundwater are contaminated with petroleum compounds and volatile organic compounds (VOCs). Vinyl chloride also has been detected at the site. On the basis of the groundwater data available on the ECSI Web site, groundwater samples collected in 1995, 1996, and 1997 had detections of naphthalene (a low molecular weight polynuclear aromatic hydrocarbon [LPAH]) at concentrations ranging from 26 to 70 milligrams per liter (mg/L). There is no chronic freshwater (freshwater chronic criterion [CCC]) ambient water quality standard for naphthalene (DEQ, June 2004b). Stormwater permit benchmark values for copper, lead, zinc, total suspended solids (TSS), and oil and grease have been exceeded intermittently at the site since 1994. The DEQ has indicated that additional stormwater sampling is needed to assess the stormwater pathway at the site.

End of Swan Island Lagoon (ECSI #3901) is located adjacent to the river and occupies the southeast end of the lagoon. Only a small portion of the site is located within Basin M-3. This portion is currently a parking area connected to a boat ramp. This site recently was added to the DEQ ECSI database. No information regarding types of potential contamination is listed in DEQ's ECSI database at this time (as of May 19, 2004). This property is currently owned by the City. On the basis of information obtained in an environmental data interpretive report (EDIR) prepared by the City of

[1] Note: The DEQ High comparison value is for sediment; however, it has been used for comparison purposes in this report.

Portland, Bureau of Environmental Services (BES), in 2000, soils have some elevated concentrations of high molecular weight polynuclear aromatic hydrocarbons (HPAH) and LPAHs in the 0 to 15 feet below ground surface (bgs) range. Samples that had exceedances of Portland Harbor Baseline Sediment Values (PH Baseline) and the DEQ High for HPAHs and LPAHs are: LA-201: 0 to 4 feet bgs and PB-1205: 5 to 6.5 feet bgs, both of which are on the half of the property farthest from the Willamette River. This report did not have HPAH and LPAH groundwater data. However, there were no exceedances of HPAHs or LPAHs in the soil within the approximate range of groundwater levels (Bureau of Environmental Services, June 2003).

NW Paper Box Manufacturing (formerly Island Holdings, Inc.) (ECSI #260), has been designated as the adjacent owner/occupant of the private outfall WR-16. The Island Holdings, Inc., property is listed in DEQ's ECSI database as having known or potential arsenic, chromium, PCB, 2,4-D, and other pesticide contamination. Data obtained from the DEQ ECSI file do not show that Island Holdings was a historical source of PAHs or phthalates to the river. No source of these contaminants to private outfall WR-16 has been identified. While NW Paper Box Manufacturing discharges to private outfall WR-16, (based on-site activities, investigations, and dye testing) it is unlikely that PAHs and phthalates currently originate from this site.

The Swan Island Ship Yard (ECSI #271) occupies most of the north, west, and south perimeters of Swan Island. Elevated concentrations of PAHs, phthalates, and metals have been detected in sediments near the site. Flow dynamics and depositional characteristics of the lagoon are not understood well enough to determine whether this site is a viable source of the PAHs and phthalates found in the sediments near Outfall M-3.

Property located adjacent to Island Holdings, Inc. This small parcel is located between the lagoon and the Island Holdings site (ECSI #260). The Port of Portland owns this unoccupied parcel, which is primarily sandy beach and rip-rap. Any contamination that may be present on this property and the adjacent beach likely would be from off-site sources. The in-river sediment sample collected closest to this area was SI01M3050. This sample had detected concentrations of two phthalates (including BEHP), chromium, and zinc that exceeded the PH Baseline, and concentrations of total HPAHs and BEHP that exceeded the DEQ High. A sample also was collected above the high tide water line in an erosional ditch below the private outfall that runs through this property (private outfall WR-16). Elevated LPAHs, HPAHs, and PAHs (including BEHP) were detected in this sample.

Basin 19/19A

Anderson Brothers Property (ECSI #970) is listed in DEQ's ECSI database as having known or potential contamination, including: oil, motor oil, Stoddard solvent, paint waste, and solvent wastes. This site was used primarily by trucking firms to transport bulk oil and gas. Some truck service and repair also were performed onsite. A paint spill occurred in 1989. A soil sample collected from the site had a hydrocarbon concentration of 4,100 mg/kg.

Brazil & Co. (ECSI #1026) is listed in DEQ's ECSI database as having potential PCB contamination. Although there are no environmental data specific to this site in the DEQ ECSI database or file, this site is directly adjacent to PGE-Forest Park (ECSI #2406; see below).

Calbag Metals (ECSI #2454) is listed in DEQ's ECSI database as having known or potential metals contamination. Historically, the site was used for metal recycling activities (such as copper, aluminum, and lead recovery from coated wires). Stormwater sampling conducted for the site's National Pollutant Discharge Elimination System (NPDES) 1200-Z permit showed exceedances of the permit benchmarks for copper, lead, zinc, and oil/grease from 1993 to 1999. Stormwater collected from the site also exceeded ambient water quality criteria for cadmium, copper, lead, mercury, and zinc. In an attempt to provide source control for these constituents, filter fabric was placed in catch basins in 1995 to trap solids. Catch basin solids were collected from the on-site catch basins in 2001 and 2002. Two separate samples were collected from the site and analyzed for cadmium, chromium, copper, and lead. In the catch basin sample collected near the former maintenance shop, copper and lead were detected at concentrations greater than the DEQ High, and cadmium and chromium were detected at concentrations greater than the PH Baseline. The other sample, which was located downstream of the first sample, had concentrations that were much lower, and only the PH Baseline for lead was exceeded. Subsequent source control actions were implemented, including site repaving and filter media installations in the catch basins. However, the effectiveness of these source control efforts has not been evaluated adequately, especially in relation to sediment concentrations in the river. The site is currently occupied by a variety of trucking, transportation, and auto service businesses (see Table 2-2; 4927 NW Front Ave.).

Dura Industries (ECSI #111) is listed in DEQ's ECSI database as having known or potential cadmium, chromium, and lead contamination. Limited information is available for this site. The site has received notices of violation for improper hazardous waste management practices. A soil sample collected from an area affected by paint sludge and analyzed by extraction procedure (EP). Toxicity procedures had detectable levels of cadmium, chromium, nickel, lead, and zinc.

Mt. Hood Chemical Corp. (ECSI #81) is listed in DEQ's ECSI database as having known or potential corrosive liquids and methylene chloride contamination. Sampling conducted in 1984 indicated a potential release of solvents to the City stormwater conveyance system. A liquid sample collected from a storm drain catch basin had a

concentration of 4,400 mg/L of methylene chloride. No metals data were reported for this sample (DEQ, September 2003d).

Mt. Hood Chemical Property (ECSI #1328) is listed in DEQ's ECSI database as having known or potential chlorinated solvents contamination. Historically, this facility has been used for bulk chemical storage and distribution (including some hazardous waste, such as chlorinated solvent wastes). Sampling conducted in 1991 indicated a potential release of VOCs to the City stormwater conveyance system. A surface sample collected at the site had a concentration of 460 mg/kg 1,1,1-trichloroethane (only VOCs were analyzed). According to the DEQ ECSI database, a concrete pad sample taken from the site showed no signs of significant contamination (DEQ, September 2003e).

This site is currently occupied by Color Magic (a photo processing company). As part of the City's Industrial Stormwater Program, stormwater sampling has been conducted at node AAP918 (which is downstream of Color Magic). Samples have been collected during storm events three times per year starting in 1998. Between October 1998 and May 2002, dissolved silver concentrations ranged from less than 0.1 (the detection limit) to 0.8 micrograms per liter (µg/L), and total silver concentrations ranged from less than 0.1 to 111 µg/L. A cross-connection at the Color Magic facility was identified and removed in July 2000. After the cross-connection was removed, the average concentration of dissolved silver dropped from 0.4 to 0.1 µg/L and the total silver from 17.1 to 0.31 µg/L.

Schnitzer Investment Corp. (ECSI #2442) is listed in DEQ's ECSI database as having known or potential contamination, including: cadmium, lead, mercury, zinc, barium, silver, and benzoic acid. Soil samples collected from the site (unknown depth) show concentrations of PCBs that exceed the DEQ High and concentrations of lead that exceed PH Baseline. A groundwater sample collected from the site had concentrations of cadmium, lead, mercury, zinc, and PCBs that exceeded ambient water quality criteria (DEQ, September 2003f).

PGE-Forest Park (ECSI #2406) is listed in DEQ's ECSI database as having known or potential PCB contamination. A focused soil and groundwater investigation of the site indicated concentrations of PCBs in the soil and groundwater that exceeded the DEQ High and ambient water quality criteria, respectively. Soil samples also were analyzed for hydrocarbons, VOCs, and metals. Metals were below the PH Baseline and DEQ High, and VOCs and hydrocarbons were below test method detection limits. Groundwater samples also were analyzed for benzene, toluene, ethylbenzene, and xylene (BTEX) and PAHs, both of which were below the test method detection limits, except for naphthalene. On the basis of these results, PCBs were the only contaminant of concern for this site (De Minimis, Inc., February 1999). A removal action was completed at this site in 2001. Residual PCB concentrations in remaining site soil were below the cleanup level of 1.2 mg/kg in all samples except two (PGE, January 2001). An NFA determination was made by DEQ for the site on May 15, 2001 (DEQ, May 2001). Even though PCB concentrations were cleaned up to levels below the cleanup limits, concentrations were still higher than the DEQ High in several locations throughout the site. It appears that the stormwater migration pathway was not a focus of the

investigations at the site. Remediation activities included the removal of an on-site drainage system connected to the City stormwater collection system. However, a stormwater pathway still exists via infiltration to a perforated pipe along the northeastern boundary of the site.

Front Avenue LP Properties[2] (ECSI #1239) is listed in DEQ's ECSI database as having known or potential contamination, including: waste oil, metals, 4-methylphenol, and benzoic acid. Four parcels comprise the Front Avenue LP Properties site: Parcel 1 is located in the northern portion; Parcel 2 in the western portion; Parcel 3 in the eastern portion and adjacent to Outfall 19 and 19A; and Parcel 4 is a narrow strip along the shoreline of the river. On the basis of environmental samples collected at the site, it is a potential source of PCBs, metals, PAHs, and BEHP. A sludge sample collected from a catch basin (not connected to the City stormwater conveyance system) near the former steam cleaning area at the site had concentrations of BEHP and 2-methylnaphthalene that exceeded the DEQ High. A sludge sample collected from the oil-water separator had concentrations of cadmium, chromium, copper, lead, nickel, and zinc that exceeded the DEQ High. Surface soil samples collected from the site had concentrations of BEHP, HPAHs (benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i) perylene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene), LPAHs (phenanthrene and pyrene), cadmium, copper, lead, nickel, and zinc that exceeded comparison values (Sweet-Edwards/EMCON, November 1989). No subsurface sampling has been conducted at Parcel 3. However, slag material from former steel mill operations in the area was historically used as fill along the shoreline.

Chevron USA Asphalt Refinery (ECSI #1281) is listed in DEQ's ECSI database as having known or potential contamination, including: total petroleum hydrocarbons (TPH) (primarily gasoline), BTEX, PAHs, and phenolic compounds. According to the DEQ ECSI database, discharge of contamination to storm sewers and preferential migration along them or other utility corridors is the primary concern for this site. There is free product in the groundwater onsite. Soil samples show concentrations of individual LPAHs and HPAHs that exceed the DEQ High and PH Baseline (DEQ, July 2004a).

Shaver Transportation Company (ECSI #2377) is a tugboat and barge company. It is located adjacent to the river at Outfall 19. There is also a floating boat dock less than 50 feet from the outfall that is used to support a variety of overwater activities conducted for the company's fleet of 11 tugboats and 16 barges. Overwater activities consist of general ship maintenance, such as refueling and oil changes. These activities are a potential source of PAHs and diesel. In addition to the overwater activities conducted at the boat dock, some maintenance activities are conducted on land. Various lubricating oils, fuels, paints, and solvents have been used on the site. Two petroleum releases (diesel releases to soil in 1992 and 1994) have been documented at the site. The 1992 diesel release has residual soil contamination after the cleanup of 230 mg/kg. No confirmation samples were taken after the 1994 release. Elevated concentrations of

[2] Note: ECSI #2378—Glacier Northwest, Inc., is parcel 1 of the Front Avenue LP site), but it is not discussed in this section because it is not located in or near Outfalls 19 and 19A drainage basins.

metals have been found in the sediments near the site. A sediment sample (SD135) collected by EPA downstream of the dock had concentrations of PAHs that were below the PH Baseline (DEQ, May 2004a). However, samples collected by the City during the Source Control Sediment Investigation had elevated levels of diesel, HPAHs, and LPAHs, some of which were greater than PH Harbor Baseline.[3] EPA sediment sample SD135 had concentrations of cadmium, mercury, lead, and zinc that were above the PH Baseline in the subsurface sample and below the PH Baseline in the surface sample. City samples collected during the Source Control Sediment Investigation detected chromium, copper, nickel, lead, and zinc at concentrations above the DEQ High and detected mercury and silver above the PH Baseline. Redistribution of these sediments may be occurring as fine particles are resuspended by large boat propellers. These finer particles could possibly be redeposited along the shore.

Lakeside Industries (ECSI #2372) is located just upstream of Shaver Transportation. Lakeside Industries is listed in DEQ's ECSI database as having known or potential contamination, including: antimony, barium, cadmium, lead, mercury, silver, zinc, 4-methylphenol, and benzoic acid (DEQ, September 2003a). Stormwater at the site discharged to onsite dry wells.

[3] There is no baseline value for diesel. Baseline for LPAHs is 0.7 mg/kg, and baseline for HPAHs is 2.4 mg/kg. Baseline is higher than DEQ High for these constituents.

Basin 22B

Gould, Inc./NL Industries, Inc. (ECSI #49) is listed in DEQ's ECSI database as having known or potential contamination, including metals and organics. This site was added to the National Priorities List (NPL) in September 1983. Historically, the site discharged wastes to East Doane Lake. As of 1980, following the construction of the City stormwater conveyance system along NW Front Avenue, overflows from East Doane Lake were discharged to the Willamette River via City Outfall 22B. The site also obtained an individual NPDES permit in 1993, to discharge stormwater and treated process water to the City stormwater collection system.

Between 1983 and 2002, this former secondary lead smelter and battery recycling facility underwent extensive investigation and remediation. Investigation results showed that the site had contaminated process material/waste, soil, sediments, surface water, and groundwater. Cadmium, chromium, lead, zinc, petroleum hydrocarbons, herbicides, and furans were detected in surface water samples from East Doane Lake. Lead concentrations in the groundwater have decreased significantly since remediation activities began and have only intermittently exceeded the action level for lead (0.015 mg/L) since 1993. In addition, arsenic, chromium, and zinc were detected at concentrations above the DEQ High and PH Baseline levels. The organics contamination is suspected to be from the adjacent pesticide/herbicide facility (Rhone-Poulenc), which is currently under investigation. Remediation included the construction of an Onsite Containment Facility (OCF); stabilization and consolidation of contaminated waste, soils, and sediment onsite; institutional controls; and groundwater monitoring. In September 2002, this site was delisted from the NPL (EPA, March 1988; EPA, June 1997; and EPA, September 2000).

Leachate from the OCF collects in sumps and is transferred to the Rhone Poulenc pre-treatment system before discharge to private outfall WR-6 under the Rhone Poulenc NPDES permit. Stormwater collecting in perimeter drainage swales of the OCF discharges to the Outfall 22B stormwater conveyance system. Drainage system design specified discharge via a field drain connected to a catch basin on NW Front Avenue. The field drain no longer exists, and stormwater is presumed to discharge from the site via a private stormwater lateral connected to the Outfall 22B system. The City does not have a plumbing permit on record for this inlet pipe, but currently is conducting an investigation of the inlet pipe to evaluate discharges into the Outfall 22B system. In addition, a camera survey has confirmed groundwater infiltration discharging through cracks in the Outfall 22B system piping located downgradient from the Gould site as well as other portions of the system (refer to the Rhone Poulenc site for additional information).

Schnitzer Investment–Doane Lake (ECSI #395) is listed in DEQ's ECSI database as having known or potential contamination, including: calcium hydroxide, lead, arsenic, petroleum hydrocarbons, PCBs, and chlorinated solvents. In 1949, Schnitzer built an acetylene manufacturing plant on this site. From 1949 to 1969, Schnitzer discharged the calcium hydroxide generated by its manufacturing process into East Doane Lake. In

1969, Air Liquide began leasing the plant and continued to discharge calcium hydroxide until 1981. Calcium hydroxide has been detected in soils, surface water, and groundwater at the site. Groundwater samples have elevated concentrations of lead; the source of this contamination is uncertain. In addition, the site has some compressor oil, PCB, and chlorinated solvent contamination (DEQ, September 2003g).

Metro Central Transfer Station (ECSI #1398) was listed in DEQ's ECSI database based on the presence of Rhone Poulenc type contaminants detected beneath the site. The property was formerly used to manufacture steel products. The DEQ has indicated that Metro will be required to assess potential subsurface contamination from the past practices conducted at the site after Rhone Poulenc has completed remediation of contaminants originating from its site. BES conducted a preliminary evaluation of the stormwater system at the Metro site that indicated the likelihood of infiltrating Rhone Poulenc groundwater contamination into the stormwater system. Metro's stormwater system connects to the Outfall 22B stormwater conveyance system via piping located on Schnitzer Investment–Doane Lake property.

ATOFINA Chemicals, Inc. (ECSI #398) is listed in DEQ's ECSI database as having known or potential contamination, including: chlorine, hydrochloric acid, ammonia, sodium hydroxide, asbestos, sodium metabisulfite, sodium bichromate, sulfuric acid monochlorobenzene, and DDT (DEQ, June 2004d). Some drainage from this site along NW Front Avenue may enter the City's Outfall 22B conveyance system, although most site drainage is served by private outfalls several hundred feet upstream of Outfall 22B.

Rhone Poulenc (ECSI #155) is listed in DEQ's ECSI database as having known or potential contamination, including: 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), dioxins and furans, isomers of dichlorobenzene, phenolic compounds, creosols, trichloroethene, BTEX, lead, and arsenic. Groundwater samples taken from the site have concentrations of cadmium, chromium, copper, and lead that exceed ambient water quality criteria (AMEC, March 2003). Rhone Poulenc (RPAC) is currently in the process of having a Groundwater Transport Evaluation conducted. In addition to groundwater data, sediment samples collected from West Doane Lake exhibit elevated concentrations of HPAHs, LPAHs, metals (antimony, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), and pesticides (2,4-Db, 4,4-DDE, and 4,4-DDT) that exceed the PH Baseline and/or DEQ High. Surface water samples at West Doane Lake have elevated concentrations of metals and pesticides. Surface water samples also have been collected from what RPAC reported as outfall effluent at Outfalls 22B and 22C and a river seepage meter (WR-SM3) located upstream of Outfall 22B.[4] The RPAC Remaining Remedial Investigation Technical Memo (RRITM) reported detections only for the outfall effluent and seepage meter samples; both the Outfall 22B and the seepage meter samples exceeded ambient water quality standards for lead and copper. 2,4-D, 2,4-dichlorophenol, and 4,4-DDE were detected in the Outfall 22B sample (no ambient water quality standards are available for these constituents) (AMEC, February 2003).

[4] On the basis of the description of the outfalls in RPAC's report, there is some uncertainty whether Outfall 22B was actually sampled.

ESCO Corp. Willbridge Landfill (ECSI #397) is listed in DEQ's ECSI database as having known or potential contamination, including: foundry sand, slag, demolition debris, dust, and foundry yard debris (including zirconium sand). ESCO dumped its foundry waste at this privately owned landfill from 1953 to 1983. The groundwater is contaminated with lead, which is thought to have migrated from Gould, Inc. (ECSI #49) (DEQ, June 2004e).

Basin 22C

Santa Fe Pacific Pipeline Co. (ECSI #2104) is listed in DEQ's ECSI database as having known or potential contamination, including: 2-methylnaphthalene, carbazole, LPAHs, HPAHs, 2,4-D, and 2,4-DB. According to the DEQ ECSI database, this site had gasoline and diesel spills in 1991 and 1994 that affected the on-site and off-site soil and groundwater. A drainage ditch located adjacent to this site drains into North Doane Lake and then into Outfall 22C. This drainage ditch is approximately 0.50 mile from the river; however, it is a potential surface water migration pathway (DEQ, July 2004c).

Wacker Siltronic Corp. (Wacker) (ECSI #183) is a site with prior waste storage use by an adjacent historical coal tar gasification plant, and is listed in DEQ's ECSI database as having known or potential contamination, including: PAHs, BTEX, phenols, 2,4-D, metals, 2-methylnaphthalene, bis(2-ethylhexyl) phthalate, carbazole, pentachlorophenol (PCP), di-n-butylphthalate, dibenzofuran, DDTs, 2,4-D, and 2,4-DB. This site is located directly downstream of Outfall 22C and is adjacent to the river. Only a small portion of this site discharges to Outfall 22C. This portion is primarily an open drainage ditch that is owned by Burlington Northern Santa Fe (BNSF) Railroad. Investigation of this ditch has been proposed for the site. Between July 2001 and August 2002, Wacker completed remedial investigation activities in support of the Unilateral Order issued by DEQ in October 2000. As part of these activities, Wacker sampled three private outfalls downstream of Outfalls 22B and 22C. All three of these samples exceeded ambient water quality criteria standards for copper and zinc. Wacker also collected a composite catch basin sample from two on-site catch basins (one near the facility process area and the other adjacent to the bulk chemical storage). Catch basin sediment exceeded the PH Baseline for zinc and the DEQ High for indeno(1,2,3-cd)pyrene. Cyanide also was detected (0.4 mg/kg), but no DEQ comparison values are available for cyanide. A surface soil sample collected on the embankment above the Fab 2 outfall on the Wacker site (downstream of Outfalls 22B and 22C) exceeded the PH Baseline and DEQ High for copper and zinc, and the PH Baseline for lead. This sample also exceeded the PH Baseline and DEQ High for multiple PAHs. Five other surface soil samples were collected from the embankment along the river, but the only exceedance of DEQ comparison values was for indeno(1,2,3-cd) pyrene in two of the samples. It is important to note that two other surface samples (S-5 and S-4) were collected between the Fab 2 sample and Outfall 22C, and neither had any exceedances of PH Baseline or DEQ High (Hahn and Associates, November 2003).

GASCO/Koppers Industries (ECSI #84) GASCO is listed in DEQ's ECSI database as having manufactured gas production (MGP) waste, which includes PAHs, BTEX, phenols, tars, oil, creosote, and lead. According to the ECSI database, an 8-acre portion of the NW Natural Gas Company site was leased to Koppers starting in 1965. Koppers built a coal-tar distillation plant and cooled and solidified streams of creosote and pitch in on-site storage tanks. The plant has been closed since 1973 and currently is used only for the bulk transfer of creosote oil and coal tar pitch (DEQ, September 2003h; DEQ, September 2003i).

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