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LWG
LOWER WILLAMETTE GROUP

EPA Region 10 Superfund
RELEASABLE
Date 4/10/08
Initial per Kristine Koch

PORTLAND HARBOR RI/FS

CONCEPTUAL SITE MODEL UPDATE

SITE SUMMARIES: BATCHES 1 AND 2

DRAFT

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March 8, 2005

Prepared for:
The Lower Willamette Group

Prepared by:
Integral Consulting, Inc.
Groundwater Solutions, Inc.

USEPA SF
1225089

IC05-0011

SITE SUMMARIES: BATCHES 1 AND 2

ACF Industries **Pending**
Babcock Land Company
Boydstun Metal Works (and Western Machine Works, Portland Blast Media)
Calbag Metals – Front Avenue
Chase Bag
Columbia American Plating Company **Pending**
Consolidated Metco – Rivergate (Conmet) Facility
Crawford Street Corporation
Equilon Property (Equilon Terminal Sales & Marketing / Equilon Pipeline Containment)
Georgia-Pacific – Linnton Fiber Terminal
Jefferson Smurfit Corporation
Linnton Plywood Association (Columbia River Sand and Gravel)
Noncontiguous Burgard Industrial Park Properties
Northwest Pipe Company
Owens Corning Linnton
Port of Portland – Terminal 2 **Pending**
Portland Container Repair
Schnitzer Steel Industries (and Calbag Metals)
U.S. Army Corps of Engineers U.S. Government Moorings Facility
U.S. Coast Guard Marine Safety Office (MSO/Group Portland) **Pending**
Willamette Cove **Pending**

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ACF Industries

Babcock Land Company

BABCOCK LAND COMPANY
CSM Site Summary

BABCOCK LAND COMPANY

Oregon DEQ ECSI # 2361

9933 NW 107th Avenue
DEQ Site Mgr: Thomas Gainer
Latitude: 45.5991°
Longitude: -122.7847°
Township/Range/Section: 1N/1W/2

River Mile: 4.7 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Babcock Land Company site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

There are no known overland transport pathways from the site to the river.

1.2. Riverbank Erosion

According to Figure 2-3 of Appendix B (Ecological Risk Assessment Approach) of the Portland Harbor Work Plan (Integral et al. 2004), the bank in the vicinity of Babcock is described as a river beach. Evidence of bank erosion is unknown.

1.3. Groundwater

There are no known contaminated groundwater discharges from the site to the river.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

There are no known stormwater or wastewater discharges from the site. There are inadequate data available to support historic direct discharge from overwater activities.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Babcock site is located on the west bank of the river at approximately RM 4.4. It is adjacent to a channel area characterized in the Portland Harbor Work Plan (Integral et al. 2004) as transitional between the upstream transport zone (RM 5-7) and the downstream depositional zone (RM 1-3) (Integral et al. 2004). The Sediment Trend Analysis® results suggest that the nearshore environment off of this site experiences both net accretion and net erosion episodically and that the mid-channel and eastern side of the river is in dynamic equilibrium. Time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) show a region of sediment erosion (up to 30 cm in extent) in swath immediately

offshore of the site out to about the –10 foot NAVD88 contour. The sedimentary environment then transitions sharply and exhibits net sediment accretion (with deposits up to 60 cm in extent) out to the toe of the channel slope at approximately the –35 foot NAVD88 contour. The riverbed in the main channel offshore of this site largely shows no measurable riverbed elevation change over the measurement period. No information is available on erosion or depositional patterns above the + 5 foot NAVD88 contour in the small, shallow embayment at this site.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

GeoEngineers (1995 and 1997) conducted a site investigation of the properties now occupied by Babcock Land Company and RK Storage. The investigation included testing and removal of a pile of foundry sand located on the Babcock parcel, as well as a soil and groundwater investigation of the RK Storage parcel.

DEQ recommended a preliminary assessment of the Babcock site in 1999.

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☐	
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3 or Not ranked): Tier 3

4. SITE OWNER HISTORY

Owner/Occupant	Type of Operation	Years
Babcock Land Company - **owner**	Storage of steel rail and other railroad materials by Harmon Steel Products, lessee	1998 – present
Burlington Northern and Santa Fe Railway Company - **owner**	Storage of railroad materials	Unknown - 1998
Harmon Steel Products Co. - **operator**	Storage of steel railroad materials	Late 1990s (?) – present
Clark & Wilson Lumber Co. - **operator**	Log/lumber storage, loading and dock operation	Unknown – Facility ceased operation by 1924
Willamette Box and Lumber Co. - **operator**	Box manufacturer	1904 – after 1919

5. PROPERTY DESCRIPTION

The property is located on the western shoreline of the Willamette River at approximately RM 4.7 (Figure 1). This unpaved, 1.9-acre site lies at the base of the Portland Hills. It is located in an area of mixed industrial, commercial, and residential uses. The Babcock property is bounded on the north by the RK Storage and Warehouse (ECSI #2376), on the east by the Willamette, on the south by Columbia

River Sand & Gravel (ECSI #2351), and on the west by Northwest Front Avenue. There are currently no structures on the property.

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Department of State Lands files.

6. CURRENT SITE USE

Babcock Land Company currently leases the site to Harmer Steel Products. Harmer Steel stores steel rail and other railroad materials on the property. No other information regarding current site use was available in DEQ files.

7. SITE USE HISTORY

The site was used by the Clark & Wilson Lumber Company for log and lumber storage, loading and dock operations beginning in at least 1936, although these activities were much reduced by 1957 (DEQ 1999). Two residences were constructed on the property sometime after 1936, but aerial photographs (reviewed by Integral) indicate that the residences were gone by 1963 (DEQ 1999). Since that time, the property has been used primarily for storage. Large piles of debris and sandblast grit/foundry material (possibly from Brake Shoe and Foundry Company, currently Harmer Steel, located southeast of the property) were observed in a 1980 photograph [see Supplemental Figure 3 from GeoEngineers (1995)] (DEQ 1999). The site has been primarily used to store railroad materials (e.g., steel rail) since 1974.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources at the site requiring additional discussion.

There is no available information indicating any chemical releases from this site. No record of regulatory permits exists. Known investigations have been limited to foundry sand stored on property. Foundry sand stored in the southern corner of the property contained trace levels of barium and no other detectable chemicals, passed acute aquatic toxicity tests, and was disposed of at an offsite landfill. A second pile of sandblast grit/foundry sand could not be located due to dense vegetation, but is assumed to still remain onsite (DEQ 1999).

8.1. Uplands

Other than the possibility of a second pile of sandblast grit/foundry sand remaining on the site, no record or information on chemical releases was found in DEQ files.

8.2. Overwater Activities ☒ Yes ☐ No

Historically, there were loading and dock operations onsite, and incidental releases of diesel, motor oils, or other contaminants may have been released to the river.

Information about the owner having and exercising a statutory right to an overwater facility was not found in Oregon Department of State Lands files.

8.3. Spills

No documented spills were found in DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, in oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], in facility-specific technical reports, or in DEQ correspondence.

9. PHYSICAL SITE SETTING

9.1. Geology

Available records indicate that no subsurface data have been collected at the site. Based on data from nearby properties, facilities adjacent to the Willamette River in this area were constructed on varying thicknesses of fill up to approximately 25 feet (DEQ 1999). The fill consists of fine-to-medium-grained sand and silt overlying Pleistocene flood deposits and recent alluvium.

9.2. Hydrogeology

Although no subsurface data have been collected at the site, depth-to-water measurements were collected from monitoring wells at an adjacent property located north of the site (RK Storage). The depth to groundwater observed at RK Storage was approximately 25 feet below ground surface. Shallow groundwater in the region generally flows toward the Willamette River. No seeps were identified at the Babcock site (GSI 2003).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section.

10.1. Soil

10.1.1. Upland Soil Investigations ☐ Yes ☒ No

No soil investigations have been conducted at the site. Foundry sand stored on the property was found to have no detectable organic chemicals, passed acute aquatic toxicity tests, and was disposed of at an offsite landfill (DEQ 1999).

10.1.2. Riverbank Samples ☐ Yes ☒ No

10.1.3. Summary

Available records indicate that no soil investigations have been conducted at the site.

10.2. Groundwater

10.2.1. Groundwater Investigations ☐ Yes ☒ No

No known groundwater investigations have been conducted at the site.

10.2.2. NAPL (Historic & Current) ☐ Yes ☐ No

Unknown.

Preferential Pathways

No review of preferential pathways has been conducted at the site in the documents reviewed.

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☐ No

Unknown.

10.2.4. Summary

Available records indicate that no groundwater investigations have been conducted at the site.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

There does not appear to be any stormwater systems at the site, and rainfall most likely infiltrates the ground. There are inadequate data available to support historic direct discharge from overwater activities.

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

No site-specific sediment investigation has been performed in the river adjacent to the Babcock property; however, Weston (1998) collected a sample offshore in the approximate middle of the Babcock site (SD026), and Integral collected a beach sediment sample (04B024) as part of the Round 1 sediment investigation for the Portland Harbor RI/FS (Integral 2004). Sample locations are shown on Figure 1, and sediment chemistry data are summarized in Table 2.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Soil cleanup has been not been conducted at the site.

11.2. Groundwater Cleanup/Source Control

No groundwater remediation has been conducted at the site

11.3. Other

Foundry sand previously stored on the property contained no detectable organic chemicals, passed acute aquatic toxicity tests, and was disposed of at an offsite landfill (date unknown).

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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DEQ. 2003. DEQ Site Summary Report – Details for Site ID 2361. DEQ Environmental Cleanup Site (ECSI) Database. Accessed December 10, 2003. www.deq.state.or.us/wmc/ecsi/ecsidetail.asp?seqnbr=2361.

GeoEngineers. 1995. Supplemental Site Characterization and Preliminary Remedial Options. Prepared for Burlington Northern Railroad, February 23, 1995.

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GSI. 2003. Technical Memorandum: Results of Seep Reconnaissance Survey, River Mile 22-10.5, Lower Willamette River. Groundwater Solutions, Inc., Portland, OR.

Integral. 2004. Round 1 Site Characterization Report. Prepared for Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.

Integral, Windward, Kennedy/Jenks, Anchor Environmental, and Groundwater Solutions. 2004. Portland Harbor RI/FS Programmatic Work Plan. Prepared for the Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Olympia, WA.

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Weston. 1998. Portland Harbor Sediment Investigation Report. Prepared for U.S. Environmental Protection Agency. Roy F. Weston, Inc., Portland, OR.

Other relevant references/information sources:

EDR. 2002. EDR Environmental Atlas, Portland Harbor, Multnomah. OR. Environmental Data Resources, Southport, CT.

GSI. 2003. Portland Harbor RI/FS: Upland Groundwater Data Review Report, River Mile 2-11, Lower Willamette River. Prepared for the Lower Willamette Group, Portland, OR. Groundwater Solutions, Inc., Portland, OR

Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Scanned Figures:

Figure 3. Site Plan (GeoEngineers 1995)

FIGURES

Figure 1. Site Features

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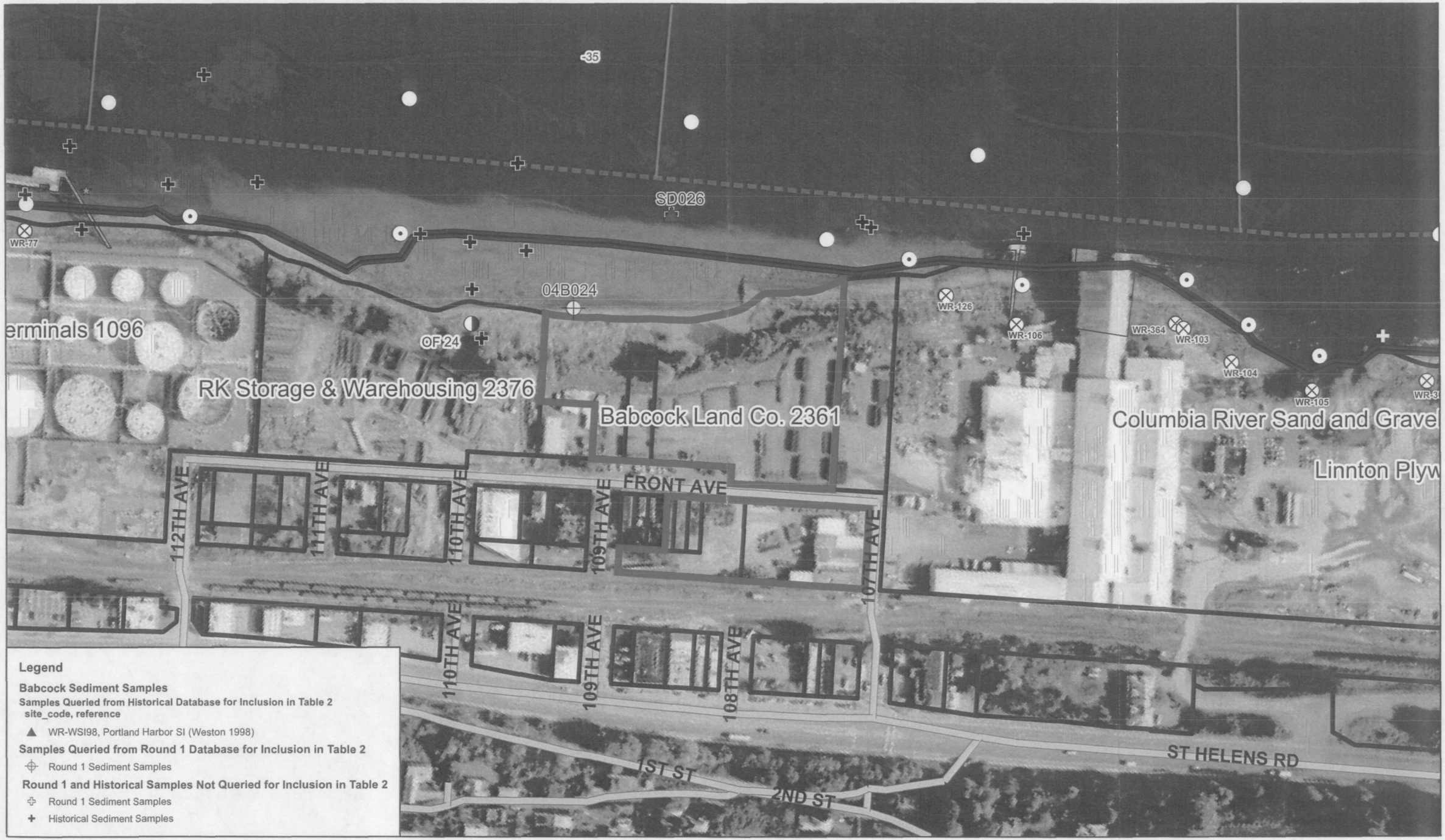

integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls (Abandoned)
Non-City Outfalls
City Outfalls
Seep Photo Location (Not location of actual Seep)

Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
Navigation Channel
Docks & In-water Structures

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Babcock Land Co.
ECSI 2361

TABLES

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

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Babcock Land Company #2361

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
Foundry Sand	✓	✓														✓									
Overwater Areas																									
Historic Dock Operations					?		?	?															?		
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

Table 2. Qureied Sediment Chemistry Data.

		Location Name	04B024	SD026
		Location ID	LWG0104B024SDS015C00	WR-WSI98SD026
		Site Name	WLCRIJ02	WR-WSI98
		Sample Date	10/11/2002	09/17/1997
		Start Depth	0	0
		End Depth	15	10
CAS No	Chemical Name	Unit		
12674-11-2	Aroclor 1016	ug/kg	< 3.8 U	
53469-21-9	Aroclor 1242	ug/kg	< 3.8 U	
12672-29-6	Aroclor 1248	ug/kg	< 6 U	
11097-69-1	Aroclor 1254	ug/kg	< 7.7 U	
11096-82-5	Aroclor 1260	ug/kg	< 5.2 U	
11104-28-2	Aroclor 1221	ug/kg	< 7.6 U	
11141-16-5	Aroclor 1232	ug/kg	< 3.8 U	
1336-36-3	Polychlorinated biphenyl	ug/kg	< 7.7 U	
TSO	Total solids	%	77.5	
TOC	Total organic carbon	%	1.4	1.5
GS_GRAVEL	Gravel	%	10.5	.19
GS_SAND	Sand	%		26.37
GS_VCS	Very coarse sand	%	5.6	
GS_CS	Coarse sand	%	15.8	
GS_MS	Medium sand	%	38.8	
GS_FS	Fine sand	%	24.8	
GS_VFS	Very fine sand	%	3.3	
GS_FINES	Fines	%		73.44
GS_SILT	Silt	%		62.99
GS_CSILT	Coarse silt	%	0.32	
GS_MSILT	Medium silt	%	0.27	
GS_FSILT	Fine silt	%	0.27	
GS_VFSILT	Very fine silt	%	0.15	
GS_CLAY	Clay	%		10.45
GS_CCLAY	8-9 Phi clay	%	0.05	
GS_MCLAY	9-10 Phi clay	%	0.04	
GS_FCLAY	>10 Phi clay	%	0.1	
75-99-0	Dalapon	ug/kg	< 16 UJ	
1918-00-9	Dicamba	ug/kg	< 3.2 U	
94-74-6	MCPA	ug/kg	< 3200 U	
120-36-5	Dichloroprop	ug/kg	< 6.3 UJ	
94-75-7	2,4-D	ug/kg	< 6.3 UJ	
93-72-1	Silvex	ug/kg	< 1.6 UJ	
93-76-5	2,4,5-T	ug/kg	< 1.6 UJ	
94-82-6	2,4-DB	ug/kg	< 32 U	
88-85-7	Dinoseb	ug/kg	< 3.2 UJ	
93-65-2	MCPP	ug/kg	< 3200 U	
7429-90-5	Aluminum	mg/kg	21100	38300
7440-36-0	Antimony	mg/kg	13 J	< 5 UJ
7440-38-2	Arsenic	mg/kg	4.7	< 5 U
7440-43-9	Cadmium	mg/kg	0.09	.2
7440-47-3	Chromium	mg/kg	24 J	36.2
7440-50-8	Copper	mg/kg	194	41.7
7439-92-1	Lead	mg/kg	12	9
7439-96-5	Manganese	mg/kg		715
7439-97-6	Mercury	mg/kg	< 0.05 U	.06
7440-02-0	Nickel	mg/kg	29 J	28
7782-49-2	Selenium	mg/kg	< 0.2 UJ	< 5 U
7440-22-4	Silver	mg/kg	< 0.02 UJ	.4
7440-28-0	Thallium	mg/kg		11

Table 2. Qureied Sediment Chemistry Data.

		Location Name	04B024	SD026
		Location ID	LWG0104B024SDS015C00	WR-WSI98SD026
		Site Name	WLCRIJ02	WR-WSI98
		Sample Date	10/11/2002	09/17/1997
		Start Depth	0	0
		End Depth	15	10
CAS No	Chemical Name	Unit		
7440-66-6	Zinc	mg/kg	96	92.5
7440-39-3	Barium	mg/kg		177
7440-41-7	Beryllium	mg/kg		.7
7440-70-2	Calcium	mg/kg		8180
7440-48-4	Cobalt	mg/kg		18.5
7439-89-6	Iron	mg/kg		40200
7439-95-4	Magnesium	mg/kg		6910
7440-09-7	Potassium	mg/kg		1240
7440-23-5	Sodium	mg/kg		1040
7440-62-2	Vanadium	mg/kg		100
91-57-6	2-Methylnaphthalene	ug/kg	< 19 U	< 20 U
83-32-9	Acenaphthene	ug/kg	< 19 U	31
208-96-8	Acenaphthylene	ug/kg	51	< 20 U
120-12-7	Anthracene	ug/kg	46	29
86-73-7	Fluorene	ug/kg	< 19 U	27
91-20-3	Naphthalene	ug/kg	25	30
85-01-8	Phenanthrene	ug/kg	320	130
LPAH	Low Molecular Weight PAH	ug/kg	442	247 A
53-70-3	Dibenz(a,h)anthracene	ug/kg	57 J	< 20 U
56-55-3	Benz(a)anthracene	ug/kg	200 J	81
50-32-8	Benzo(a)pyrene	ug/kg	330 J	120
205-99-2	Benzo(b)fluoranthene	ug/kg	260 J	92
191-24-2	Benzo(g,h,i)perylene	ug/kg	380 J	59
207-08-9	Benzo(k)fluoranthene	ug/kg	250 J	83
218-01-9	Chrysene	ug/kg	360 J	120
206-44-0	Fluoranthene	ug/kg	520	160
193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	180 J	94
129-00-0	Pyrene	ug/kg	700	220
BKBFLANTH	Benzo(b+k)fluoranthene	ug/kg		175 A
HPAH	High Molecular Weight PAH	ug/kg	3240 J	1029 A
130498-29-2	Polycyclic Aromatic Hydrocarbons	ug/kg		1276 A
53-19-0	2,4'-DDD	ug/kg	< 0.95 U	
3424-82-6	2,4'-DDE	ug/kg	< 2.4 U	
789-02-6	2,4'-DDT	ug/kg	< 0.38 U	
72-54-8	4,4'-DDD	ug/kg	2.7	
72-55-9	4,4'-DDE	ug/kg	< 0.65 U	
50-29-3	4,4'-DDT	ug/kg	< 0.58 U	
PP_DDT3ISO	Total of 3 isomers: pp-DDT,-DDD,-DDE	ug/kg	2.7	
309-00-2	Aldrin	ug/kg	< 0.19 U	
319-84-6	alpha-Hexachlorocyclohexane	ug/kg	< 0.19 U	
319-85-7	beta-Hexachlorocyclohexane	ug/kg	< 0.19 UJ	
319-86-8	delta-Hexachlorocyclohexane	ug/kg	< 0.19 U	
58-89-9	gamma-Hexachlorocyclohexane	ug/kg	< 0.19 U	
5103-71-9	cis-Chlordane	ug/kg	3.2 J	
5103-74-2	trans-Chlordane	ug/kg	2.7	
27304-13-8	Oxychlordane	ug/kg	< 0.38 U	
5103-73-1	cis-Nonachlor	ug/kg	< 0.38 U	
39765-80-5	trans-Nonachlor	ug/kg	< 0.38 U	
60-57-1	Dieldrin	ug/kg	< 0.38 U	
959-98-8	alpha-Endosulfan	ug/kg	< 0.19 U	

Table 2. Qureied Sediment Chemistry Data.

		Location Name	04B024	SD026
		Location ID	LWG0104B024SDS015C00	WR-WSI98SD026
		Site Name	WLCRIJ02	WR-WSI98
		Sample Date	10/11/2002	09/17/1997
		Start Depth	0	0
		End Depth	15	10
CAS No	Chemical Name	Unit		
33213-65-9	beta-Endosulfan	ug/kg	< 0.38 U	
1031-07-8	Endosulfan sulfate	ug/kg	< 0.38 U	
72-20-8	Endrin	ug/kg	< 0.38 U	
7421-93-4	Endrin aldehyde	ug/kg	< 0.45 U	
53494-70-5	Endrin ketone	ug/kg	< 0.38 U	
76-44-8	Heptachlor	ug/kg	< 0.22 U	
1024-57-3	Heptachlor epoxide	ug/kg	< 0.5 U	
72-43-5	Methoxychlor	ug/kg	< 1.9 U	
2385-85-5	Mirex	ug/kg	< 0.38 U	
8001-35-2	Toxaphene	ug/kg	< 19 U	
58-90-2	2,3,4,6-Tetrachlorophenol	ug/kg	< 96 U	
95-95-4	2,4,5-Trichlorophenol	ug/kg	< 96 U	< 98 U
88-06-2	2,4,6-Trichlorophenol	ug/kg	< 96 U	< 98 U
120-83-2	2,4-Dichlorophenol	ug/kg	< 58 U	< 59 U
105-67-9	2,4-Dimethylphenol	ug/kg	< 58 U	< 20 U
51-28-5	2,4-Dinitrophenol	ug/kg	< 190 U	< 200 UJ
95-57-8	2-Chlorophenol	ug/kg	< 19 U	< 20 U
95-48-7	2-Methylphenol	ug/kg	< 19 U	< 20 U
88-75-5	2-Nitrophenol	ug/kg	< 96 U	< 98 U
534-52-1	4,6-Dinitro-2-methylphenol	ug/kg	< 190 U	< 200 U
59-50-7	4-Chloro-3-methylphenol	ug/kg	< 39 U	< 39 U
106-44-5	4-Methylphenol	ug/kg	< 19 U	< 20 U
100-02-7	4-Nitrophenol	ug/kg	< 96 UJ	< 98 U
87-86-5	Pentachlorophenol	ug/kg	< 9.7 U	< 98 U
108-95-2	Phenol	ug/kg	< 39 U	< 20 U
4901-51-3	2,3,4,5-Tetrachlorophenol	ug/kg	< 96 U	
935-95-5	2,3,5,6-Tetrachlorophenol	ug/kg	< 96 U	
131-11-3	Dimethyl phthalate	ug/kg	< 19 U	< 20 U
84-66-2	Diethyl phthalate	ug/kg	< 19 U	< 20 U
84-74-2	Dibutyl phthalate	ug/kg	< 19 U	< 20 U
85-68-7	Butylbenzyl phthalate	ug/kg	< 19 U	< 20 U
117-84-0	Di-n-octyl phthalate	ug/kg	< 19 U	91
117-81-7	Bis(2-ethylhexyl) phthalate	ug/kg	65	< 140 UJ
103-33-3	Azobenzene	ug/kg	< 19 U	
108-60-1	Bis(2-chloro-1-methylethyl) ether	ug/kg	< 19 U	< 20 U
121-14-2	2,4-Dinitrotoluene	ug/kg	< 96 U	< 98 U
606-20-2	2,6-Dinitrotoluene	ug/kg	< 96 U	< 98 U
91-58-7	2-Chloronaphthalene	ug/kg	< 19 U	< 20 U
88-74-4	2-Nitroaniline	ug/kg	< 96 U	< 98 U
91-94-1	3,3'-Dichlorobenzidine	ug/kg	< 96 UJ	< 98 U
99-09-2	3-Nitroaniline	ug/kg	< 120 U	< 120 U
101-55-3	4-Bromophenyl phenyl ether	ug/kg	< 19 U	< 20 U
106-47-8	4-Chloroaniline	ug/kg	< 58 U	< 59 U
7005-72-3	4-Chlorophenyl phenyl ether	ug/kg	< 19 U	< 20 U
100-01-6	4-Nitroaniline	ug/kg	< 96 U	< 98 U
62-53-3	Aniline	ug/kg	< 19 U	
65-85-0	Benzoic acid	ug/kg	< 190 U	< 200 U
100-51-6	Benzyl alcohol	ug/kg	< 96 U	< 20 U
111-91-1	Bis(2-chloroethoxy) methane	ug/kg	< 19 U	< 20 U
111-44-4	Bis(2-chloroethyl) ether	ug/kg	< 39 U	< 39 U

Table 2. Qureied Sediment Chemistry Data.

		Location Name	04B024	SD026
		Location ID	LWG0104B024SDS015C00	WR-WSI98SD026
		Site Name	WLCRIJ02	WR-WSI98
		Sample Date	10/11/2002	09/17/1997
		Start Depth	0	0
		End Depth	15	10
CAS No	Chemical Name	Unit		
86-74-8	Carbazole	ug/kg	16	< 20 U
132-64-9	Dibenzofuran	ug/kg	4.2	< 20 U
118-74-1	Hexachlorobenzene	ug/kg	< 0.19 U	< 20 U
87-68-3	Hexachlorobutadiene	ug/kg	< 0.34 UJ	< 20 U
77-47-4	Hexachlorocyclopentadiene	ug/kg	< 96 U	< 98 U
67-72-1	Hexachloroethane	ug/kg	< 1.9 U	< 20 U
78-59-1	Isophorone	ug/kg	< 19 U	< 20 U
98-95-3	Nitrobenzene	ug/kg	< 19 U	< 20 U
62-75-9	N-Nitrosodimethylamine	ug/kg	< 96 U	
621-64-7	N-Nitrosodipropylamine	ug/kg	< 39 U	< 39 U
86-30-6	N-Nitrosodiphenylamine	ug/kg	< 19 U	< 20 U
95-50-1	1,2-Dichlorobenzene	ug/kg	< 19 U	< 20 U
541-73-1	1,3-Dichlorobenzene	ug/kg	< 19 U	< 20 U
106-46-7	1,4-Dichlorobenzene	ug/kg	< 19 U	< 20 U
120-82-1	1,2,4-Trichlorobenzene	ug/kg	< 19 U	< 20 U

SUPPLEMENTAL FIGURES

Figure 3. Site Plan (GeoEngineers 1995)

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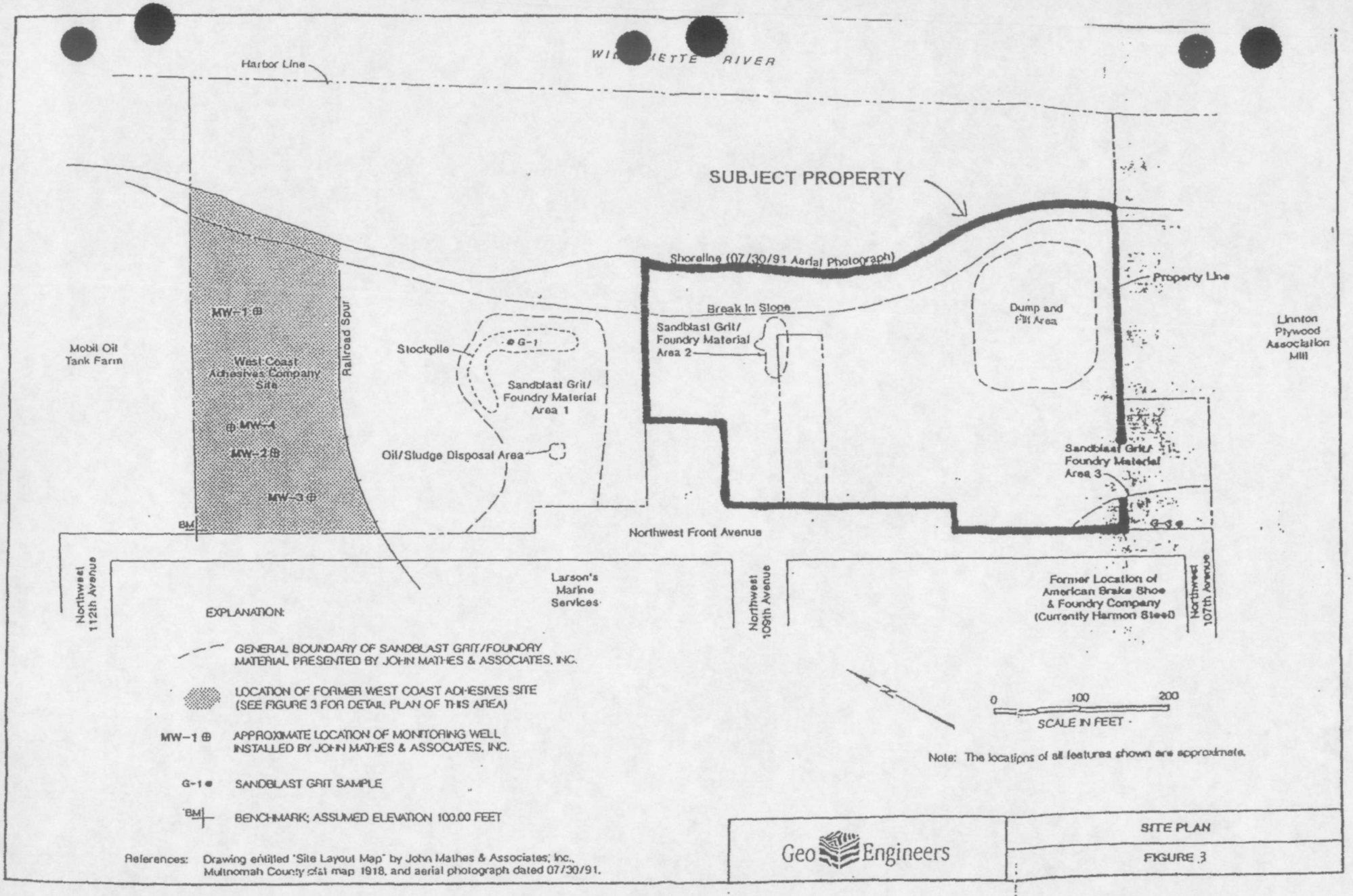
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part



506-553-P18 LGECLX 03/16/94

Boydstun Metal Works
(and Western Machine Works, Portland Blast Media)

BOYDSTUN METAL WORKS (and Western Machine, Portland Blast Media) CSM Site Summary

BOYDSTUN METAL WORKS (and Western Machine Works, Portland Blast Media)

Oregon DEQ ECSI #2362

9002 N. Sever Court (Burgard Industrial Park)
DEQ Site Mgr: Alicia Voss
Latitude: 45.6091°
Longitude: -122.7697°
Township/Range/Section: 2N/1W/35

River Mile: 4.2 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Boydstun Metal Works (southeast facility), Western Machine Works, and Portland Blast Media facilities to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

Boydstun Metal Works, Western Machine Works, and Portland Blast Media are located in the southeast area of the Burgard Industrial Park (see Figure 1). This area is landlocked and is located over 1,000 feet from the International Terminals Slip and 0.5 mile from the main stem of the river. Other than communal stormwater runoff to private Outfall 18 (WR-123) within the slip, there does not appear to be direct migration pathways for contaminants originating in this area to reach the river.

1.2. Riverbank Erosion

Not applicable to these properties.

1.3. Groundwater

No preferential pathways for groundwater movement have been identified at Boydstun Metal Works (southeast), Western Machine Works, or Portland Blast Media. Any potential groundwater transport of contaminants will likely be in the general direction of groundwater flow which is anticipated to be to the west toward the Willamette River. However, the site-specific groundwater flow direction and gradient have not been determined. Insufficient data are available to assess whether low concentrations of chlorinated solvent and metals impacts to groundwater at the site is a current or historic source of contamination to the Willamette River or the International Terminals Slip.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Stormwater from drainage basin 18, encompassing Boydstun, Western Machine Works, Portland Blast Media, and other properties, is routed to a shared storm drain system that empties into the slip through private Outfall 18 (WR-123). Only Boydstun and Portland Blast Media have NPDES permits. Historically stormwater in this area either infiltrated directly to the ground or evaporated.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

Not applicable to these properties.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☒	Phase I and II RI for Burgard Industrial Park (Bridgewater 2002a, 2003a)
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 2

4. SITE OWNER HISTORY

Primary Sources: Bridgewater 2000a, DEQ 1999

Owner/Occupant	Type of Operation	Years
Boydstun Metal Works (ECSI# 2362)		
Schnitzer Investment Corp./Boydstun Metal Works (lessee)	Limited manufacturing and equipment maintenance	1995 - present
Schnitzer Steel. Inc.	Truck maintenance and repair	Late 1970s – early 1990s
Consolidated Freightways	Unknown	1968 - 1972
Western Machine Works (no ECSI#)		
Schnitzer Investment Corp./Western Machine Works (lessee)	Metal parts fabrication	1989 - present
Schnitzer Steel, Inc.	Truck maintenance and repair	1972 - 1989
Portland Blast Media (no ECSI#)		
Schnitzer Investment Corp./Portland Blast Media (lessee)	Drop box container sandblasting and painting	1994 - present
Schnitzer Steel, Inc.	Railroad crane maintenance and repair	Early 1990s - 1994
Overall SE Area (no ECSI#)		
Various owners and lessees, including Metra Steel Corp., Schnitzer Steel, Inc., Dulien Steel	Unknown, mixed uses	1945 - 1972

Products, Inc., Owen & McIntrye Electric Co.		
U.S. Government, City of Portland, Oregon	WWII shipyard salvage area	1941 - 1945
Gatton Family	Undeveloped	Prior to 1941

5. PROPERTY DESCRIPTION

Boydstun Metal Works, Western Machine Works, and Portland Blast Media are three of eight tenants in the Schnitzer Burgard Industrial Park, which is located at RM 4.2 on the northeast bank of the Willamette River (Figure 1). Altogether, these three tenants occupy a triangular-shaped, 4.5-acre parcel located in the southeast corner of the park (Figure 1). The southeast area is fenced and zoned for heavy industry; a majority of the site is paved. It has a slight grade toward the west.

Currently, Boydstun operates from three buildings onsite, including a prefab office building, a lower shop for fabricating trailers, and an upper shop that houses the paint booth. Oil/water separators are located in the pavement north and south of the main building. Until 2000, Boydstun also leased a 1-acre area and building located west of the Western Machine Works building (see Figure 1). This building is currently empty. Portland Blast Media is located south of the current Boydstun operation and operates out of two permanent buildings and two temporary shelters. A wash pad is located east of the north building. Wash water is discharged to the municipal sanitary sewer system. Western Machine Works occupies the large 72,000-square-foot building that is centrally located in this area (Bridgewater 2000a).

Two groundwater industrial supply wells (Wells Nos. 3 and 5) and their associated pump houses installed in 1943 for the Oregon Shipbuilding Corporation are located near the eastern boundary of this area (see Section 10.2 for additional information).

The southeast area encompasses drainage basin 18, which was not included in the overall stormwater BMP assessment performed by Bridgewater (2003b) for Schnitizer Investment Corporation. Stormwater runoff from paved portions of the southeast area is routed through a series of catch basins and an oil/water separator before discharging through private Outfall 18 (WR-123) into the slip. Filter socks and straw bales are placed around the catch basins to capture particulates. Boydstun and Portland Blast Media have individual NPDES 1200Z stormwater permits for their discharges. Western does not have an NPDES stormwater permit (Bridgewater 2000a, 2003b). A site drainage map for the Boydstun property is shown on Supplemental Figure 2 (Columbia West Engineering 2001).

6. CURRENT SITE USE

Boydstun Metal Works - SE Facility. Boydstun manufactures automotive trailers for commercial haulers and modifies trucks to accommodate automotive hauling and the assembled trailers. The southeast facility was the primary facility until recently, when it was moved to the northern location (see Boydstun NE Property in *Noncontiguous Burgard Industrial Park* site summary). Current activities at the southeast facility include limited manufacturing and maintenance. Washing of assembled trucks and trailers is performed at this location. There are four aboveground storage tanks for used oil, hydraulic oil, lubricating oil, and diesel located at the site (Bridgewater 2000a; EMS 1998).

The site was listed as a RCRA large-quantity generator in 2000, and Boydstun's waste streams at that time included spent solvent, lacquer paint thinner, still bottoms, and paint-related wastes. Boydstun is currently a conditionally exempt generator.

Western Machine Works. Western Machine Works repairs, machines, and constructs industrial parts in a facility located in the southeast corner of the Burgard Industrial Park, adjacent to Boydstun Metal Works. Primarily activities include repairing bearings for paper rollers and machining metal shafts for the paper and pulp industry. Machining is done using lathes and a grinder. Water-based cutting lubricants are used to cool the machines, and a hot-water parts washer cleans bearings before repair.

Limited painting and application of polyurethane coatings is done in an enclosed paint booth.

One aboveground storage tank for waste oil is located on the exterior wall of the building. Lubricants, oil products, paints, and solvents are stored in a shed adjacent to the waste oil tank. Waste streams include cutting lubricants, used lubricating oils, wash water, waste solvents, waste dye, and metals shavings.

Western does not have a stormwater permit. Catch basins are surrounded by straw bales and contain fabric filters that are changed routinely (Bridgewater 2000a).

Portland Blast Media. This 2-acre facility is located in the southeast corner of the Burgard Industrial Park. There are two permanent buildings and two temporary shelters. Portland Blast Media sandblasts and paints solid waste and recycling drop box containers. Blasting is conducted in a temporary shelter on the northwest corner of the property. Magnesium, iron, and aluminum oxide silica are used as blast materials. These materials were tested for leachable metals, and the concentrations were determined to be within acceptable waste limits (EMS 1998). However, EMS noted that the blast media would not be considered suitable for fill and should continue to be removed and disposed of offsite. Painting is performed in an enclosed paint booth. Small quantities of paint and paint supplies are stored in another permanent building. A large portion of the site is unpaved. An industrial water supply well (Well No.3) located in a pump house east of the north building is unused (Bridgewater 2000a).

An outside wash pad drains to a sump that leads to the onsite stormwater system. A sink in one of the buildings also drains to the sump. Two catch basins contain fabric filters. Portland Blast Media has an NPDES stormwater permit and a Stormwater Pollution Prevention Plan.

7. SITE USE HISTORY

There is no specific information for the southeast portion of the Burgard property prior to WWII. Some bulk oil storage may have occurred in this area. According to Bridgewater (2000a), this corner of the property was used as a salvage area during the time of the WWII shipyard. Given the shortage of raw materials during the war years, maximizing recovery of all materials was of great importance. Refuge and scrap materials from all areas of the shipyard were collected in this area. Electric cable ends were reportedly burned here so that lead could be recovered from the wires. Refuse was disposed of in the "City Incinerator" (Osborn 1945). Between 1945 and 1972, industrial use was limited following dismantling of the shipyard, but activities included metals fabrication, salvage operations, and upland log storage. Consolidated Freightways purchased the property in 1968.

In recent years, the general area has been used as a metals scrap yard, sand-blasting area, and for equipment manufacturing. Schnitzer purchased the southeast property in 1972 for use as a truck maintenance and repair area. Most of their activity occurred in the former salvage building. Western Machine Works began operating in 1989. Boydstun leased their portions of the property in 1995 for the manufacturing of truck trailers, including assembly and painting. In 2000, Boydstun ended their lease of the 1-acre parcel in the southeast corner of the park; however, they still occupy the easternmost building on this parcel. Portland Blast Media began their sandblasting and painting operation in the late 1990s (EMS 1997; Bridgewater 2000a,b).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of the historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources at the site requiring additional discussion.

8.1. Uplands

Several industrial operations have occurred on the Burgard property in the past 50-60 years, including a former shipyard. Soil and groundwater may be contaminated by past and current

practices. As discussed further below, stormwater runoff from ground surfaces, especially areas stained with oil or hydraulic fluids, could be considered an upland contamination source.

According to Bridgewater (2000b), the southeast Boydstun parcel has an oil storage area on the eastern boundary of the property that has evidence of heavily stained concrete. This area is covered and contains a 1,000-gallon hydraulic oil tank, a solvent recovery still, a smaller tank of used oil, and drums of lubricating oil. A compressor located west of the main building drains to the pavement. Stained concrete was identified beneath two rail-mounted cranes, a portable hydraulic lift and plasma cutting tables, and in a concrete-lined trench in the maintenance area at the southeast facility. The concrete pad apron around the oil storage containment area was also stained, suggesting possible releases to soil in this area. An inactive well (Well No. 5) is located in a pump house in this area. It is not known if it was abandoned in accordance with Oregon rules (Bridgewater 2000b).

Near-surface soil contaminated with heavy oil, PAHs, and metals has been detected at the Portland Blast Media wash pad and at the Western Machine Works compressor areas (discussed further in Section 10.1.1). This soil could be considered an upland contamination source if it becomes entrained in surface water runoff from this area. The potential also exists for the soil contamination to impact groundwater and ultimately the river (Bridgewater 2002a).

Low concentrations of VOCs (chlorinated solvents) and dissolved metals have been detected historically in the alluvial groundwater zone in this area. The highest concentrations of chlorinated solvents were detected along the eastern edge of the facilities, likely upgradient with respect to the general direction of groundwater flow. The source and extent of the chlorinated solvent plume is unknown.

8.2. Overwater Activities ☐ Yes ☒ No

8.3. Spills

No documented spills at the Boydstun SE, Western Metal Works, or Portland Blast Media properties were found either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence.

9. PHYSICAL SITE SETTING

The Schnitzer Burgard Industrial Park is generally level with ground surface elevations ranging between 20 and 30 feet above msl. The topography gently slopes from east to west across the site, with the exception of a steep embankment along the Willamette River and the slip channel (DEQ 1999). Boydstun Metal Works historically operated in the southeast corner of the Schnitzer Burgard Industrial Park (see Figure 1) until 2000 when Boydstun moved the majority of its operations to a facility in the north corner of the Schnitzer Burgard Industrial Park. Western Machine Works and Portland Blast Media are located adjacent to Boydstun Metal Works (southeast).

The Schnitzer Burgard Industrial Park lies along the northeastern bank of the Willamette River where deposits from high-energy Pleistocene floods formed a peninsular terrace at the convergence of the Willamette and Columbia rivers. The southern two-thirds of the Schnitzer Burgard Industrial Park lies within the Willamette River's 100-year-flood zone (DEQ 1999).

9.1. Geology

The near-surface geology at the Schnitzer Burgard Industrial Park is dominated by the presence of dredge fill placed during the development of the industrial park in the late 1930s and during

filling of the shipways in the later 1960s and early 1970s. The dredge fill, consisting of a mixture of brown sand and silty sand, varies in thickness across the Schnitzer Burgard Industrial Park from 25 to 35 feet along the river and thinning to 15 feet along the eastern edge of the site (Bridgewater 2001).

Limited site-specific investigation information is available for Boydstun Metal Works (southeast), Western Machine Works, and Portland Blast Media. In 1997, EMS completed 4 tests pits and 15 boreholes in November and December 1997 to investigate subsurface conditions in the area [see Supplemental Figure 2 from EMS (1998)]. The tests pits extended to a maximum depth of 15 feet bgs, and the boreholes extended to a maximum depth of 20 feet bgs. Bridgewater Group (2002a) completed an additional four soil borings in late December 2001 and early January 2002. These boreholes extended to a maximum depth of 32 feet. For additional information on subsurface lithology and soil and groundwater contamination, see Supplemental Figure 2-2 from Bridgewater (2002a).

Based on the site investigation work, the stratigraphy at the site appears to be similar to that of other Schnitzer Burgard Industrial Park areas. Soil probe borings completed at the site indicate dredge fill from less than 1 to 14 feet in thickness. Alluvial deposits consisting of silts, sandy silt, and silty sand underlie the dredge fill to the maximum depth explored (32 feet bgs). An industrial water production well (State well record MULT 1824) completed at an adjacent property to the west (Northwest Pipe Company) indicates that silt, sandy silt, and silty sand are present to a depth of 124 feet bgs. Below this, the Quaternary deposits consist of coarser material composed of sand and gravel and may represent the Pleistocene flood gravels; the coarser sand and gravel was present to a depth of 220 feet bgs (CH2M HILL 2000). The coarser-grained material may represent Pleistocene flood gravels (Quaternary deposit) and/or possibly the Troutdale Formation. Between 220 and 258 feet bgs, silty clay and clay with minor lenses of gravel were noted (CH2M HILL 2000). The latter unit may represent the Sandy River Mudstone.

No site-specific cross sections have been constructed for these facilities during past investigations. The stratigraphy at the site is depicted only in the direct push soil boring lithologic logs completed by EMS (1998, Table 1) and Bridgewater (2002a, Appendix A).

9.2. Hydrogeology

Localized zones of perched groundwater may be present within the dredge fill. Such perched zones have been encountered at a depth of about 15 to 20 feet on nearby properties. The presence and extent of the perched zones is expected to be variable and related to the presence of silt content within the dredge fill. The groundwater flow gradients in the perched zones are anticipated to be variable and relatively low; discharge from the perched groundwater zones either discharges toward the river or infiltrates downward into the underlying dredge fill and alluvial deposits (Bridgewater 2001). A more continuous, unconfined, groundwater zone is anticipated within the upper portions of the alluvial deposits underlying the dredge fill (Bridgewater 2001) and potentially including the lower portions of the dredge fill itself. The groundwater flow direction in the alluvial groundwater zone is generally to the west, toward the Willamette River, with local variations in groundwater flow expected. The alluvial groundwater zone is anticipated to discharge to the river (Bridgewater 2001). However, site-specific information related to the groundwater flow direction and gradient was not available in the DEQ records.

During completion of soil probe borings at Boydstun Metal Works (southeast), static water levels were obtained in the soil probe borings before groundwater sampling and backfilling (Bridgewater 2002a). The depth to groundwater ranged from 26.8 to 28 feet bgs in three of the four borings, with the fourth having a depth to water between 16 and 20 feet bgs. The shallower depth to groundwater observed in the one soil boring was not explained by Bridgewater (2002a).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations

☒ Yes ☐ No

Boydstun Metal Works. A level II environmental sampling study of the southeast Boydstun property was performed by EMS (1998), which consisted of limited test pit [using an organic vapor monitor (OVM)], borehole, and surface sampling. The OVM readings did not indicate any subsurface contamination. PAHs, PCBs, and TCLP lead were detected in TP-1, above DEQ's industrial maximum allowable soil concentrations (OAR 340-122-045) for those analytes. PCBs were detected in two of 14 samples at 15.3 ppm and 0.5 ppm, which are within the range of DEQ cleanup criteria [see Supplemental Figure 2 from EMS (1998)]. However, EMS concluded that the limited area of PCB soil contamination did not pose a threat to the Willamette River, due to the large distance from this area to the river and the essentially insoluble nature of PCBs.

Western Machine Works. Soil and groundwater sampling was performed on this property in 1997. EMS (1998) concluded that the investigation "...did not detect widespread contamination associated with prior land use of the subject property." No petroleum hydrocarbons were detected in the area of the former underground storage tanks. Bridgewater (2002a) collected soil samples in this area during their RI and found total PAHs at 1,466 mg/kg in a 1-foot sample collected from PP-2, located near the Western Machine Works air compressor.

Portland Blast Media. Soil samples were also collected by Bridgewater (2002a) in the SSI's southeast area. Minimum and maximum concentrations are provided below:

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Total Petroleum Hydrocarbons (TPH)		
TPH- Heavy Oil Range	100 U	1,520
Polycyclic Aromatic Hydrocarbons (PAHs)		
Benzo(a)anthracene	--[a]	0.48
Benzo(a)pyrene	--	0.742
Benzo(b)fluoroanthene	--	0.73
Benzo(g,h,i)perylene	--	0.975
Benzo(k)fluoroanthene	--	0.684
Chrysene	--	0.692
Fluoranthene	--	0.782
Pyrene	--	0.952
LPAH	--	0.295
HPAH	--	6.957
Metals (total)		
Arsenic	2.48	5.18
Barium	80	163
Cadmium	0.5 U	2.47
Chromium	7.33	71.4
Copper	13	177
Lead	5.77	222
Mercury	0.1 U	0.811
Nickel	11.1	33.5
Zinc	48.3	775

mg/kg = milligrams per kilogram (ppm)
U = Not detected at noted reporting limit
[a] *Only one sample was analyzed.*

Heavy oil was detected in a single sample at a maximum concentration of 1,520 mg/kg at a depth of 1 foot from PP-4, located immediately east of the Portland Blast Media wash pad [see Supplemental Figure 2-2 from Bridgewater (2002a)]. PCBs were not detected in this area. High concentrations of all metals were detected in a 1-foot sample collected at PP-4. These results were some of the highest metal concentrations in samples collected throughout the Burgard Industrial site.

10.1.2. Riverbank Samples

☐ Yes ☒ No

10.1.3. Summary

Soil contaminated with PCBs was identified by EMS (1998) in the area just south of the Boydstun building in the southeast area. PAHs, PCBs, and TCLP lead were detected in TP-1, above DEQ's industrial maximum allowable soil concentrations (OAR 340-122-045) for those analytes. Follow-up sampling by Bridgewater (2002a) in the general area found no PCBs in soils. However, heavy oil, PAHs, and heavy metals were detected in near-surface soil samples at the Portland Blast Media wash pad and at the Western Machine Works compressor areas.

10.2. Groundwater

Groundwater samples have been collected from temporary well points, one monitoring well, and two industrial water supply wells located at the site. The two industrial water supply wells each were sampled once. The single monitoring well has been monitored routinely by Bridgewater since installation in January 2002.

10.2.1. Groundwater Investigations

☒ Yes ☐ No

In November and December 1997, 15 soil borings were completed by EMS during a site investigation at Boydstun Metal Works (southeast) [see Supplemental Figure 2 from EMS (1998)]. Groundwater samples were collected from temporary well point BH-13 [see Supplemental Figure 2 from ESM (1998)] and from an industrial water supply well (Well No. 5) located to the east of Boydstun Metal Works (southeast) [see Supplemental Figure 2-2 from Bridgewater (2002a)]. The groundwater samples were analyzed for soluble metals, TPH, and chlorinated and aromatic VOCs.

In December 2001 and January 2002, Bridgewater (2002a) completed four additional soil probe borings at the site. Temporary well points were installed in three of the soil borings and the fourth was completed as a permanent monitoring well (MW-7) [see Supplemental Figure 2-2 from Bridgewater (2002a)]. The groundwater sample collected from the monitoring well was analyzed for VOCs, PAHs, and metals. The groundwater samples collected from the temporary well points were analyzed for VOCs. Bridgewater (2002a) also collected a groundwater sample from an industrial water supply well (Well No. 3) located to the east of Portland Blast Media [see Supplemental Figure 2-2 from Bridgewater (2002a)] that was analyzed for VOCs.

Bridgewater (2003c) has continued groundwater monitoring at MW-7 since the 2001/2002 site investigation. The groundwater samples from this well have been analyzed for total metals, dissolved metals, VOCs, SVOCs, and PAHs.

The two industrial water supply wells (Well No. 3 and Well No. 5) were completed in 1944 with depths of 80 feet bgs. The wells appear to be screened in the alluvial groundwater zone (same water bearing zone as the monitoring wells and temporary well points). The Oregon Water Resources Department well identification numbers associated with these two wells are MULT 1827 and MULT 1828.

10.2.2. NAPL (Historic & Current)

☐ Yes ☒ No

No evidence of non-aqueous phase liquids has been reported.

10.2.3. Dissolved Contaminant Plumes

☒ Yes ☐ No

Groundwater samples collected during past investigations have had low detections of VOCs (chlorinated solvents) and dissolved metals. The specific constituents historically detected in groundwater are detailed in the table below. The most recent groundwater detections are detailed in a subsequent section.

VOCs	Dissolved Metals
Tetrachloroethene (PCE)	Arsenic
Trichloroethene (TCE)	Barium
1,1,1-Trichloroethane	Copper

Plume Characterization Status ☐ Complete ☒ Incomplete

Additional data are necessary to adequately characterize the identified chlorinated solvent and metals impacts to groundwater based on the distribution of available groundwater data.

Plume Extent

Groundwater samples collected at the site have had low concentrations of chlorinated solvents (total of PCE, TCE, and trichloroethane less than 5.3 µg/L). The highest concentrations of chlorinated solvents were detected in the two industrial water supply wells located along the eastern property boundary of Boydstun Metal Works (southeast) and Portland Blast Media (EMS 1998, Bridgewater 2002a). The source and extent of chlorinated solvents observed in groundwater at the site are unknown.

Min/Max Detections (Current situation)

The most recently reported groundwater data were collected in March 2003 (Bridgewater 2003c); however, Bridgewater indicates that another round of groundwater sampling was planned for September or October 2003. The minimum and maximum detections in groundwater from available documents are provided in the table below.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Volatile Organic Compounds (VOCs)		
Tetrachloroethene (PCE)	< 1	1.91
Trichloroethene (TCE)	< 1	3.9
1,1,1-Trichloroethane	< 1	1.23
Dissolved Metals		
Arsenic	< 1	6.1
Barium	< 1	65.3
Copper	< 1	1.61

Current Plume Data

Only the single monitoring well (MW-7) has been monitored routinely [see Supplemental Figure 2-2 from Bridgewater (2002a)]. The other groundwater sampling locations – the temporary well points and two industrial water supply wells – were sampled only once. Therefore, GSI's estimate of the extent of the chlorinated solvent plume is based on historical data from the temporary well points and the two industrial water supply wells were used in conjunction with the current data for the monitoring well (see Figure 2). The estimated extent of the plume carries a high level of uncertainty due to the lack of groundwater data collected in the area.

The chlorinated solvents plume appears to extend beneath the Western Machine Works facility, the eastern Boydstun Metal Works building, and the Portland Blast Media facility. As noted above, the highest concentrations of chlorinated solvents were detected in the two industrial water supply wells located along the eastern edge of the Boydstun Metal Works (southeast) and Portland Blast Media facilities (EMS 1998; Bridgewater 2002a).

Preferential Pathways

No preferential groundwater pathways have been identified at the site.

Downgradient Plume Monitoring Points (min/max detections)

Based on available information, downgradient monitoring points have not been established during site investigations.

Visual Seep Sample Data ☐ Yes ☒ No

Not applicable.

Nearshore Porewater Data

Boydstun Metal Works (southeast), Western Machine Works, and Portland Blast Media facilities do not occupy the shoreline along the Willamette River or any of the slips. Nearshore porewater data were not collected as part of the site investigations.

Groundwater Plume Temporal Trend

All groundwater sampling locations were sampled during single events, except for monitoring well MW-7 that has been monitored routinely since construction in January 2002 [see Supplemental Figure 2-2 from Bridgewater (2002a)]. In 2002, the groundwater sample collected from MW-7 had a detection of PCE and was non-detect for all other VOCs. The subsequent groundwater sample collected in 2003 had a detection of TCE and was non-detect for all other VOCs.

10.2.4. Summary

The current groundwater data set consists of groundwater levels and groundwater analytical data collected from five temporary well points, one monitoring well, and two industrial water supply wells. Depth to groundwater measured in the wells ranged from 16 to 28 feet bgs. The general groundwater flow direction is anticipated to be to the west toward the Willamette River with local variations in flow direction expected around the slips (Bridgewater 2002a). However, site-specific information related to the groundwater flow direction and gradient was not available in the DEQ records.

Low concentrations of VOCs (chlorinated solvents) and dissolved metals have been detected historically in the alluvial groundwater zone. The highest concentrations of chlorinated solvents were detected along the eastern edge of the facilities, likely upgradient with respect to the general direction of groundwater flow. The source and extent of the chlorinated solvent plume is unknown.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
Boydstun – GEN12Z	111395	11/13/96	#18 (WR-123)	Standard[1]/twice yearly
PBM – GEN12Z	Unknown	Unknown	#18 (WR-123)	Standard[1]/twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☒ Yes ☐ No

A catch basin solids sample was collected from a stormwater catch basin at Western Machine Works property in 1997 and analyzed for TCLP metals. Only barium (1 mg/L) and chromium (0.33 mg/L) were detected in the sample (EMS 1998) at concentrations below characteristic waste levels.

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Stormwater from drainage basin 18, encompassing the Boydstun, Western Machine Works, and Portland Blast Media properties, is routed to a shared storm drain system that empties into the slip through private Outfall 18 (WR-123). Only Boydstun and Portland Blast Media have NPDES permits. A single catch basin solids sample collected at the Western Machine Works site revealed low levels of metals (EMS 1998).

10.4. Sediment

10.4.1. River Sediment Data ☐ Yes ☒ No

10.4.2. Summary

The southeast area of the Burgard Industrial Park is landlocked and is located over 1,000 feet from the International Terminals Slip and 0.5 mile from the main stem of the river. Other than communal stormwater runoff to private Outfall 18 (WR-123) within the slip, there are no direct migration pathways for contaminants originating in this area to reach the river.

Sediment sampling in the vicinity of private Outfall 18 (WR-123) has revealed some of the highest metals, PAH, and PCB (including PCB congeners, PCB-126 and PCB-169) concentrations in the Burgard Industrial Park area. However, it is difficult to identify a source of these contaminants as drainage basin 18 includes several land use activities, including NW Pipe, Ryerson and Sons, Boydstun Metal Works, Western Machine Works, Portland Blast Media, and various Schnitzer-owned properties.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

The following soil cleanup and source control measures have occurred in the southeast area:

- Removal of three underground storage tanks in 1988, including two 10,000-gallon diesel fuel tanks and one 10,000-gallon gasoline tank, from the Boydstun property.
- Daily removal of fine metal cuttings and blast media from pavement, pavement and containment provided for refueling truck, and replumbing of sink drain to the local sanitary sewer at Portland Blast Media.

Removal of near-surface contaminated soil in the Portland Blast Media wash pad and Western Machine Works compressor areas.

11.2. Groundwater Cleanup/Source Control

There is no groundwater cleanup history at Boydstun Metal Works, Western Machine Works, or Portland Blast Media.

11.3. Other

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

Supplemental Scanned Figures:

Figure 2. Site Drainage Map (Columbia West Engineering 2001)
Figure 2. Site Diagram (EMS 1998)
Figure 2-2. Phase I Explorations-SE Area, Burgard Industrial Park (Bridgewater 2002a)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005
Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 150 300 600 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Burgard Industrial Park
ECSI 2355

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 150 300 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_Boydstun_SummaryMap.mxd

LEGEND

Site Boundary

Maximum Detection Location

Contaminant Type

VOCs (HVOCs)

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Burgard Industrial Park
Boydstun Metal Works
Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Boydstun Metal Works (and Western Machine Works, Portland Blast Media) #2362

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
A																									
Oil storage area along eastern boundary	✓	?					✓	✓																	
Contaminated soils near Western Machine and PBM	✓			✓				✓					✓			✓									
Stormwater private outfall 18					✓								✓			✓	✓								
Unknown source			✓								✓											?			
Overwater Areas																									
B																									
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

SUPPLEMENTAL FIGURES

Figure 2. Site Drainage Map (Columbia West Engineering 2001)
Figure 2. Site Diagram (EMS 1998)
Figure 2-2. Phase I Explorations-SE Area, Burgard Industrial Park (Bridgewater 2002a)

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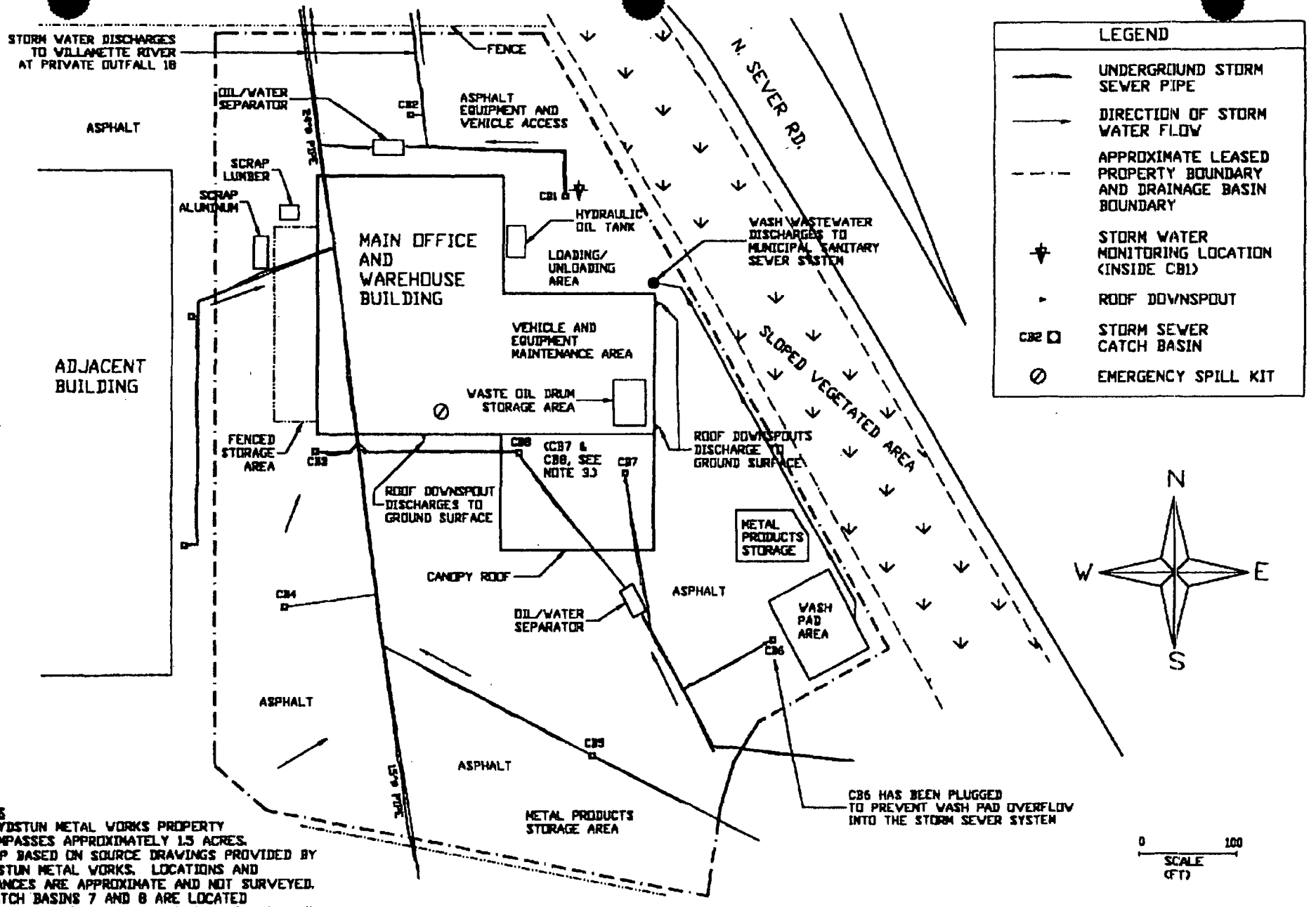


NOTES
1. BOYDSTUN METAL WORKS PROPERTY ENCOMPASSES APPROXIMATELY 1.5 ACRES.
2. MAP BASED ON SOURCE DRAWINGS PROVIDED BY BOYDSTUN METAL WORKS. LOCATIONS AND DISTANCES ARE APPROXIMATE AND NOT SURVEYED.
3. CATCH BASINS 7 AND 8 ARE LOCATED PARTIALLY INDOORS AND UNDER ROOF CANOPY AND WILL BE CAPPED TO PREVENT FLOW TO THE STORM SEWER SYSTEM.
4. CATCH BASIN TYPES AND STORM PIPE LOCATIONS ARE BASED UPON DISCUSSION WITH BOYDSTUN METAL PERSONNEL AND ARE ASSUMED TO BE LOCATED AND CONFIGURED AS SHOWN.
5. GROUND SURFACE IS IMPERVIOUS ASPHALT UNLESS OTHERWISE NOTED.

Columbia West Engineering

Design:	Drawn: DEL		
Checked: LVL	Date: 10-17-01		
Client: Boydstun	Rev	By	Date
Job No: 0181			
CAD File: FIGURE 2			
Scale: AS SHOWN			

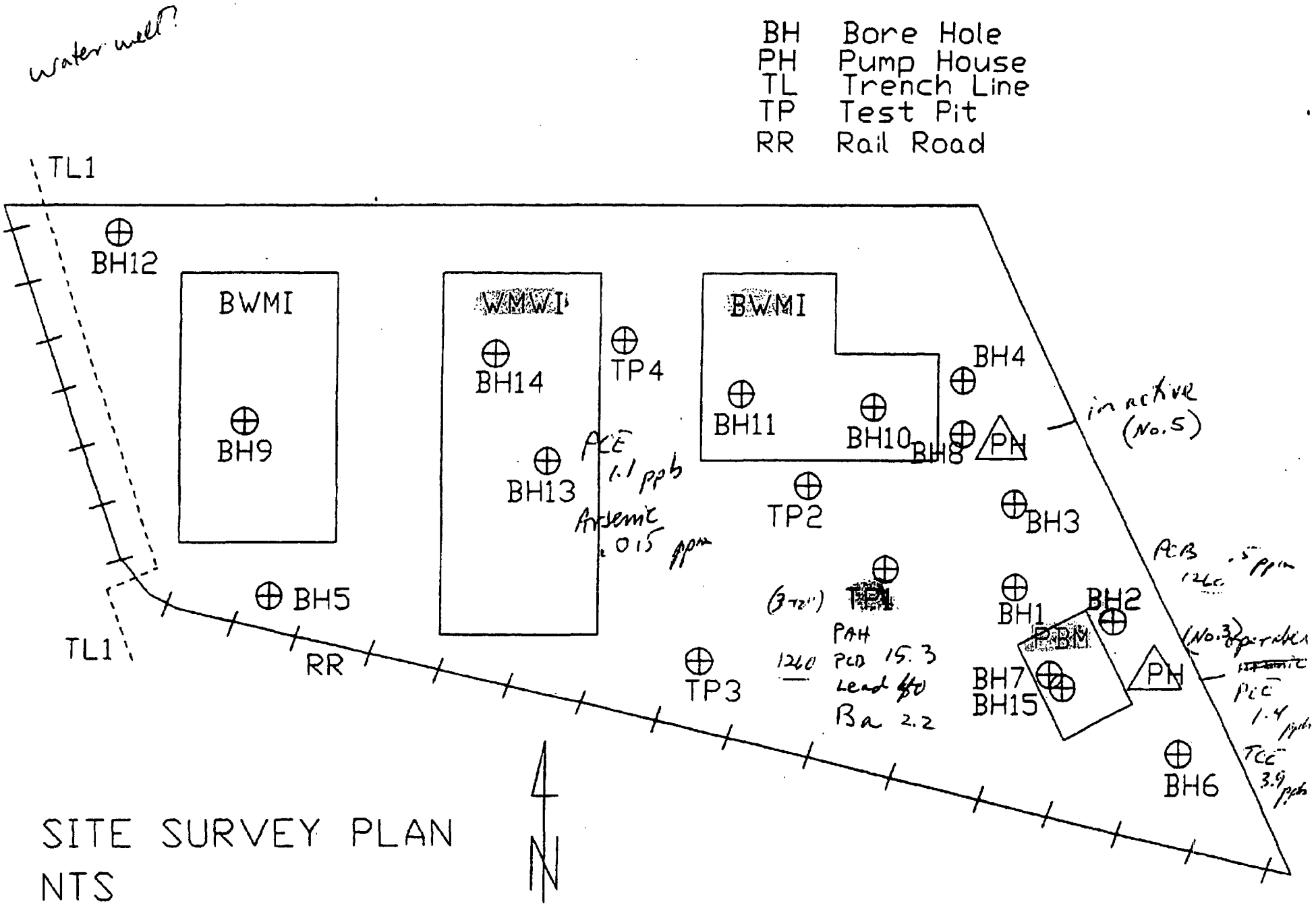
SITE DRAINAGE MAP

BOYDSTUN METAL WORKS
9002 N. SEVER COURT, PORTLAND, OREGON

FIGURE 2

FIGURE 2: SITE DIAGRAM

BH Bore Hole
PH Pump House
TL Trench Line
TP Test Pit
RR Rail Road



SITE SURVEY PLAN
NTS

N

Approximate Scale

100 feet

Monitoring Well

Push Probe

Catch Basin Sediment Sample

Figure 2-2
Phase I Explorations-SE Area
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

Calbag Metals – Front Avenue

CALBAG METALS - FRONT AVENUE
CSM Site Summary

CALBAG METALS - FRONT AVENUE

Oregon DEQ ECSI #: 2454

4927 NW Front Ave.
DEQ Site Mgr: Thomas Gainer
Latitude: 45.558°
Longitude: -122.7313°
Township/Range/Section: 1N/1E/19

River Mile: 8.6 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Calbag Metals (Calbag) site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

The entire property is paved except for a thin strip of ground adjacent to the railroad spur. The Calbag site is not located adjacent to the river. Overland transport of contaminated media is not considered a pathway of concern at this site.

1.2. Riverbank Erosion

The Calbag Metals property is not located adjacent to the Willamette River.

1.3. Groundwater

DEQ (2002, pers. comm.) has determined that the groundwater pathway from the uplands to the Willamette River is not a pathway of concern.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Calbag has implemented Best Management Practices (BMPs) to control transport of contaminants from the site via stormwater. Stormwater runoff from Calbag is directed to catch basins equipped with filter bags before being routed under an NPDES permit to the City storm drain system that discharges at Outfall 19/19A on the Willamette River. Acme Trading and Supply Company documented the presence of elevated metals concentrations in stormwater and waste characterization samples, prior to occupancy of the site by Calbag and implementation of BMPs (DEQ 2002, pers. comm.). According to Tom Gainer, DEQ, a current site investigation is addressing historical contamination in onsite and offsite stormwater drainpipes (Gainer 2005, pers. comm.).

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

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1.6. Sediment Transport

Not applicable.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☒	XPA completed by McKenna Environmental (2001); additional site investigations are currently being performed (Gainer 2005, pers. comm.)
RI	☐	
FS	☐	
Interim Action/Source Control	☐	DEQ issued a draft source control decision in May 2002; a final SCD will be issued when site investigations have been completed (Gainer 2005, pers. comm.)
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Tier 3

4. SITE OWNER HISTORY

Owner/Occupant	Type of Operation	Years
Greenstein Trust - **owner**	No operations on site	1995 - present
Calbag Metals - **lessee**	Partially inactive, some wire chopping occurs in former granulator building	1995 - present
Oncorp Corporation - **sub-lessee to Calbag**	Unknown, uses half of warehouse	1997 - ?
O'Neill Transfer - **sub-lessee to Calbag**	Moving and storage operation	1998 - present
Calbag Metals - **lessee**	Scrap metal recycling	1995 - 1997
Acme Trading & Supply Company	Metals recycling and recovery	1968 - 1995
Unknown	Industrial	1948 - 1968

5. PROPERTY DESCRIPTION

The 4.71-acre site is located in an industrial area approximately 1,000 feet west of the Willamette River at approximately RM 8.6 (Figure 1). The property is surrounded by the Schnitzer-Kittridge site to the west (ECSI #2442), Front Avenue LP Properties (#1239) to the north, Shaver Transportation (#2377) and Lakeside Industries (#2372) to the east, and U.S. Highway 30 to the south. The property is divided into two areas: a sublease area (western side) leased by O'Neill Transfer, and the remainder, which is leased by Calbag. Site buildings include a warehouse and loading dock on the sublease area, and in the eastern half of the property, a granulator building with protected adjoining storage bins and a maintenance building. An aboveground used-oil storage tank also is located here. The site is fully paved except for a

small strip along the southwestern edge that accommodates the railroad spur line. The property is fenced with access through a gate along NW Front Street.

Topography in the area is generally flat; the site overlies fill and alluvial deposits of the Willamette River. Stormwater runoff from Calbag is directed to catch basins with inverted discharge pipes, which are lined with fabric filter bags for trapping solids and oils. Surface water from the site and surrounding facilities discharges via a common storm drain beneath Front Avenue to the river, approximately 1,000 feet northwest of the property boundary.

6. CURRENT SITE USE

The warehouse, loading dock, and parking area are leased to O'Neill Transfer, which uses the facilities for a moving and storage operation. Goods are stored temporarily indoors. Calbag has consolidated their scrap operations to their headquarters facility, so their operations on the site have ceased. Only minor storage takes place (McKenna Environmental 2001). According to Tom Gainer, DEQ (2005, pers. comm.), Calbag has sub-leased the site to other operators.

7. SITE USE HISTORY

The site was developed for industrial use by 1948. The site is currently owned by Greenstein Trust, which leases the land and buildings to Calbag Metals. Acme Trading and Supply Company owned the property from 1968 to1995. They operated a metals recycling business that included cutting, torching, segregating, storing, and distributing metals, as well as recovering metals from wire (primarily copper, aluminum, and lead). Wire coatings and insulation were removed from the wire using an incinerator that generated recyclable ash. They were regulated by DEQ as a hazardous waste generator from 1987 to 1994 and subsequently as a conditionally exempt generator until 1995, when they ceased operations at the site. Three underground storage tanks were installed in 1968: a 1,000-gallon gasoline, 1,000-gallon diesel, and a 500-gallon used oil tank. These tanks were decommissioned in 1987. Sampling after decommissioning of the tanks was not conducted as post-closure sampling was not required in 1987. (DEQ 2002, pers. comm.)

DEQ conducted two compliance inspections in 1989, primarily because lead-containing waste was not claimed as being generated in 1988, although up to 100 tons had been generated previous to that year. DEQ observed ash stored in an open container with holes in the bottom and various unmarked drums containing scrap metal and other residue. The area had recently been washed down and rinse water apparently had entered the storm drain. Analytical results of stormwater and waste characterization samples collected by DEQ showed elevated metals concentrations. Eight violations related to improper management of hazardous waste were documented, and a Notice of Noncompliance was issued to Acme Trading and Supply on October 18, 1989 (DEQ 2002, pers. comm.). According to Tom Gainer, DEQ, a current site investigation is addressing contamination in onsite and offsite stormwater drainpipes (Gainer 2005, pers. comm.).

Calbag assumed operations at the property in 1995 and continued the metal recycling and the mechanical recovery of metal from wire. Calbag owns leasehold improvements on the property and, in turn, sub-leases the warehouse, loading dock, and parking area to O'Neill Transfer. Beginning in 1995, Calbag began consolidating their operations to their headquarters facility located elsewhere and relocated equipment and yard inventory to that site. The granulator was mothballed in April 1998, and the plasma-cutting operations were moved to headquarters in March 2000. Remaining scrap metal operations, except for long-length extrusion, were relocated to headquarters in October 2000. Calbag currently sub-leases the site to other operators (Gainer 2005, pers. comm.).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

The entire property is paved except for a thin strip of ground adjacent to the railroad spur. The pavement is contoured to direct all surface water runoff to the catch basins. Entrained sediment in stormwater runoff from paved areas is the only potential current upland source. However, current source control measures such as sweeping exposed paved areas and routine cleaning of catch basins, as well as the decline in stormwater concentrations in site runoff, have shown that Calbag Metals is not a current source of Willamette River water or sediment contamination. These BMPs were initiated when Calbag occupied the site in late 1995. Past operations may have resulted in a release of hazardous substances to the storm drain system, and ultimately to the river (DEQ 2002, pers. comm.). According to Tom Gainer, DEQ, a current site investigation is addressing historical contamination in onsite and offsite stormwater drainpipes (Gainer 2005, pers. comm.).

COPCs in stormwater runoff are two heavy metals (copper and lead) and oil and grease.

8.2. Overwater Activities ☐ Yes ☒ No

8.3. Spills

Information regarding known or documented spills at the Calbag Metals site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence.

According to DEQ (1999), a complaint was filed in October 1992 indicating that hydraulic shears were leaking oil on the ground; the complaint stated that the oil was subsequently hosed into the storm drain.

9. PHYSICAL SITE SETTING

9.1. Geology

Available files indicate that no geologic or hydrogeologic data have been collected at the site.

9.2. Hydrogeology

Available files indicate that no geologic or hydrogeologic data have been collected at the site.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☐ Yes ☒ No

The site has been paved since operations began in 1968, and there have been no soil investigations.

10.1.2. Riverbank Samples ☐ Yes ☒ No

There are no riverbank data associated with this site, as it is not adjacent to the Willamette.

10.1.3. Summary

Evidence of soil contamination on the Calbag Metals site is unknown as no soil samples have been collected at the site.

10.2. Groundwater

No groundwater investigations have been conducted at the site. DEQ (2002, pers. comm.) has concluded that the groundwater pathway from the uplands to the Willamette River is not a pathway of concern. According to Tom Gainer, DEQ, a current site investigation that is addressing contamination in onsite and offsite stormwater drainpipes may include a groundwater component (Gainer 2005, pers. comm.).

10.2.1. Groundwater Investigations ☐ Yes ☒ No

Groundwater investigations have not been conducted at the site; no groundwater data are available.

10.2.2. NAPL (Historic & Current) ☐ Yes ☐ No

Groundwater investigations have not been conducted at the site; no groundwater data are available.

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☐ No

Groundwater investigations have not been conducted at the site; no groundwater data are available.

Plume Characterization Status ☐ Complete ☐ Incomplete

Plume Extent

Not Applicable (N/A). Groundwater investigations have not been conducted at the site; no groundwater data are available.

Min/Max Detections (Current situation)

N/A. Groundwater investigations have not been conducted at the site; no groundwater data are available.

Current Plume Data

N/A. Groundwater investigations have not been conducted at the site; no groundwater data are available.

Preferential Pathways

N/A. Groundwater investigations have not been conducted at the site; no groundwater data are available.

Downgradient Plume Monitoring Points (min/max detections)

N/A. Groundwater investigations have not been conducted at the site; no groundwater data are available.

Visual Seep Sample Data ☐ Yes ☐ No

This site is not adjacent to the river, so seeps along the river cannot be directly related to the Calbag Metals site.

Nearshore Porewater Data

This site is not adjacent to the river.

Groundwater Plume Temporal Trend

N/A. Groundwater investigations have not been conducted at the site; no groundwater data are available.

10.2.4. Summary

No hydrogeologic or groundwater quality data have been collected at the site. DEQ (2002) has determined that groundwater is not a pathway of concern. According to Tom Gainer, DEQ, a current site investigation that is addressing contamination in onsite and offsite stormwater drainpipes may include a groundwater component (Gainer 2005, pers. comm.).

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit [Current or Past] ☒ Yes ☐ No

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN 12Z	111953	?	?	Standard[1] / twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

Stormwater from Calbag Metals enters the City of Portland storm drain system before discharging to the river.

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☒ Yes ☐ No

McKenna Environmental (2002, pers. comm.) collected two catch basin sediment samples in November 2001, which were analyzed for cadmium, chromium, lead, and copper. Copper was detected at concentrations of 2,120 mg/kg in the upgradient catch basin sample and 47 mg/kg in the downgradient catch basin sample. These samples were obtained from material captured in the filter bags and therefore do not reflect actual concentrations leaving the site via stormwater discharge.

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Calbag Metals discharges stormwater to the City storm drain system under an NPDES permit. Copper has been detected as high as 2,120 mg/kg and 47 mg/kg in samples of

solids in upgradient and downgradient catch basins, respectively. However, the samples were obtained from material captured in the filter bags and do not represent actual concentrations leaving the site via stormwater discharge. According to Tom Gainer, DEQ, a current site investigation is addressing historical contamination in onsite and offsite stormwater drainpipes (Gainer 2005, pers. comm.).

10.4. Sediment

10.4.1. River Sediment Data

☐ Yes ☒ No

10.4.2. Summary

There are no site-specific river sediment data associated with this property as all stormwater runoff is routed to the City storm drain system, which combines runoff from several land uses and property owners along Front Avenue before being discharged to Outfall 19/19A.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Best Management Practices implemented by Calbag include routine sweeping of the paved areas to remove debris, and cleaning out stormwater catch basins and replacing absorbent material and filter bags. Gooseneck sediment traps in the catch basins separate the oil and grease components of the stormwater runoff. Material is removed twice a year during routine maintenance activities (McKenna Environmental 2002, pers. comm.). A current site investigation is addressing historical contamination in onsite and offsite stormwater drainpipes (Gainer 2005, pers. comm.). This investigation may result in additional removal activities.

Three underground storage tanks were decommissioned in 1987, but post-closure activities are unknown.

11.2. Groundwater Cleanup/Source Control

DEQ (2002) has determined that groundwater is not a pathway of concern.

11.3. Other

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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Other relevant references/information sources:

EDR. 2002. EDR Environmental Atlas, Portland Harbor, Multnomah. OR. Environmental Data Resources, Southport, CT.

GSI. 2003. Portland Harbor RI/FS: Upland Groundwater Data Review Report, River Mile 2-11, Lower Willamette River. Prepared for the Lower Willamette Group, Portland, OR. Groundwater Solutions, Inc., Portland, OR.

Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

FIGURES

Figure 1. Site Features

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Calbag Metals #2454

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs																	Potential Complete Pathway				
						TPH			VOCs																		
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	*Grease*	*Oils*	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																											
Stormwater runoff to Outfall 19/19A				✓	✓											✓					✓	✓				✓	
Overwater Areas																											
Other Areas/Other Issues																											

Notes:

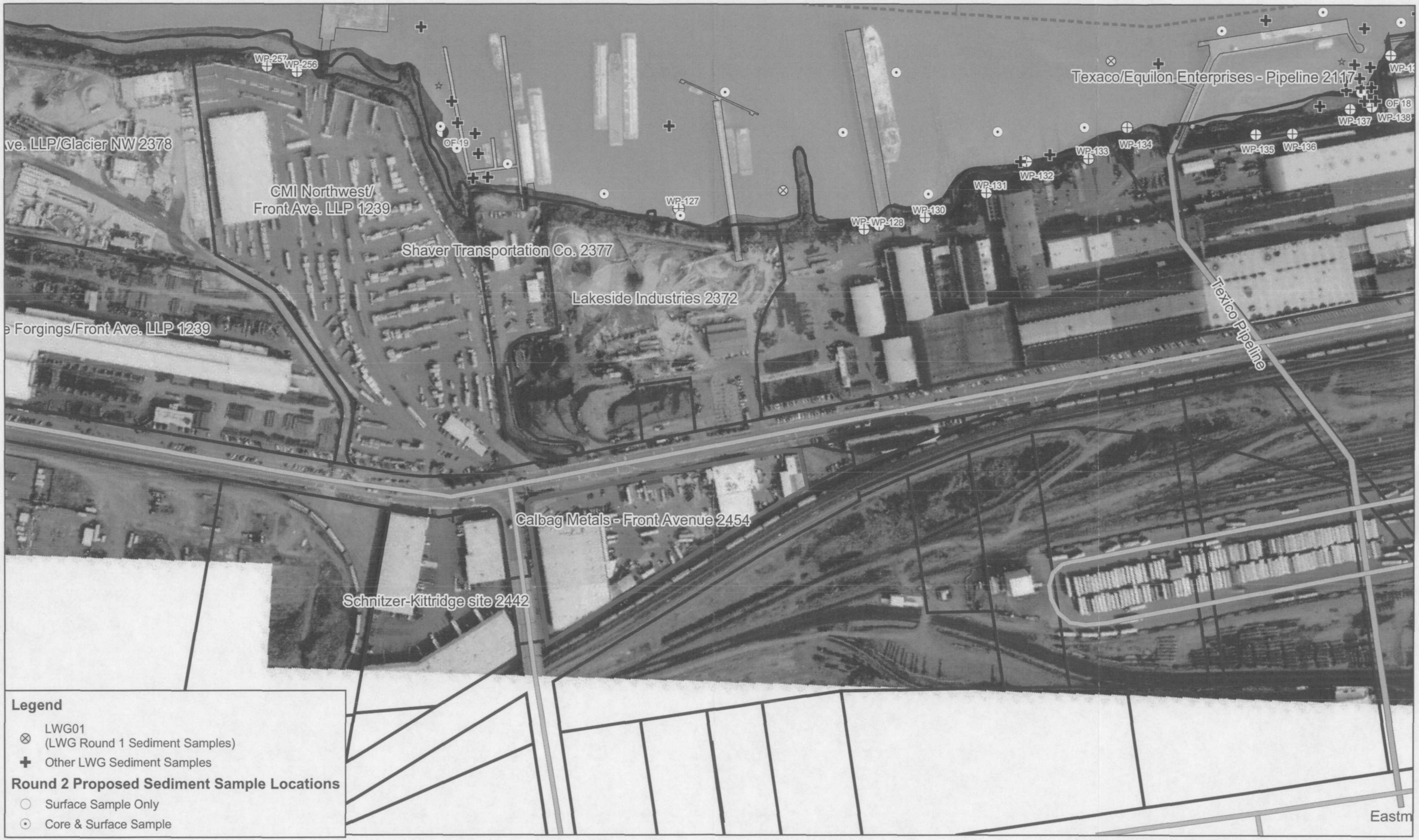
All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychorinated biphenols



integral consulting inc

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 05/19/2004

0 50100 200 Feet

City Outfalls
Outfalls
Seep Photo
River Miles
-35ft. Contour (NAVD 88)
dock-structures-2001
Selected ECSI Site Property Boundary

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

DO NOT QUOTE OR CITE. This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

DRAFT

Figure 1
Portland Harbor
Conceptual Site Model
Calbag Metals - Front Avenue
ECSI 2454

Chase Bag

CHASE BAG
CSM Site Summary

CHASE BAG

Oregon DEQ ECSI #: 2424

3720 NW Yeon Ave.
DEQ Site Mgr: No PM
Latitude: 45.5484°
Longitude: -122.7181°
Township/Range/Section: 1N/1E/20

River Mile: 9.2 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Chase Bag site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

The Chase Bag property is located 0.4 mile from the Willamette River. Most of the site is covered with impervious surfaces; therefore, minimal overland transport is expected to occur on this site.

1.2. Riverbank Erosion

The site is not located adjacent to the Willamette River.

1.3. Groundwater

DEQ (1999) identified potential discharge of contaminated groundwater to the Willamette River via leaking storm sewer lines as one of the most significant potential exposure pathways of concern. DEQ also indicated that underground utilities along the southern and western boundaries of the site could provide preferential groundwater flow.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

There are no overwater activities associated with this site. Information about stormwater runoff was not found during research for this site. Stormwater is routed to municipal storm sewers along NE 35th and NW Yeon Avenue that discharge to the Willamette River through City Outfalls 17 and 18. The west portion of the site discharges to City Outfall 18 and the east portion of the site discharges to City Outfall 17.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

Not applicable.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

A Preliminary Assessment was recommended by DEQ in 1999.

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☐	
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Not ranked

4. SITE OWNER HISTORY

Primary Sources: DEQ 1999, 2004

Owner/Occupant	Type of Operation	Years
Donald Wirfs and Associates (owner)	Unknown	1998 - present
Schnitzer Investment Company (owner)/ Union Camp Corporation (lessee)	Unknown	Early 90s - 1998
Schnitzer Investment Company (owner)/Chase Bag (aka Chase Packaging Corp., Union Camp Corp.) (lessee)	Bag manufacturing	1979 - 1994
Schnitzer Investment Company (owner)/ Ace Hardware (lessee)	Wholesale goods storage	1972 - 1975
Great Western Chemical Company	Office and warehouse, may have stored, packaged and redistributed chemicals too	1959 - 1970
Willard Storage Battery Company	Manufacture and/or distribution of batteries	1952 - 1958

5. PROPERTY DESCRIPTION

As shown in Figure 1, the 2.84-acre former Chase Bag property is located in the Guild Lakes area, approximately 0.4 mile south of the Willamette (RM 9.2). The currently inactive site is located in a heavy industrial and warehousing area. The closest residence is 0.28 mile to the southeast. A separate Schnitzer Investment Corp. parcel lies between the site and NW 35th Street, Terminal Transfer and a Burlington Northern railroad spur are located to the east, a Hill Investment Co. warehouse is located to the south, the Trumbull Asphalt site is located to the west, and Burlington Northern's Lake Yard rail yard is located to the north (DEQ 2004).

An 80,520-square-foot structure occupies most of the property. It is mostly paved. An underground storage tank fill pipe and vent pipe were observed by DEQ in the southeast corner of the site. An aboveground storage tank rack was also observed along edge of the site. Fencing surrounds most of the site, except along the southeast property line (DEQ 2004).

Municipal stormwater sewers along NE 35th Street and NW Yeon Avenue, near the Chase Bag property, discharge to the Willamette through City Outfalls 17 and 18. The west portion of the site discharges to City Outfall 18 and the east portion of the site discharges to City Outfall 17.

6. CURRENT SITE USE

The site is currently inactive.

7. SITE USE HISTORY

According to DEQ (1999), the structure on the property was built in 1948. Willard Storage Battery Company manufactured storage batteries at the site from approximately 1952-1958. Great Western Chemical Company manufactured and stored chemicals on the site from 1959 until 1970. Later, Ace Hardware stored wholesale hardware goods on the property from 1972 to 1975. Beginning in 1979, Chase Bag (subsequently known as Chase Packaging Company and Union Camp Corporation) began making multi-wall bags at the facility until 1994. Schnitzer Investment Corporation (SIC) bought the site in 1971 and sold it to Donald Wirfs & Associates in 1998.

Two leaking underground storage tanks were discovered simultaneously on two properties adjacent to the Chase Bag facility in 1989. One occurred at the Terminal Transfer site, located along the eastern site boundary of the site. The other was located at the Hill Investment property (also called the Nabisco facility) abutting the southern site boundary. When soil and groundwater concentrations from monitoring wells at the Nabisco site showed elevated concentrations of tetrachloroethylene (PCE) and its decomposition products, DEQ was first alerted to the possibility that the Chase Bag facility was potentially contributing to the contamination. The highest soil and groundwater concentrations were found in a monitoring well only 10 feet from the Chase Bag facility's southern property line. PCE detected at 35.5 mg/L suggested that free product DNAPL might have been present in groundwater. This monitoring well is located near a former underground storage tank on the Hill Investment site. Long-term water table measurements at the Hill Investment site indicate that groundwater flows generally to the southwest, in a direction suggestive that contamination could also be originating from the Chase Bag facility.

According to DEQ UST records, in May 1985, an inactive, 1,000-gallon UST was decommissioned by filling at the Chase Bag facility. Contents of the tank are unknown, but it was located in the southeast corner of the site. Also, in 1997, SIC removed 294 tons of lead-contaminated soil from the facility.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of the historic and current potential upland sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources at the site requiring additional discussion.

8.1. Uplands

Little is known about the historical operations on this site. Photographs taken in 1991 by an environmental contractor for the Terminal Transfer site showed evidence of poor housekeeping practices on the Chase Bag property. Several leaking drums were observed along the south and east sides of the site, as well as an apparent runoff pool of petroleum-like substance from leaking drums along the western property line.

A UST located in the southeast corner of the site was decommissioned (by filling) in 1985. DEQ's Hazardous Waste database indicates that SIC removed 294 tons of lead-contaminated soil from the site in December 1997. Information about the cleanup, extent of soil and groundwater

contamination, and exact location of the removal is unavailable.

8.2. Overwater Activities ☐ Yes ☒ No

8.3. Spills

No known or documented spills at the Chase Bag site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence.

9. PHYSICAL SITE SETTING

9.1. Geology

The site is located in the area of the former Guilds Lake. The lake was filled with sand and silts from nearby hills and the Willamette River in the early 1900s (DEQ 1999). Available files indicate that no geologic or hydrogeologic data have been collected at the site.

9.2. Hydrogeology

Available information indicates that no geologic or hydrogeologic data have been collected at the site. Based on information from adjacent sites, the shallow groundwater flow in this area is variable, resulting from the original Guilds Lake bed contours. Groundwater at the neighboring Hill Investments site, located to the south, has been encountered at 9.5 feet bgs. Groundwater monitoring at the Hill Investments site (ECSI #1076) indicates that groundwater at the southern edge of the Chase Bag site appears to flow in a southwesterly direction (onto the Hill Investments site), with a groundwater mound occurring east of the Chase Bag site (DEQ 1999).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☐ Yes ☒ No

Schnitzer conducted a hazardous waste removal action on the site in December 1997. Approximately 297 tons of lead-contaminated soil were removed and disposed of offsite. No further soil removals or investigations are known to have been conducted on this site.

10.1.2. Riverbank Samples ☐ Yes ☒ No

10.1.3. Summary

DEQ (2004) indicates that no surface or subsurface soil information is available from this site other than a file confirming a lead-contaminated soil removal action that took place in 1997. Other evidence, however, has led DEQ to believe that potential historical releases could have contributed to groundwater contamination encountered at the adjacent Hill Investment site (see Section 10.2).

10.2. Groundwater

10.2.1. Groundwater Investigations ☐ Yes ☒ No

No groundwater investigations are known to have been conducted at the site.

DEQ's site strategy recommendation suggests that the Chase Bag site could be a contributor to the subsurface contamination encountered at the adjacent Hill Investment site based on the groundwater data collected there (DEQ 1999). At the Hill Investment facility, PCE was detected at its highest concentration in shallow monitoring well MW-2, located approximately 10 feet south of the Chase Bag site. The shallow groundwater flow direction appears to be from the Chase Bag site onto the Hill Investment site. The concentration in MW-2, 35.5 mg/L, suggests that DNAPL potentially may be present. Farther to the south and southwest on the Hill Investment facility (possibly downgradient from the Chase Bag site), concentrations of PCE degradation products tended to predominate in the groundwater samples (DEQ 1999).

Deep groundwater investigations have not been conducted at the Chase Bag or Hill Investment sites.

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

The PCE concentration detected in a groundwater sample approximately 10 feet from the southern boundary of the Chase Bag site (the suspected downgradient groundwater flow direction) suggests that DNAPL potentially may be present beneath the Chase Bag site (DEQ 1999).

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☒ No

No groundwater investigations are known to have been conducted at the site. However, DEQ documents suggest that the Chase Bag site could be a contributor to the groundwater plume consisting of PCE and associated degradation products encountered beneath the Hill Investment site, located downgradient from the Chase Bag site (DEQ 1999).

Plume Characterization Status ☐ Complete ☒ Incomplete

Groundwater conditions at the Chase Bag site have not been assessed. Consequently, the existence of the PCE plume on the Chase Bag site has not been confirmed and the nature and extent of the plume have not been evaluated, except on the Hill Investment site.

Plume Extent

The nature and extent of the plume consisting of PCE and associated degradation products have not been evaluated on the Chase Bag site. Plume characterization has been limited to the Hill Investment site, which is located downgradient of the Chase Bag site.

Min/Max Detections (Current situation)

N/A. Groundwater data have not been collected at the Chase Bag site. The maximum concentration of PCE detected on the Hill Investment site was 35 mg/L.

Current Plume Data

N/A. Groundwater data have not been collected at the Chase Bag site.

Preferential Pathways

Underground utilities along the southern and western boundaries of the site could provide preferential groundwater flow (DEQ 1999).

Downgradient Plume Monitoring Points (min/max detections)

N/A. Groundwater data have not been collected at the Chase Bag site.

Visual Seep Sample Data ☐ Yes ☒ No

This site is not adjacent to the river, so seeps along the river cannot be directly related to the Chase Bag site.

Nearshore Porewater Data

N/A

Groundwater Plume Temporal Trend

No groundwater investigations have been conducted at the site.

10.2.4. Summary

Although no groundwater investigations have been conducted at the site, data from the adjacent Hill Investment site indicate the Chase Bag site could be a contributor to the groundwater contamination encountered at that site. Groundwater monitoring at the Hill Investments site indicates that groundwater appears to flow from the Chase Bag site in a southwesterly direction onto the Hill Investments site. At the Hill Investment facility, PCE was detected at its highest concentration in a monitoring well located approximately 10 feet south (potentially downgradient) of the Chase Bag site (DEQ 1999).

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☐ Yes ☒ No

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Information about surface water runoff was not found during research for this site. Stormwater is likely routed to municipal stormwater sewers along NE 35th Street and NW Yeon Avenue that discharge to the Willamette River through City Outfalls 17 and 18. The west portion of the site discharges to City Outfall 18 and the east portion of the site discharges to City Outfall 17.

10.4. Sediment

10.4.1. River Sediment Data ☐ Yes ☒ No

10.4.2. Summary

The Chase Bag site is not located adjacent to the river.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Approximately 294 tons of lead-contaminated soil was removed from the site in 1997. It was transported to Chemical Waste Management's Arlington, OR, facility for treatment and disposal.

11.2. Groundwater Cleanup/Source Control

None

11.3. Other

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

References cited:

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DEQ. 2004. DEQ Site Summary Report – Details for Site ID 2424. DEQ Environmental Cleanup Site (ECSI) Database. Accessed March 9, 2004. www.deq.state.or.us/wmc/ecsi/ecsidetail.asp?seqnbr=2424.

Integral, Windward, Kennedy/Jenks, Anchor Environmental, and Groundwater Solutions. 2004. Portland Harbor RI/FS Programmatic Work Plan. Prepared for the Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.

Other relevant references/information sources:

EDR. 2002. EDR Environmental Atlas, Portland Harbor, Multnomah. OR. Environmental Data Resources, Southport, CT.

GSI. 2003. Portland Harbor RI/FS: Upland Groundwater Data Review Report, River Mile 2-11, Lower Willamette River. Prepared for the Lower Willamette Group, Portland, OR. Groundwater Solutions, Inc., Portland, OR.

Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

FIGURES

Figure 1. Site Features

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integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 05/19/2004
Areal Photo Date: July & Oct. 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information

0 100 200 400
Feet

City Outfalls
Outfalls
Creek_Outfalls
Seep Photo Location (Not location of actual Seep)
River Miles
-35ft. Contour (NAVD 88)
dock-structures-2001
Selected ECSI Site Property Boundary

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

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DRAFT

Figure 1
Portland Harbor
Conceptual Site Model
Chase Bag (Schnitzer Investment)
ECSI 2424

TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Chase Bag #2424

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Storm Sewer Sediment	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
Location of former 1,000-gallon storage tank	✓	✓	?			?	?	?	?	?	?	?				✓						?			
Location of excavated lead-contaminated soils	✓	✓	?													✓						?			
Leaking drums along south and east sides of facility	✓	✓	?			?	?	?	?	?	?	?										?			
Location of observed pool of petroleum substance	✓	✓	?			?	?	?	?	?	?	?										?			
Possible DNAPL groundwater plume	✓	✓	✓							?	✓											✓			
Overwater Areas																									
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychlorinated biphenols

Columbia American Plating Company

Consolidated Metco – Rivergate (Conmet) Facility

CONSOLIDATED METCO, INC
CSM Site Summary

CONSOLIDATED METCO-RIVERGATE (CONMET) FACILITY

Oregon DEQ ECSI #: 3295

13940 North Rivergate Blvd.
DEQ Site Mgr: Alicia Voss
Latitude: 45.6229°
Longitude: -122.7766°
Township/Range/Section: 2N/1W/26

River Mile: 2.5 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Consolidated Metco-Rivergate Facility (ConMet) site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

The ConMet facility lies downstream of the Portland Harbor Superfund site and 0.25 miles upland from the river. There is expected to be little overland transport of contaminants via soil erosion since approximately 80 percent of the site is paved and impacted soils from releases (see below) have been excavated and transported offsite for disposal (Hillsboro Landfill). However, spills or releases can be transported to the site's stormwater collection system and then potentially discharged to the river.

1.2. Riverbank Erosion

This site is not on the waterfront.

1.3. Groundwater

The limited groundwater data available indicate the presence of diesel-range and oil-range hydrocarbons and PAHs in the groundwater at the ConMet site (DEQ 2003). As described in the following section, the stormwater conveyance system acted as a preferential pathway for shallow groundwater containing petroleum-based cutting fluid to reach the river following the February 2001 release (DEQ 2003).

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

There is one City of Portland outfall associated with the site's stormwater collection system, which is described in Section 9.3. Three releases to the stormwater system have been reported, with two of these reaching the river. There are no analytical results reported for this active outfall.

Two release incidents are reported in DEQ's spill database. In May 2000, ConMet reported the release of 200 gallons of petroleum-based reclaimed cutting fluid when a forklift accidentally dropped a tank containing the fluid. This material flowed over the asphalt paving to a nearby stormwater catch basin. Approximately 70 gallons were unrecoverable although no discharge to

the river was documented (DEQ 2003). The second release occurred in February 2001 due to a split pipe connection where galvanized piping connects to the polyvinyl chloride (PVC) pipeline that runs between the reclamation building and the machine shop (Supplemental Figure 3 from DEQ 2003). Released cutting fluids infiltrated fill materials, and DEQ (2003) noted that once the perched aquifer zone became saturated, the contaminated groundwater leaked up through a crack in the asphalt paving surrounding a cover frame to a nearby stormwater catch basin. Approximately 80 gallons were unrecoverable from the catch basin and were transported to the river via porous gravelly substrate surrounding the stormwater collection system. The contaminated water may also have been released through cracks between sections of the stormwater piping into the gravel pipe bedding (DEQ 2003).

The third release occurred in August 2003 when a fire caused a release of oil/water to the site catch basin. It was reported that the catch basin and riverbank area would be cleaned, and that groundwater flushed the storm sewer.

Stormwater drains through four catch basins on the site that discharge to the City of Portland conveyance system to the Willamette River. The catch basins may contain contaminants that could be discharged to the river using the City of Portland conveyance system as a preferential pathway.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

Not applicable.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

DEQ recommended the completion of an XPA in February 2001.

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☐	
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Not ranked

4. SITE OWNER HISTORY

Primary Sources: DEQ 2003, 2004

Owner/Occupant	Type of Operation	Years
Consolidated Metco, Inc. (aka Metco, Inc.)	Metals casting foundry and machining operation	1983 - present
Unknown	Vacant	1964 - 1982

5. PROPERTY DESCRIPTION

The ConMet facility is located 0.25 miles upland from the Willamette River (RM 2.5). The facility's 19.9-acre property is zoned for industrial and commercial uses and is encircled by other industrial businesses such as Ash Grove Cement to the west, Union Oil Company to the north, and Fort James Corporation to the south (Figure 1).

Review of aerial photographs indicates that fill was being placed onsite to create uplands as recently as the early 1980s. Approximately 80 percent of the facility is covered either by steel or concrete pads, or with asphalt (DEQ 2003). The permanent structures that are currently being used to support metal casting foundry operations include the following:

- Administrative office
- Foundry shop
- Reclamation building
- Machine shop
- Warehouses
- Casting plant.

The location of these structures is shown in Supplemental Figure 3 from DEQ (2003). This figure also identifies the layout of the stormwater drainage system for the site including the location of catch basins either with or without filtering devices.

6. CURRENT SITE USE

The ConMet facility is a metal casting foundry (aluminum casing, structural plastics, small engine components) as well as machine manufacturing (transportation industrial components). Operations at the site also include a reclamation process for removing aluminum shavings from the cutting fluid used to manufacture aluminum castings (DEQ 2003, 2004).

7. SITE USE HISTORY

Throughout the history of the facility, it has operated as a metal casting foundry.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

As mentioned in Section 1, a release of reclaimed cutting fluid occurred in February 2001. The release was caused by a split in a pipe connection where galvanized piping connects to the polyvinyl chloride (PVC) pipeline that runs between the reclamation building and the machine shop [see Supplemental Figure 3 from DEQ (2003)]. The pipe connection occurs at a depth of

approximately 2 feet bgs (Kennedy/Jenks 2004). The incident investigation notes that released cutting fluids infiltrated fill materials. Once the perched aquifer zone became saturated, the contaminated groundwater leaked up through a crack in the asphalt paving surrounding a cover frame to a nearby stormwater catch basin. Approximately 80 gallons were unrecoverable and were transported to the river via porous gravelly substrate surrounding the stormwater collection system. The contaminated water may also have been released through cracks between sections of the stormwater piping into the gravel pipe bedding (DEQ 2003).

Results also indicated that the released fluid infiltrated fill materials surrounding the recirculation pipes. The contaminated fill material was excavated (15.5 tons) by ConMet's contractor and transported offsite for disposal [see Supplemental Figure 1 from Kennedy/Jenks (2004)]. This investigation also addressed a smaller release of cutting fluid (200 gallons) to asphalt in May 2000 (see Section 9).

Fill material (not related to the February 2001 release) is also expected to be a potential source of PAH constituents since analytical results from two boring cores [B-8 and B-9; Supplemental Figure 1 from Kennedy/Jenks (2004)] collected for investigating the environmental impacts associated with site's 2001 release incident detected benzo(a)pyrene concentration above its RBC of 0.27 mg/kg (Kennedy/Jenks 2004).

8.2. Overwater Activities

☐ Yes ☒ No

This site does not have overwater activities.

8.3. Spills

Known or documented spills at the ConMet site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003, by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
May 2000	Reclaimed cutting fluid	Approx. 200	Asphalt w/residues washed out via sewer	65% recovered
February 2001	Reclaimed cutting fluid	Approx. 3,000	Subgrade gravel & fill materials w/residues washed out via sewer	75% recovered
August 2003	Oil water mixture	?	Surface spill that reached the storm sewer catch basins	Yes – catch basin and edge of river

As described in Sections 1 and 8.1, the February 2001 spill and the August 2003 resulted in discharge to the Willamette River. ConMet was notified of the February 2001 release after the Portland Fire Department traced an approximately 50- by 20-foot milky white sheen on the river back to City of Portland Outfall 53A. The origin of release was then traced back to a stormwater catch basin located in the northeast corner of the ConMet site (DEQ 2003). ConMet reported the August 2003 spill to the city and reported a catch basin and riverbank cleanup were being conducted at that time.

9. PHYSICAL SITE SETTING

One subsurface investigation has been completed at the ConMet site as a result of the two incidental releases of reclaimed cutting fluids. The investigation installed nine temporary borings and collected five grab groundwater samples. The following information on the geology and hydrogeology at the site is summarized from DEQ's Strategy Recommendation (DEQ 2003).

9.1. Geology

Subsurface material at the site consists of well-drained sandy alluvium or sandy dredge spoils, overlaying fine- to medium-grained sands to depths of approximately 5 to 10 feet bgs. Underlying these overburden deposits and fill material are dark grey to orange silty clays (DEQ 2003).

9.2. Hydrogeology

Site borings indicate that the shallow groundwater system contains relatively thin, locally elevated perched aquifers (samples collected as shallow as 1 foot bgs) with the water table generally found between 6 and 20 feet bgs (DEQ 2003). Groundwater flow has not been evaluated.

10. NATURE AND EXTENT

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section based on subsurface investigation reports prepared for the site (Kennedy/Jenks 2004, DEQ 2003). When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

Kennedy/Jenks Consultants completed the installation of nine soil borings (using a hydraulic-push probe) to define the extent of subsurface soil contamination resulting from the February 2001 spill. Borings B-1 through B-3 and B-7 through B-9 extended to 8 ft bgs, B-4 and B-5 extended to 16 ft bgs, and B-6 extended to 20 ft bgs. Soils were subsampled from each boring and one hand-dug location. Samples were analyzed for PAH compounds, diesel-range TPH, and oil-range TPH. Areas of subsurface soil contamination are generally present within the location of the February 2001 incidental release of reclaimed cutting fluids. However, identification of the nature and extent of subsurface soils contamination is limited to light-weight oil constituents. Metals or other chemicals were not analyzed. The subsurface soil investigation reported TPH and PAH maximum concentrations as follows:

TPH	10,600 mg/kg
Benzo(a)pyrene	0.910 mg/kg

The detected PAH compound, benzo(a)pyrene, occurred in a sample collected adjacent to the incidental release site (DEQ 2003). This compound is not a constituent of cutting fluid, suggesting that the source may be related to contaminants in the fill material placed at the site in the 1960s (Kennedy/Jenks 2004).

10.1.2. Riverbank Samples ☐ Yes ☒ No

This site is not located on the waterfront.

10.1.3. Summary

Soils impacted by the February 2001 release of spent cutting fluids were excavated and transported offsite for disposal. The subsurface soils with elevated PAH constituents have not been fully evaluated for nature and extent.

10.2. Groundwater

10.2.1. Groundwater Investigations ☒ Yes ☐ No

One groundwater investigation, limited to the evaluation of the extent of subsurface contamination resulting from the February 2001 cutting fluids spill, has been conducted at the site. Groundwater samples were collected from five borings and one hand-dug location. All six groundwater samples were analyzed for diesel-range TPH and oil-range TPH. Additionally, four of the groundwater samples were analyzed for PAH compounds (DEQ 2003).

No groundwater data are available regarding other areas of the site.

10.2.2. NAPL (Historic & Current) ☒ Yes ☐ No

According to DEQ (2003), detected concentrations of diesel-range and heavy-oil-range hydrocarbons (40,700 µg/L and 17,400 µg/L, respectively) in the groundwater indicate that free product was present at the time of sampling (solubility of diesel and oil ~ 3,000 µg/L). However, emulsifying agents likely were present in the released cutting fluids, potentially altering the solubility of the hydrocarbons (DEQ 2003). *(Note: available documents were inconsistent regarding the units used in presentation of the TPH values and these TPH values may be mg/L).*

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

A dissolved groundwater plume is present in the shallow aquifer beneath the site. Diesel-range TPH and oil-range TPH were detected in all six groundwater samples, with concentrations ranging from 0.580 µg/L to 40,700 µg/L (*see note above*). Five PAH compounds (acenapthene, fluoranthene, fluorene, phenanthrene, and pyrene) were detected in two of the four groundwater samples analyzed (DEQ 2003).

Plume Characterization Status ☐ Complete ☒ Incomplete

Based on the data reviewed by GSI, the dissolved plume characterization is incomplete.

Plume Extent

Groundwater data available for the site are limited to the evaluation of the February 2001 cutting fluid spill. The results of this sampling indicate that the groundwater contained diesel-range and oil-range hydrocarbons to the west and south of the location of the February 2001 release. PAHs also were detected in two samples collected west of the release site (DEQ 2003). Based on the data reviewed by GSI, the nature and extent of the groundwater plume cannot be fully evaluated.

Min/Max Detections (Current Situation)

The following table summarizes detected chemical concentrations in the groundwater samples from the site (DEQ 2003).

Analyte	Minimum Concentration	Maximum Concentration
Total Petroleum Hydrocarbons (µg/L)*		
Diesel-range TPH	0.580	40,700
Oil-range TPH	0.870	17,400
Polycyclic Aromatic Hydrocarbons (PAHs)(ug/L)*		
Acenapthene	2.17	27.6
Fluoranthene	0.315	0.578
Fluorene	0.201	<5
Phenanthrene	1.40	8.06
Pyrene	<0.2	0.706

**Available documents were inconsistent regarding the units used in presentation of the TPH values, and these TPH values may be mg/L.*

Current Plume Data

Based on the data reviewed by GSI, the estimated extent of the petroleum plume in the shallow aquifer is shown in Figure 2.

Preferential Pathways

Stormwater drains through four catch basins on the site that discharge through an outfall to the Willamette River. As described in previous sections, the stormwater conveyance system has acted as a preferential pathway in the past [see Supplemental Figure 3 from DEQ (2003)].

No additional information is available regarding the relationship of shallow groundwater and this or other preferential pathways (i.e., utilities) to the river.

Downgradient Plume Monitoring Points

Groundwater flow direction at the ConMet site has not been evaluated; therefore, the downgradient direction at the site is not known.

Visual Seep Sample Data

☐ Yes ☒ No

The site is not adjacent to the river, and no seeps are anticipated to be associated with this site.

Nearshore Porewater Data

No nearshore porewater data are available.

Groundwater Plume Temporal Trend

A groundwater plume temporal trend has not been assessed because of a lack of temporal data for the site.

10.2.4. Summary

A groundwater investigation limited to evaluating the extent of subsurface contamination resulting from the February 2001 cutting fluids spill indicates the presence of diesel-range and oil-range hydrocarbons and PAHs in the groundwater near this release (DEQ 2003). Based on the data reviewed by GSI, the nature and extent of the release is not defined. Additionally, the stormwater conveyance system acted as a preferential pathway for the reclaimed cutting fluid to reach the river after the February 2001 release (DEQ 2003).

No groundwater data are available regarding other areas of the site.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

The site's stormwater runoff discharges through four catch basins before being transported to the City of Portland system, which eventually discharges to the river at Outfall #53A [see Supplemental Figure 3 from DEQ (2003)]. The four connections drain four different basins, one of which (Drainage Basin 2) is non-industrial. Two of the four connections (Drainage Basins 1 and 4) are considered "representative" of site activities and are therefore monitored under a GEN12Z permit. The drainage basins are as follows:

Drainage Basin 1: This basin incorporates a storage area for aluminum borings and chips, which are stored in large metal containers. Machine oil is also stored in this location. Stormwater from this area may contain oil, grease and metals.

Drainage Basin 2: This basin is non-industrial, including the employee parking lot and main office building.

Drainage Basin 3: Waste oil and coolants (water soluble) and hydraulic oil are transferred at this location. Stormwater from this area may contain oil, grease and metals.

Drainage Basin 4: This basin includes outdoor waste storage (i.e., trash) and the shipping and receiving dock. Stormwater from this area may contain oil, grease, color and foam, TOC, COD, and TSS.

In Drainage Basin 1, stormwater samples are collected from a manhole at the northwest corner of the foundry building. I Drainage Basin 4, stormwater samples are collected from a manhole located at the junction of the south entrance access road and the north/south trending access road at the center of the facility.

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN12Z	100514	10/27/97	Connects to City of Portland Outfall 53A	Standard[1]/Twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

A GEN12H permit was issued on July 29, 1992 and expired in 1996.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

No data exist for solids contained in catch basins although the potential for contaminant release via these structures may be a concern.

10.3.5. Wastewater Permit ☐ Yes ☒ No

Not applicable.

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

There is potential for industrial materials to be released into the river because the stormwater conveyance system has acted as a preferential pathway in the past [see Supplemental Figure 3 from DEQ (2003)].

10.4. Sediment

10.4.1. River Sediment Data ☐ Yes ☒ No

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

In May 2000, approximately 200 gallons of Trimsol VHP E210 were released onto a paved surface. Although response appears to have been timely, there are references to flushing and pumping of the stormwater system and manhole but no mention of precautions taken to prevent the released material and/or wash water from continuing down the stormwater system and discharging to the river. Spill reports indicate that approximately 70 or 80 gallons were unrecoverable (DEQ 2003).

The February 2001 cleanup response related to the release of cutting fluid included:

- Vacuuming 3,000 gallons of the released material from a catch basin (directly 20 feet west of the leaking pipe),
- Vacuuming an additional 1,500 gallons from the reclamation plant, and
- The disposal of approximately 15.5 tons of excavated contaminated soils offsite.

Although the response effort in the immediate vicinity of release was timely, there is no report of precautions taken to prevent wash water from flowing into the stormwater system (DEQ 2003).

The August 2003 cleanup response related to the release of oil/water mixture following a fire included cleaning out the catch basins and cleaning the river bank.

11.2. Groundwater Cleanup/Source Control

No groundwater cleanup or source control measures have been conducted at the site.

11.3. Other

Not applicable.

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

References cited:

DEQ. 2003. DEQ Strategy Recommendation – ConMet. May 21, 2003. Site Assessment Program, Oregon Department of Environmental Quality, Portland, OR.

DEQ. 2004. DEQ Site Summary Report – Details for Site ID 3295. DEQ Environmental Cleanup Site (ECSI) Database. Accessed May 11, 2004. www.deq.state.or.us/wmc/ecsi/ecsidetail.asp?seqnbr=3295.

Integral, Windward, Kennedy/Jenks, Anchor Environmental, and Groundwater Solutions. 2004. Portland Harbor RI/FS Programmatic Work Plan. Prepared for the Lower Willamette Group, Portland, OR. Integral Consulting, Inc., Mercer Island, WA.

Kennedy/Jenks. 2004. Consolidated Metco, Inc. – Response to Strategy Recommendations. Letter response. Kennedy/Jenks Consultants, Portland, OR.

Other relevant references/information sources:

EDR. 2002. EDR Environmental Atlas, Portland Harbor, Multnomah. OR. Environmental Data Resources, Southport, CT.

Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources

Supplemental Scanned Figures:

Figure 3. On-Site Stormwater Map (DEQ 2003)
Figure 1. Site Plan Showing Impacted Area (Kennedy/Jenks 2004)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Consolidated Metco
ECSI 3295

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 175 350 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_ConsolMetco_SummaryMap_70604.mxd

LEGEND

Site Boundary

Maximum Detection Location

Contaminant Type

Petroleum related

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Consolidated Metco, Inc.
Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Consolidated Metco, Inc. #3295

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs																	Potential Complete Pathway				
						TPH				VOCs																	
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Lighter - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																											
Reclamation	✓	✓	✓	✓	?		✓		✓					✓										✓		✓	
Soils impacted by March 2001 release of cutting fluid		✓	?											✓										?			
Foundary																											
Fill material																											
Overwater Areas																											
Other Areas/Other Issues																											
Catch Basins				✓			✓		✓																	✓	
Stormwater discharge																											

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychorinated biphenols

SUPPLEMENTAL FIGURES

Figure 3. On-site Sormwater Map (DEQ 2003)
Figure 1. Site Plan Showing Impacted Area (Kennedy/Jenks Consultants 2004)

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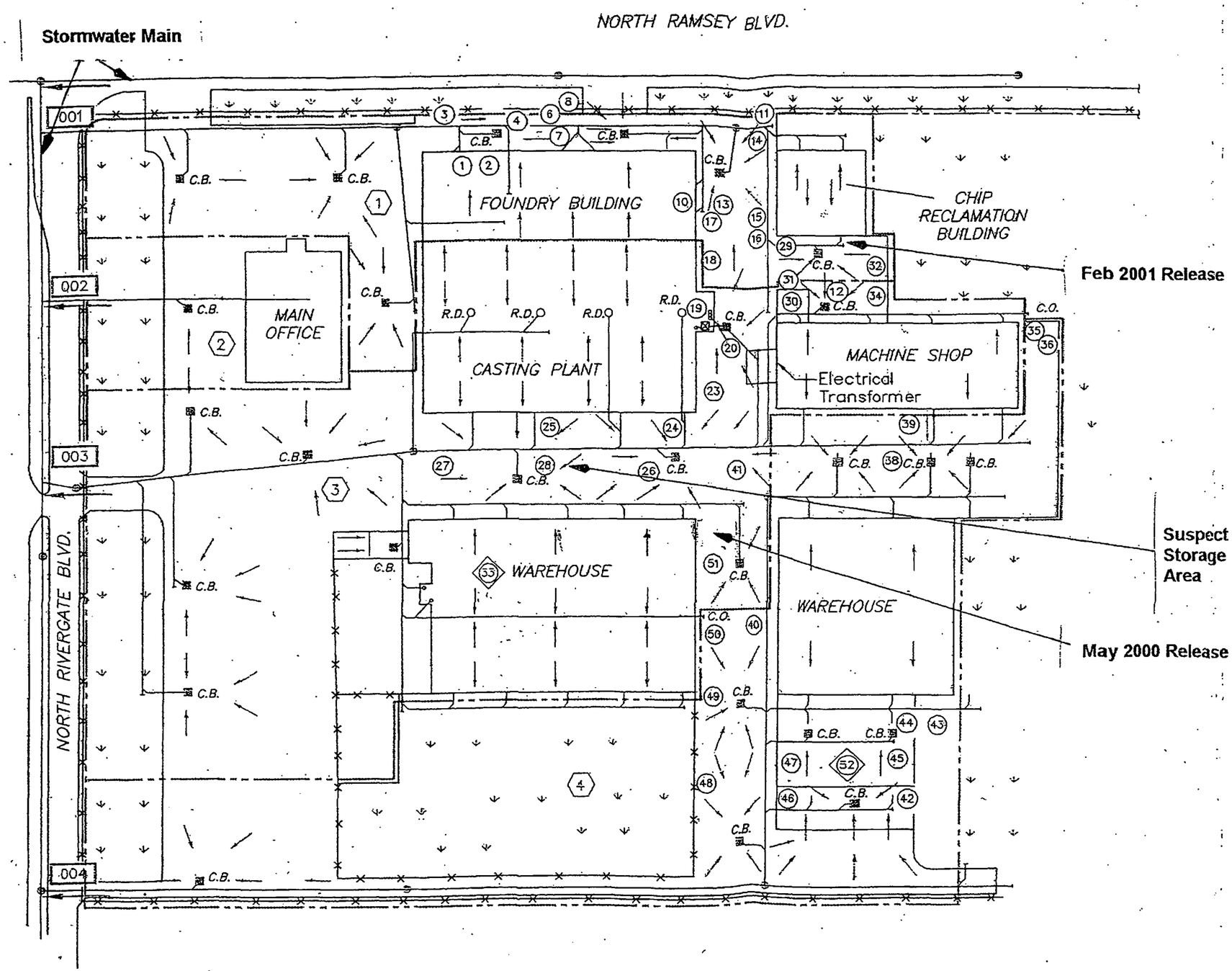


- LEGEND

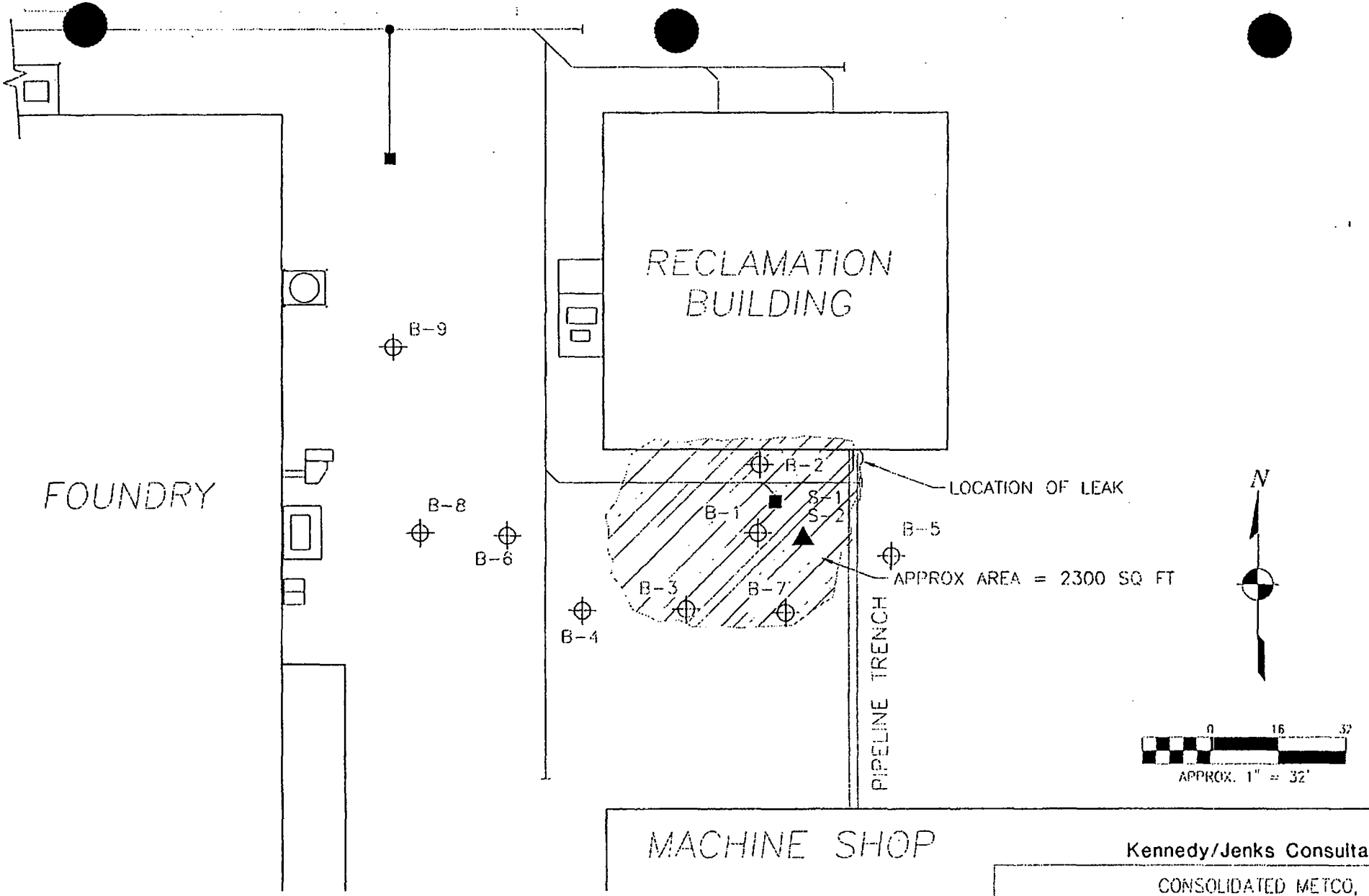
- Outfall
- 001 Outfall Number
- Underground Storm Sewer
- Catch Basin
- Catch Basin with Filter
- Roof Drain
- Manhole
- Drainage Area Boundary
- (3) Drainage Basin Identification
- Direction of Drainage
- Grass and /or Shrubs
- (22) Areas of Significant Materials or Industrial Activity
- Fence
- (23) Potential Spill Areas
- Property Line

0 100
Scale in Feet

Figure 3
On-Site Stormwater Map

CONSOLIDATED METCO, INC.
RIVERGATE FACILITY

2529FIG2 5-22-95 TD



LEGEND:

B-9 BORING LOCATION (21, 27, FEBRUARY 2001)

S-2 HAND DUG EXPLORATION SAMPLE LOCATION (2, FEBRUARY 2001)

CATCH BASIN

Kennedy/Jenks Consultants

CONSOLIDATED METCO, INC.
RIVERGATE FACILITY
PORTLAND, OREGON

SITE PLAN SHOWING IMPACTED AREA

K/J 016024.00/P1SK001

FIGURE 1

Crawford Street Corporation

CRAWFORD STREET CORPORATION
CSM Site Summary

CRAWFORD STREET CORPORATION

Oregon DEQ ECSI #: 2363

8424 N Crawford St.
DEQ Site Mgr: Tom Gainer
Latitude: 45.5855°
Longitude: -122.7564°
Township/Range/Section: 1N/1W/12

River Mile: 6.5 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Crawford Street Corporation (CSC) site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

The occurrence of overland transport in the southern portion of the site is evidenced by erosional gullies present on the riverbank, including in areas of the former black sand fill material that is an identified historical contaminant source.

1.2. Riverbank Erosion

The black sand fill material historically placed along the top of the riverbank was apparently transported to the beach fronting the property and into the Willamette River by riverbank erosion (DEQ 2004). Other site sources that may include complete contaminant migration to the river via bank erosion include the metal debris pile present on the beach and the abandoned outfall pipes along the riverbank.

1.3. Groundwater

Contaminants of interest were not detected in representative groundwater samples collected from three monitoring wells located near the Willamette River (Bridgewater 2002b). For this site, groundwater does not appear to be a migration pathway for contaminants to the Willamette River (DEQ 2004) (see Section 10.2).

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

The CSC site includes no current dock structures or functioning private outfalls. Stormwater systems present on the northern portion of the site drain to municipal stormwater sewers or to a recently installed sand filter/retention box located south of a central operations yard near the Union Pacific Railroad (UPRR) railroad right-of-way. Historically, drainage from the operations yard discharged directly to the ground surface near the right-of-way. Limited sampling has been conducted onsite to determine the extent of possible site contributions to runoff in the northern portion of the property.

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Stormwater on the southern portion of the site infiltrates the unpaved ground surface or drains to the shoreline through localized erosional gullies. Dock structures were historically present at the site, though details of overwater activities are unknown. Several abandoned pipes were located along the shoreline, the purposes of which are unknown. These pipes were not observed carrying flow or discharge and are likely related to historical usage (Bridgewater 2001, pers. comm.). Stormwater from the former black sand deposits along the riverbank and shoreline, a metal debris pile on the beach, and abandoned outfalls along the shoreline may serve as a transport pathway for contaminants associated with these potential sources (see Section 10.3).

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Crawford Street property is located along the east bank of the lower Willamette at approximately RM 6.3 and within the narrow river reach (RM 5-7) that is characterized as a transport/non-depositional zone in the Programmatic Work Plan (Integral et al. 2004). There is a relatively gently sloping, shallow-water bench that extends outward from the uplands to the 0 NAVD88 contour. From there, the bottom slopes more steeply to channel depth. The Sediment Trend Analysis® indicates that dynamic equilibrium transport paths dominate in this portion of the river. The time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) indicate that a swath between the – 0 and –20 foot NAVD88 contours is dominated by sediment scour up to 1+ foot in extent. Below the –20 foot NAVD88 contour and out across the channel, the riverbed is a mosaic of small-scale erosion and no change areas. Very little sediment accretion is evident in this segment of the river. No bathymetric change data are available for nearshore areas above the 0 contour due to limited survey vessel.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☒	XPA performed by Bridgewater (2000/2002b)
RI	☐	
FS	☐	
Interim Action/Source Control	☒	Black sand removal action (Bridgewater 2002a)
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 1

4. SITE OWNER HISTORY

Sources: Multnomah County Taxation records, Polk City of Portland directories, Sanborn fire insurance maps, USACE Port Series reports, Bridgewater 2000, CFMW 1999, pers. comm., SE/E 1988.

Owner/Occupant	Type of Operation	Years
Crawford Street Corporation - **owner***		Portions from 1971-; 1988-present
Lampros Steel - **operator**	Structural steel recycling and distribution	1989 - present
TLS Steel Products, Inc. - **operator**	Small forging and fabricated steel business	1989 - ~1999
Manufacturing Management Incorporated - **owner**	Unknown	1988
Asset Recovery	Unknown	~1987?
St. Johns Forge & Iron - **operator**	Unknown	~1986/1987
Silco Construction Co. - **operator**	Unknown	~1986/1987
Columbia Forge and Machine Works, Inc. - **operator**	Metal forging and stamping products	1971- present
City of Portland, Portland Development Commission - **owner**	Unknown	1970s - 1988
Peninsula Pattern Works - **operator**	Unknown	~1960 - ?
Plylock Corp. (formerly Portland Manufacturing Co.) - **operator**	Wood manufacturing	1950s
Union Pacific Railroad Co. - **operator**	Unknown	~1950 - ?
Portland Chain Manufacturing - **operator**	Chain manufacturing and warehouse	~1944 - ?
St. Johns Dock – **owner/operator**	Machine shop	1935 - ?
Portland Spruce Mills - **operator**	Lumber transfer	1932 - ?
Portland Woolen Mills - **operator**	Wool grading and baling warehouse	1932 - ~1948
Skookum Logging Supply Co. – **owner/operator**	Logging machinery manufacturing, foundries and forges	1924 - 1971
St. Johns Planing Mill - **operator**	Lumber and saw mill	~1920 - ?
St. Johns Fuel Co. - **operator**	Unknown	~1920 - ~1950s
Pacific Stove & Range Manufacturing Co. - **operator**	Stove and range manufacturing	1911 - ?
Central Lumber Co. - **operator**	Lumber – logway, saw mill, boilers	1905 - ?
Cone Brothers - **operator**	Unknown – wharf and smokestack	1905 - ?
Portland Lumber Mill (Div. of Portland Manufacturing Co.)/Portland Lumber Mills (Div. of Brand-S Corp.) - **operator**	Veneer manufacturing	1905 - ? facility demolished in 1970s
Portland Steel Ship Building Co. - **operator**	Specifics unknown	1905 - at least 1925
St. Johns Lumber Company - **operator**	Lumber – sorting, transfer, planing mill, saw mill, kiln	1905 - ?
St. Johns Machine Shop - **operator**	Machine shop	1905 - ?

*Site records indicate Schnitzer Investment Corp and/or Schnitzer Steel Industries was an owner in 2001-2002; no specific ownership information is available (DEQ 2001, pers. comm.; 2002, pers. comm.; EPA 2001). Other potential owners and operators are listed without years of operation in Section 7.

5. PROPERTY DESCRIPTION

The Crawford Street Corporation (CSC) site is located on approximately 15 acres of land in an industrial area of the St. John's district of northern Portland (Bridgewater 2000, 2002a; DEQ 1999). The site includes the current addresses of 8424 and 8524 North Crawford Street. It is bordered by North Crawford Street to the north, North Burlington Avenue to the west, North Richmond Street to the east, and the Willamette River to the south (CFMW 1999, pers. comm.; Bridgewater 2002a). A heavy equipment/truck repair company is located across Crawford Street to the north of the site (CFMW 1999, pers. comm.). A residence, auto repair shop, and vacant property are located to the east of the site across North Richmond Street (Bridgewater 2000). The City of Portland Bureau of Environmental Services (BES) laboratory (ECSI #2452) is located across North Burlington Avenue, southwest of the site, and the western parcel of the Willamette Cove site (ECSI #2066) is located across North Richmond Street to the east (Figure 1).

The CSC property is bisected by a UPRR right-of-way (CFMW 1999, pers. comm.; DEQ 1999). Except for the building footprints, the site is entirely fenced (CFMW 1999, pers. comm.). Portions of the property, including the northeastern vacant parcel, portions of the CFMW facility, and the entire southern half of the property (south of the railroad spur), are unpaved (Bridgewater 2000).

The site is located above the 100-year floodplain, at approximately 40 feet above sea level. The 1996 record flood on the Willamette River did not exceed the top of the bank along the property. The surface is relatively flat except for the riverbank, although the general vicinity north of the site slopes down steeply toward the site. The riverbank is vegetated with small trees and blackberries, and is largely covered with logs and large pieces of debris. Several 8- to 10-inch pipes have been observed protruding from the riverbank; no flow or evidence of flow was observed. The pipes are likely associated with historical site usage (Bridgewater 2000; 2001, pers. comm.).

Storm drain lines at the site are located along North Crawford Street, and along the UPRR spur [see Supplemental Figure 2-1 of Bridgewater (2000)]. Roof drains from site buildings drain directly to the storm drain line buried along the railroad tracks. Most of the runoff from the site flows to two catch basins located north of the intersection of the UPRR tracks and North Burlington Street. These catch basins also collect runoff from a large area north of the CSC site. During heavy rainfall, stormwater from upgradient sites (to the north) flows onto the CSC site. During extended rainfall periods, water ponds along the northern edge of the UPRR tracks, consisting of runoff from both the CSC and upgradient properties. This runoff may eventually enter the City of Portland (COP) catch basin on North Burlington Street, which discharges to the Willamette River through Outfall 52 west of the site. Prior to 1997, the discharge entered the river at Outfall 50. Runoff in the southern half of the site appears to infiltrate the bare ground; however, several small erosional draws were observed along the top of the riverbank that appear to drain localized areas through overland flow [see Supplemental Figure 1 from Bridgewater (2001, pers. comm.); Bridgewater 2000].

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Department of State Lands files.

6. CURRENT SITE USE

Two companies operate at the site: Columbia Forge and Machine Works, Inc. (CFMW), and Lampros Steel, Inc. (Lampros) [see Supplemental Figure 2-1 of Bridgewater (2000)].

CFMW

CFMW has operated at the site since 1971, producing metal forging and stamping products (DEQ 1999). Their facility includes three buildings (approximately 27,000 square feet [sq. ft]) and two yards (approximately 30,0000 sq. ft; CFMW 1999, pers. comm.; DEQ 1999). According to CFMW (1999, pers. comm.), stated uses of the facility buildings include:

- Building 1: Manufacturing
- Building 2: Manufacturing and tool storage
- Building 3: Shipping, manufacturing, and warehousing
- Oil Storage Hut: Drum storage.

Additional site features are shown in Supplemental Figure 2-4 from Bridgewater (2000).

Building 1 was constructed in the mid-1950s, and the oil storage hut was constructed in 1972. Equipment used at the CFMW facility includes forges, lathes, and machining equipment (Building 1), steel cutting equipment, an air compressor, two parts washers (Building 2/3), upsetter forges, induction heaters, a drop forge, and welding equipment (operations yard). All forging and general operation areas at the CFMW facility are covered, although areas surrounding the forge pads in Building 1 consist of bare ground [see Supplemental Figure 2-4 from Bridgewater (2000)]. Small quantities of oil, lubricants, and aerosol cans of brake cleaner were observed stored in Building 2/3 (Bridgewater 2000).

Steel pieces are manufactured in the Central Yard (operations yard), and raw steel is stored in the other yard (CFMW 1999, pers. comm.). Several ASTs onsite store only compressed gases (oxygen, acetylene, propane). Oil, lubricants, degreasers, and non-halogenated petroleum solvent (naphtha) are used in CFMW operations, and are sent offsite for recycling and/or disposal (DEQ 1999). Chlorinated solvents have never been used at the CFMW facility. Used oil has been recycled offsite since at least the mid-1980s. CFMW also receives used oil from Lampros Steel for disposal through their licensed contractor (Bridgewater 2000).

CFMW (1999, pers. comm.) reports the following approximate amounts of chemicals used and wastes generated annually:

- Approximately 1,000-4,999 gallons of used oil (hydraulic and motor oils)
- 4 gallons of lubricants; a maximum of 49 gallons was stored onsite in 1998
- 0-4 gallons of degreaser; a maximum of 19 gallons was stored onsite in 1998
- Up to 72 cubic yards of solid waste material is generated and disposed of offsite
- Approximately 55 gallons of petroleum naphtha solvent is typically stored onsite, with approximately 53 gallons recycled by Safety Kleen.

Prior to disposal, used lubricants, oil, and degreasers are stored in a 1,000-square-foot covered containment area (Oil Storage Hut; CFMW 1999, pers. comm.). Approximately forty 55-gallon drums, primarily of lubricating oil, were observed in secondary containment units in the oil storage hut during the PA (Bridgewater 2000). The concrete floor of the storage hut appeared sound and includes no floor drains, but evidence of incidental drippage was observed (Bridgewater 2000). Used solvent is contained in two parts washers located in Building 3 that are routinely serviced by Safety Kleen (CFMW 1999, pers. comm.). CFMW is a registered RCRA conditionally exempt generator of hazardous waste (CEG; ID# ORD009022104) and appears to be in compliance as of 1999 (DEQ 1999).

A pad-mounted electrical transformer is located in the southwest portion of the operations yard [see Supplemental Figure 2-4 from Bridgewater (2000)]. No evidence of leakage from the transformer was observed during the PA.

The CFMW facility also includes an air compressor in the operations yard [see Supplemental Figure 2-4 from Bridgewater (2000)]. Oily staining was observed on the concrete pad of the compressed air tank located next to the air compressor [see Supplemental Figure 2-4 from Bridgewater (2000)]. Another air compressor was noted outside the east wall of Building 1 in 1988, which was said to generate oily blowdown water that discharged to the ground surface south of the compressor building [see Supplemental Figure 3 from SE/E (1988)]. No information on

blowdown volumes or specific drainage routes were provided, but based on information in the PA, it is assumed that the blowdown effluent drained to unpaved ground and either infiltrated the ground or ran off to the general drainage area along the UPRR tracks [see Supplemental Figure 2-4 from Bridgewater (2000)].

Two stormwater catch basins are located in the operations yard: one near the northeastern corner of the drop forge, the other along the western edge of the yard north of the compressor building, south of a former paint storage room [see Supplemental Figure 2-4 from Bridgewater (2000)]. Yard runoff drains to these catch basins, then flows through underground piping to a sand filter/retention box that was installed in approximately 2000 at the southern boundary of the yard. After flowing through the retention box, the runoff infiltrates the ground next to the UPRR spur. Previous to the retention box installation, runoff from the yard would exit the drainpipes at the southern yard boundary and drain directly to the ground surface near the railroad spur. During the PA site visit, "significant" sheetflow was observed flowing from properties to the north of the site (particularly from the North John Street area) onto and across the CFMW/Lampros storage yard [east of Building 1; see Supplemental Figure 2-1 from Bridgewater (2000)]. CSC constructed an asphalt berm to the north of the CFMW operations yard [see Supplemental Figure 2-4 from Bridgewater (2000)] to prevent runoff from upgradient sites from entering the yard; prior to that, upgradient property runoff flowed into the yard and entered the yard catch basins.

Lampros

Lampros Steel has operated a structural steel distribution center at the site since 1989. Lampros facility operations include offloading trucks and railcars, bending and cutting steel (using saws), and loading trucks (Bridgewater 2000; DEQ 1999).

The Lampros facilities at the site include a covered 200-foot by 200-foot steel building located in the northeastern quarter of the site that extends from North Charleston Street to North John Street, east of the CFMW facility [see Supplemental Figure 2-1 from Bridgewater (2000)]. The building has a concrete floor (no floor drains) and is used for cutting steel beams. Small quantities of water-based lubricating oil are used in a beam saw located in the center of the building; oil and water-based cutting oil are stored in the building. Oil stains were observed on the floor beneath the cutting equipment. Water-based lubricants have been used by Lampros since they started operation at the site (Bridgewater 2000).

Used motor oil generated at the site is sent offsite for disposal/recycling (DEQ 1999). Three 55-gallon drums of hydraulic oil were observed in the Lampros building, along with two 55-gallon drums of water-based cutting oil, and one 55-gallon drum of used oil (Bridgewater 2000). Synthetic saw coolant is reused or recycled onsite (DEQ 1999). Scrap steel is recycled (FSM 2002). The Lampros facility includes one 1,000-gallon diesel aboveground storage tank (AST) with secondary containment (Bridgewater 2000; DEQ 1999). No spills from the tank were reported (Bridgewater 2000).

Lampros uses several portions of the CSC site for storage, including a vacant area at the northeastern corner of the site, extending from North Richmond Street to North Charleston Street. This area is primarily covered with vegetation, except for the interior portion that has been covered with gravel fill that is used by Lampros Steel for storage of their steel products. No evidence of hazardous materials release or spills was observed in this area (Bridgewater 2000).

The southern half of the site (south of the BNRR right-of-way) consists of approximately 7 acres of open area used by Lampros Steel as a storage and staging area for structural steel beams (Bridgewater 2000).

The ground surface along the UPRR tracks included areas of staining likely stemming from releases from diesel locomotives or other products from railcars (Bridgewater 2000).

7. SITE USE HISTORY

A review of fire insurance maps indicates that the site was developed at least as far back as 1905. Past uses of the site shown by the maps include:

- **Northern Portion:** Included various small machine shops, foundries (including several associated with Skookum Logging Equipment), forges (associated with Skookum Logging Equipment and Portland Chain Manufacturing Company), lumber and log storage, a small auto repair shop (Love Fuel Company), storage of plywood and lumber mill wood waste, a box factory, a mercantile warehouse, and a "pattern shop" and coal bin (associated with Skookum Logging Equipment) on the northern portion of the site.
- **Southern Portion:** Included a lumber mill (Central Lumber Company), a foundry and machine shop (American Marine Iron Works), a plywood mill (Plylock Corporation), a "Woolen Mill" warehouse, various small machine shops, a planning mill (St. John's Lumber Company), lumber storage (for St. John's Lumber Company and Portland Lumber Company), and docks associated with sand and gravel staging on the southern portion of the site

SE/E (1988) also identified former Portland Steel Shipbuilding and Portland Stove and Range Manufacturing Co. usage of the northeastern parcel at the site. Past uses and locations of portions of the site are listed in Table 3 and Supplemental Figure 2 from SE/E (1988).

The former lumber and plywood mills on the southern portion of the site appear to have been fueled by sawdust. The American Marine Iron Works and Portland Chain Manufacturing Company foundries may have been fueled by coke stored onsite. American Marine Iron Works was located in the southern portion of the site, between North Richmond and North John Streets, and Portland Chain Manufacturing was located in the northwestern corner of the site, at the corner of North Crawford Street and North Burlington Avenue. Bridgewater (2000) noted no fuel tanks were shown associated with Love Fuel Company. CFMW occupied the former "pattern shop" building in 1971. Machine shops located on the northern portion of the site between North Richmond and North Leavitt streets were fueled by coal (Bridgewater 2000).

The current facility buildings were constructed between 1957 and 1963. Aerial photographs indicate that the southern portion of the site was largely covered by buildings with docks from at least 1936 through 1963; these structures appear to have been removed between 1963 and 1977 (DEQ 1999).

The City of Portland's Portland Development Commission (PDC) obtained most or all of the various parcels that make up the current CSC site in the 1970s and 1988, which were then sold to Manufacturing Management Incorporated (MMI) in 1988. MMI transferred these parcels to CSC shortly thereafter (by 1989; Bridgewater 2000). It was noted that when the MMI purchased the property in 1988, a drum of Silvex (an herbicide) was present in a PDC building that was located in the current Lampros storage building area (Bridgewater 2000).

A former building at the site was served by a septic tank and drain field [see Supplemental Figure 3-1 of Bridgewater (2000)]. This building had been used for wool scouring and plywood storage; the most recent tenant was "Fibron Insulation" (Fibron) during the 1970s to early 1980s before the building was demolished in 1986 (SE/E 1988). Fibron sold fiberglass insulation (Bridgewater 2000). No information has been found regarding Fibron's specific use of the site, whether for the manufacture, storage, and/or sales of their product.

Up to approximately 6 feet of black sand fill material was placed by previous property owners during the demolition of the former lumber mill building in 1977-1978 [see Supplemental Figure 3-1 of Bridgewater (2000); SE/E 1988]. The sand had reportedly been obtained from a local sandblasting company and previously had been used to clean land- and ship-based oil tanks (SE/E 1988). The sand appeared oily when placed on the site, and runoff from the area later created a "slick" or sheen on the Willamette River

that eventually disappeared (SE/E 1988).

The CFMW facility Building 2/3 contains a former paint room [see Supplemental Figure 2-4 from Bridgewater (2000)]. No information regarding the types of paints associated with paint room is available. The former practice for cleaning the paint room had involved hosing the floor with water, which ran to a drain that led out to the southeastern corner of the building and discharged onto the ground just north of the railroad tracks (see Supplemental Figure 2-4 from Bridgewater 2000; SE/E 1988). The runoff included oil that penetrated the ground in an area approximately 10 feet wide by several tens of feet long. During periods of rainfall, oil was observed on the surface of the large runoff puddle that would typically form in the area of discharge (SE/E 1988).

TLS Steel Products, Inc. (TLS) formerly operated a small steel forging and fabrication facility in a portion of the CFMW Building 2/3 that they leased from 1989 to May 2000. Facility operations included light metal heating, cutting, punching, shaping, and bending, using a small natural gas furnace. Lubricating oil and water-based cutting oils were used in the fabrication machines and were stored in their area of the building. Petroleum staining was observed on the concrete floor of the TLS area, which included no floor drains. Used oil was accumulated at the CFMW facility and recycled offsite (Bridgewater 2000).

Four USTs formerly existed at the CSC site, as shown in Supplemental Figure 2-4 from Bridgewater (2000):

- One 1,000-gallon Bunker C UST that had been installed in Building 1 of the current CFMW facility in the late 1960s. This tank was removed in 1987
- One 1,000-gallon steel gasoline tank that had been installed in the current CFMW yard area in the mid-1950s. This tank was removed in 1987. The tank had been empty since 1960 (SE/E 1988). A small hole was observed at an unknown location on the tank (SE/E 1988).
- One 5,000-gallon steel diesel UST installed prior to 1960 west of the former TLS area on the CFMW facility. This tank was removed in 1987 (Bridgewater 2000).
- One 2,500-gallon oil tank discovered in 1988 in the southeastern portion of the site [see Supplemental Figure 3-1 from Bridgewater (2000)]. This tank was removed on January 18, 1988 (SE/E 1988).

The available results of soil samples collected following the removal of these tanks are summarized in Section 10.1.1 below.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of the historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

Following discussions between DEQ and CSC, site sources identified for sampling associated with the PA included (Bridgewater 2002b):

- **Stormwater Runoff from Columbia Forge Yard:** Site runoff, including former "paint room" and former and current CFMW operations yard runoff, discharges to southwestern corner of the yard. From there, it is routed through a sand filter installed in 2000, then to the ground surface. During periods of high flow, the runoff may drain along the railroad tracks to the municipal storm sewer located at the western end of the site. The contaminants of interest (COIs) associated with the runoff were identified as PAHs, VOCs, and metals.

- **Imported Black Sand Fill Material (a.k.a. "black sand):** Sandblast material was placed on the riverbank as fill and over time has eroded onto the beach fronting the site and into the river (DEQ 2004). COIs identified for the black sand in the PA consisted of PAHs, lead, and mercury. Samples analyzed by Toxicity Characteristic Leaching Procedure (TCLP) during the 2001 removal action (see Section 11.1) resulted in leachable lead concentrations up to 4.73 mg/L, and leachable chromium up to 0.101 mg/L (Bridgewater 2002a). These results are below the 5 mg/L criteria that would designate the black sand as a hazardous waste (Bridgewater 2002a). Other COCs associated with the black sand include PCBs, diesel- and heavy-oil-range hydrocarbons, xylene, and zinc (see Sections 10.1.1 and 11.1.1 below; SE/E 1988; Bridgewater 2002b; Geiselbrecht 2002).

Based on information provided in the PA (Bridgewater 2000), additional potential contaminant source areas in the uplands portion of the CSC site may include:

- **Current Site Operations:** These operations include steel products manufacturing and equipment maintenance operations, which use lubrication and cutting oils, solvents, and diesel fuel. Releases from site equipment or storage areas may impact surface and subsurface media (Bridgewater 2000).
- **Former USTs:** Gasoline, diesel, and bunker C USTs [DEQ (1999) referred to the latter as a "used oil UST"] were removed from the site in 1987 and 1988.
- **Railroad Right-of-Way**: Oily surface staining was observed along the railroad, runoff from which drains to the Willamette River through municipal stormwater sewers.
- **Electrical Transformer:** One pad-mounted transformer onsite may contain PCBs.
- **Historical Facility Operations:** These operations included lumber, chain, and steel manufacturing; various mills (planing, plywood, lumber); woolen mill; various machine shops; auto repair; metal forging, cleaning, machining, shaping, cutting, and painting; possible shipbuilding-associated operations. Possible contaminants associated with these operations are unknown but may include lubricating and cutting oils, solvents, wood preservatives, and butyltins. Releases from these operations may have impacted surface and subsurface media, and may potentially have been transported through overland flow to the river (Bridgewater 2002a).

8.2. Overwater Activities ☒ Yes ☐ No

Based on information provided in the PA (Bridgewater 2000), the following potential contaminant source areas have been identified along the shoreline portion of the CSC site:

- **Imported Sandblast Fill Material (a.k.a. "black sand):** Sandblast material placed as fill on the river eroded over time onto the beach fronting the site.
- **Historical Dock Operations (unknown):** Possible contaminants may include fuels and other petroleum products associated with possible releases from moored vessels, and possible wood preservatives used on dock pilings.
- **Outfalls:** Several unknown pipes were observed protruding from the riverbank at the site [see Supplemental Figure 2-1 from Bridgewater (2002b)]. The pipes were not observed to carry flow or drainage, and appear to have been associated with historic site usage. As presented in Section 10.1.1 below, contaminants associated with these outfalls include petroleum hydrocarbons, PAHs, and metals (Bridgewater 2002b).
- **Beach Metal Debris:** An area of degraded metal wire debris measuring approximately 300 square feet was present on the shoreline [see Supplemental Figure 2-1 from Bridgewater (2002b); Bridgewater 2001, pers. comm.].

8.3. Spills

Known or documented spills at the Crawford Street Corporation site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. No records of significant spills at the site were found.

A minor release (2 to 3 ounces) of PCB-containing oil was spilled in an electrical induction heater cabinet when a transformer capacitor overheated in May 1987 (CFMW 1999, pers. comm.; Bridgewater 2000). The spill was contained within the cabinet. The entire cabinet was removed and disposed of by General Electric. No PCB oil was released outside the cabinet.

TLS and CFMW reported several minor (<1 gallon) spills of motor, lubricating, or hydraulic oils from machinery onto concrete. The spills were reportedly cleaned up and did not impact soil or groundwater. Lampros claimed no spills had occurred on their property (DEQ 1999).

9. PHYSICAL SITE SETTING

The PA (Bridgewater 2000) and PA Soil and Groundwater Sampling Report (Bridgewater 2002b) were reviewed for geologic/hydrogeologic information for the site. The reports indicate that subsurface data were collected from test pits, investigative borings, and monitoring wells. The maximum depth explored was 40 feet bgs.

9.1. Geology

At least 12 test pits, 2 investigative borings, and 3 monitoring wells have been completed at the site. Based on available information, the site is underlain by recent fill and Quaternary alluvial deposits. The fill consists of predominantly sand with silts, clays, and gravels and extends to approximately 20 feet bgs. The Quaternary alluvial deposits consist of sand and silt. The base of the Quaternary alluvial deposits was not encountered during site investigations.

9.2. Hydrogeology

The depth to groundwater at the site was reported at approximately 29 feet bgs. Additional information regarding the groundwater gradient and flow direction at the site is not available in the reports reviewed for the site.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

Soil samples were collected in association with the spill from the transformer in May 1987. The analytical results were sent to DEQ (CFMW 1999, pers. comm.) but are not available for this review.

Limited soil samples were collected during the UST removal activities conducted in 1987. Samples were collected from the excavations of the CFMW Bunker C and gasoline tanks and were analyzed for petroleum hydrocarbons; the soil sample from the gasoline tank ("yard tank") excavation was also analyzed for total and EP Toxicity lead. Bridgewater (2000) reports that diesel was not detected in either soil sample. Gasoline-range

hydrocarbons were detected from the yard tank excavation at 16 mg/kg (Bridgewater 2002a). Total lead was detected at 30 mg/kg (SE/E 1988). One soil sample was collected from the tank excavation following the removal of the former 5,000-gallon steel diesel UST in 1987. The sample was analyzed for petroleum hydrocarbons; gasoline or diesel was not detected (SE/E 1988).

Three soil samples were collected following the removal of the 2,500-gallon diesel tank on the southern portion of the property in 1988; two were collected from the bottom of the tank excavation, and one was collected from a stained area beneath a near-surface pipe near the southern corner of the excavation (SE/E 1988). Oil and grease were detected in the excavation-bottom samples, at 0.01 percent (equivalent to 100 mg/kg) and 0.02 percent (200 mg/kg). The sample from beneath the pipe contained an oil and grease concentration of 0.02 percent (200 mg/kg) (SE/E 1988).

A composite sample of three surface soil samples from an area of the black sand fill material was collected in November 1987, and submitted for EP Toxicity analysis [see Supplemental Figure 3 from SE/E (1988)]. None of the results reportedly exceeded maximum allowable levels (SE/E 1988).

Test pits [#6, 7, 8, 9, 10, and 11 in Supplemental Figure 3 from SE/E (1988)] were dug in the black sand fill in 1987 to determine the thickness of the fill deposit and whether residual oil saturation in the sand was present. Two soil samples were collected, one of which appeared oily (SE/E 1988). The samples were analyzed for various analytes including weight-percent oil and grease, total halogenated organics (TOX), VOCs, PCBs, and EP Toxicity metals. Oil and grease (400 mg/kg), TOX (294 mg/kg), xylene (0.31 mg/kg), and barium (0.31 mg/L) were detected (SE/E 1988).

Four upland surface (0.5 foot bgs) soil samples were collected for the PA in April 2001 (Bridgewater 2002b). The locations included the CFMW operations yard and along the railroad drainage area, as shown in Supplemental Figure 2-1 from Bridgewater (2002b). The samples were submitted for petroleum hydrocarbons, SVOCs, and total and TCLP metals. Results for detected analytes are summarized below.

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Total Petroleum Hydrocarbons (TPH)		
TPH-Dx (Heavy Oil Range)	3130 U	13,500
Polycyclic Aromatic Hydrocarbons (PAHs)		
Benzo(a)anthracene	0.067 U	0.259
Benzo(a)pyrene	0.067 U	0.401
Benzo(b)fluoranthene	0.123	0.566
Benzo(g,h,i)perylene	0.0953	0.486
Benzo(k)fluoranthene	0.068	0.34
Chrysene	0.11	0.438
Fluoranthene	0.086	0.384
Inden(1,2,3-c,d)pyrene	0.067 U	0.379
Phenanthrene	0.067 U	0.224
Pyrene	0.092	0.314
LPAH	0.067 U	0.224
HPAH	0.574	3.791
Metals		
Antimony	0.918	3.32
Arsenic	9.69	18.4
Cadmium	0.814	3.05
Chromium	48.7	812
Copper	136	612
Lead	106	184
Mercury	0.1 U	0.136
Nickel	62	1240
Zinc	246	526
TCLP Metals (mg/L)		
TCLP Cadmium	0.5 U	0.5 U
TCLP Copper	0.5 U	0.943
TCLP Nickel	0.5 U	1.07
TCLP Zinc	1.27	3.22

10.1.2. Riverbank Samples

☒ Yes ☐ No

Surface and subsurface soil samples were collected along the riverbank of the CSC site in association with the PA in April 2001 (Bridgewater 2002b). The locations included three subsurface direct-push borings, surface soil samples from beneath pipe outfalls along the bank, samples of the black sand fill material on the beach and bank, and a soil sample from beneath metal debris on the beach, as shown in Supplemental Figure 2-1 from Bridgewater (2002b). The samples were submitted for analyses of petroleum hydrocarbons, SVOCs, and total and TCLP metals. In addition, the subsurface soil samples were submitted for VOC analysis (none were detected), and select samples of the black sand were analyzed for PCBs. Additional surface samples of the black sand were collected in June and July, 2001, and were analyzed for total and TCLP lead. Results for detected analytes are summarized below. Separate tables are provided for each sampling area.

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Waterfront Push Probes		
Total Petroleum Hydrocarbons (TPH)		
TPH-G	4 U	4.84
Metals		
Arsenic	8.08	8.08
Chromium	20.7	20.7
Copper	24.4	24.4
Lead	14.7	14.7
Nickel	20.3	20.3
Zinc	87.5	87.5

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Pipe Outfall		
Total Petroleum Hydrocarbons (TPH)		
TPH-G	4 U	4.8
TPH-D	25 U	31.7
TPH-Dx (Heavy Oil Range)	50 U	70.4
Polycyclic Aromatic Hydrocarbons (PAHs)		
Pyrene	0.33 U	0.334
LPAH	0.33 U	0.334
Metals		
Arsenic	2.91	12.7
Chromium	24.4	32.3
Copper	24.8	30.2
Lead	18.1	40.6
Mercury	0.1 U	0.405
Nickel	22	27.7
Zinc	22.7 U	122
TCLP Metals (mg/L)		
TCLP Zinc	0.765	0.765

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Black Sand - Beach		
Total Petroleum Hydrocarbons (TPH)		
TPH-D	25 U	78.3
TPH-Dx (Heavy Oil Range)	50 U	194
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	0.33 U	0.096
Anthracene	0.067 U	0.192
Benzo(a)anthracene	0.33 U	0.498
Benzo(a)pyrene	0.33 U	0.768
Benzo(b)fluoranthene	0.33 U	0.728
Benzo(g,h,i)perylene	0.33 U	0.573
Benzo(k)fluoranthene	0.33 U	0.682
Chrysene	0.33 U	0.632
Dibenzo(a,h)anthracene	0.067 U	0.168
Fluoranthene	0.33 U	0.927
Fluorene	0.067 U	0.100
Inden(1,2,3-c,d)pyrene	0.067 U	0.515
Phenanthrene	0.33 U	0.658
Pyrene	0.33 U	0.742
LPAH	0.168	1.046
HPAH	0.901	6.233
Metals		
Arsenic	5.65	5.65
Chromium	69	202
Copper	170	170
Lead	26	2150
Mercury	0.1 U	0.167
Nickel	29	29
Zinc	178	178
TCLP Metals (mg/L)		
TCLP Chromium	0.5 U	0.5
TCLP Lead	0.5 U	16.8
TCLP Zinc	1.45	1.45

Soil samples were collected from the perimeter and bottom of the beach removal area following the black sand removal action completed in October 2001 (see Section 11.1 below). The samples were analyzed for TPH, PAHs, PCBs, total metals, and TCLP lead. Supplemental Figure 4-1 from Bridgewater 2002a shows the sample locations.

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Removal Area Soil		
Total Petroleum Hydrocarbons (TPH)		
	Bottom	
TPH-D	54.3 U	53.4
TPH-Dx (Heavy Oil Range)	109 U	179
	Perimeter	
TPH-Dx (Heavy Oil Range)	101 U	87
Polycyclic Aromatic Hydrocarbons (PAHs)		
	Bottom	
Acenaphthene	0.05 U	0.105
Acenaphthylene	0.05 U	0.065
Anthracene	0.05 U	0.575
Benzo(a)anthracene	0.07	0.435
Benzo(a)pyrene	0.095	0.585
Benzo(b)fluoranthene	0.06	0.385
Benzo(g,h,i)perylene	0.05 U	0.47
Benzo(k)fluoranthene	0.09	0.645
Chrysene	0.11	0.595
Dibenzo(a,h)anthracene	0.05 U	0.1
Fluoranthene	0.16	1.21
Fluorene	0.05 U	0.17
Indeno(1,2,3-c,d)pyrene	0.05 U	0.275
Naphthalene	0.05 U	0.14
Phenanthrene	0.08	1.04
Pyrene	0.017	1.54
LPAH	0.23	2.12
HPAH	0.78	6.31
	Perimeter	
Acenaphthene	0.05 U	0.075
Acenaphthylene	0.05 U	0.085
Anthracene	0.05 U	0.5
Benzo(a)anthracene	0.05 U	0.6
Benzo(a)pyrene	0.05 U	0.885
Benzo(b)fluoranthene	0.05 U	0.56
Benzo(g,h,i)perylene	0.05 U	0.69
Benzo(k)fluoranthene	0.05 U	0.285
Chrysene	0.05 U	0.845
Fluoranthene	0.05 U	1.49
Fluorene	0.05 U	0.15
Indeno(1,2,3-c,d)pyrene	0.05 U	0.47
Naphthalene	0.05 U	0.095
Phenanthrene	0.05 U	0.795
Pyrene	0.05 U	2.06
LPAH	0.05 U	1.70
HPAH	0.05 U	8.41

Metals		
	Bottom	
Chromium	33.2	144
Copper	292	1390
Lead	30.6	1890
Mercury	0.1 U	0.21
Nickel	24.5	129
Zinc	132	384
	Perimeter	
Chromium	61.1	179
Copper	581	1890
Lead	11.6	3130
Nickel	26.9	285
Zinc	94.7	314
TCLP Metals (mg/L)		
	Bottom	
TCLP Lead	0.06	23
	Perimeter	
TCLP Lead	1.27	3.9

In the post-removal soil samples, PCBs were not detected at or above the 0.05 mg/kg reporting limit; however, the detection limit is above the 0.034 mg/kg DEQ Screening Level Value (SLV) (Bridgewater 2002a). In addition, the DEQ sediment screening level values for these metals were exceeded in one or more samples. TCLP lead concentrations ranged up to 23 mg/L in the four samples analyzed (Bridgewater 2002a).

Additional samples were collected from three beach transects in December 2001 (Bridgewater 2002c). Sample stations were located at the toe of the bank, a mid-point, and from a shallow water location at each transect, and at a point on the western edge of the beach. Samples were collected at each location: 1) from 0 to 2 inches bgs, and 2) from approximately 2 to 3 feet bgs. The samples were analyzed for copper, lead, and nickel by EPA Method 6000/7000 series. These metals were apparently selected based on the results of the removal action confirmation samples, which contained concentrations of these metals above DEQ SLVs (DEQ 2002, pers. comm.). Copper concentrations ranged from 31.8 to 700 mg/kg in the surface samples, and from 27.7 to 902 mg/kg in the subsurface samples. Lead concentrations ranged from 10.2 to 54.5 mg/kg in the surface samples, and from 11.5 to 61.1 mg/kg in the subsurface samples. Nickel concentrations ranged from 14 to 57.5 mg/kg in the surface samples, and from 18.9 to 102 mg/kg in the subsurface samples (Bridgewater 2002c).

One sample of beach sediment was collected during the 2002 Round 1 sampling event as part of the Portland Harbor RI/FS (sample 06B030, Figure 1). This sample was analyzed for metals, SVOCs, PCBs (as Aroclors), chlorinated pesticides, herbicides, grain-size distribution, and other conventional parameters. Pesticides, herbicides, and phenols were not detected. Various metals, except mercury and selenium, were detected. Aroclor 1260 was the only PCB detected, at 16 µg/kg. Various PAHs were detected; LPAHs totaled 57 µg/kg, and HPAHs totaled 555 µg/kg. Two phthalates, bis(2-ethylhexyl)phthalate and diethyl phthalate, were detected at 210 ug/kg and 48 µg/kg, respectively. In addition to the above SVOC groups, carbazole was detected at 5.4 µg/kg (see Integral 2004).

10.1.3. Summary

Analytical results from soil sampling at the site suggest:

- Relatively low soil contaminant levels were identified from a limited number of samples collected at the former USTs locations (ES/E 1988).
- The results of the PA samples indicate contaminants, including PAHs, metals (including leachable chromium, lead, and zinc), and particularly petroleum hydrocarbons, are present in surface soil in the drainage pathways at the site that may be transported by overland flow during storm events.
- Metals and low levels of gasoline were the only constituents detected in the limited number of subsurface soil samples collected at the site.
- Lead, mercury, and pyrene concentrations in the soil sample near an abandoned 8-inch steel outfall exceeded DEQ threshold sediment screening criteria (DEQ 2001, pers. comm.).
- Elevated arsenic, chromium, copper, nickel, and zinc concentrations were found in the sample near the beach metal debris (DEQ 2001, pers. comm.).
- The samples collected after the 2001 black sand removal action indicate levels of many organic contaminants were lowered but not completely remediated.
- Elevated metals concentrations remain on the shoreline (DEQ 2002, pers. comm.; Bridgewater 2002c).

10.2. Groundwater

10.2.1. Groundwater Investigations ☒ Yes ☐ No

Groundwater samples collected from two investigative borings were analyzed for TOX during the 1988 site investigation (Bridgewater 2000). Although the samples had detections of TOX, this older analytical method is susceptible to interference from organic material (e.g., wood waste). Therefore, the older data were considered less reliable than groundwater data collected from monitoring wells completed during the sampling phase of the PA (Bridgewater 2002b).

On April 25, 2001, groundwater samples were collected from three monitoring wells at the site located near the Willamette River [see Supplemental Figure 2-1 from Bridgewater (2002b)]. Low levels of metals were detected in the samples. With the exception of monitoring well PP-3, no petroleum hydrocarbons, VOCs, or SVOCs were detected in the samples. Low concentrations of PAHs were detected in the sample collected from PP-3. On June 20, 2001, PP-3 was resampled because the original groundwater sample was apparently turbid. No PAHs were detected in the groundwater sample collected during the second monitoring event. Bridgewater concluded that the original groundwater sample was not considered to be representative of groundwater conditions at the PP-3 location (Bridgewater 2002b).

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☒ No

No plumes have been identified at the site.

Plume Characterization Status ☒ Complete ☐ Incomplete

According to the DEQ (2004), sufficient groundwater data have been collected at the site to assess potential groundwater discharge impacts to the Willamette River.

Plume Extent

No plumes have been identified at the site.

Min/Max Detections (Current situation)

Not applicable (N/A)

Current Plume Data

N/A.

Preferential Pathways

No preferential pathways were identified at the site.

Downgradient Plume Monitoring Points (min/max detections)

N/A.

Visual Seep Sample Data ☐ Yes ☒ No

No seeps have been identified at the site (GSI 2003).

Nearshore Porewater Data

No porewater data have been collected at the site.

Groundwater Plume Temporal Trend

N/A.

10.2.4. Summary

Groundwater samples were collected from three monitoring wells at the site located near the Willamette River (Bridgewater 2002b). Contaminants of interest were not detected in representative groundwater samples collected from the three monitoring wells. For this site, groundwater does not appear to be a migration pathway for contaminants to the Willamette River (DEQ 2004).

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

No surface water investigations have been completed at the site.

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

CFMW was issued a General NPDES permit No. 1200-L on October 7, 1992, but it was terminated 13 days later after it was determined that the facility did not discharge directly to a waterway and that a permit was not required (CFMW 1999, pers. comm.; DEQ 1999).

Do other non-stormwater wastes discharge to the system? ☒ Yes ☐ No

Historically, wash water from the former paint room discharged to the storm drains in the CFMW operations yard (SE/E 1988).

10.3.3. Stormwater Data ☐ Yes ☐ No

A stormwater sample was collected at the CFMW facility by the Portland BES in June 1997, and analyzed for metals. The sample was collected from the western drain pipe outlet of the yard area. Copper (0.01 mg/L), selenium (0.047 mg/L), and zinc (0.065 mg/L) were detected (DEQ 1999).

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Surface water data for the CSC site are limited; relatively low concentrations of copper, selenium, and zinc were detected in a stormwater sample collected at an unknown location.

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

As shown in Figure 1, three sediment samples have been collected from the river adjacent to the CSC site: SD060, collected in 1998 as part of the Portland Harbor Sediment Investigation (Weston 1998); 06R040, located just upstream of the CSC property line and 06B030, a beach sediment sample collected during Round 1 sampling for the Portland Harbor RI/FS (Integral 2004). Analytes for these three samples included metals, butyltins, VOCs, SVOCs, PCB (as Aroclors), chlorinated pesticides, herbicides, grain-size distribution, and other conventional parameters. The analytical results are presented in Table 2. Three additional surface and core sampling locations offshore from the CSC site were proposed during the Round 2 sediment investigation.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

A black sand removal action occurred on the southwest corner of the site near the Willamette in October 2001. Approximately 381 tons of black sand were removed from the beach and bank edge [see Supplemental Figure 3-1 from Bridgewater (2002a)]. After testing indicated the removed material was not hazardous, it was disposed of at the Hillsboro solid waste landfill. Following removal of the excavation stockpile, the surface of the stockpile storage area was scraped and the surface soil was also disposed of in an offsite landfill. The excavated area along the top of the bank was backfilled and seeded; no backfill was placed in the beach removal area per the approved work plan (Bridgewater 2002a).

11.2. Groundwater Cleanup/Source Control

No groundwater cleanup or source controls have been conducted at the site.

11.3. Other

No other source control actions are described in reports reviewed for this site.

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Figure 2-1. Site Plan (Bridgewater 2000)
Figure 1. Shoreline Features (Bridgewater 2001)
Figure 2-4. Columbia Forge Site Plan (Bridgewater 2000)
Figure 2-1. PA Sampling Locations (Bridgewater 2002b)
Figure 3-1. Historical Site Features (Bridgewater 2000)
Figure 3. Historical Site Features (SE/E 1988)
Figure 3-1. Black Sand Removal Areas (Bridgewater 2002a)
Figure 4-1. Post-Removal Soil Sample Locations (Bridgewater 2002a)
Figure 4-2. Post-Removal Soil Analytical Results (Bridgewater 2002a)

Supplemental Tables:

Table 3 and Figure 2. Historical Property Ownership (SE/E 1988)
Tables 2-1 through 2-4. Chemical Concentrations in Soil Samples (Bridgewater 2002b)
Tables 4-1 through 4-5. Concentrations in Removal Area Soil Samples (Bridgewater 2002a)

FIGURES

Figure 1. Site Features

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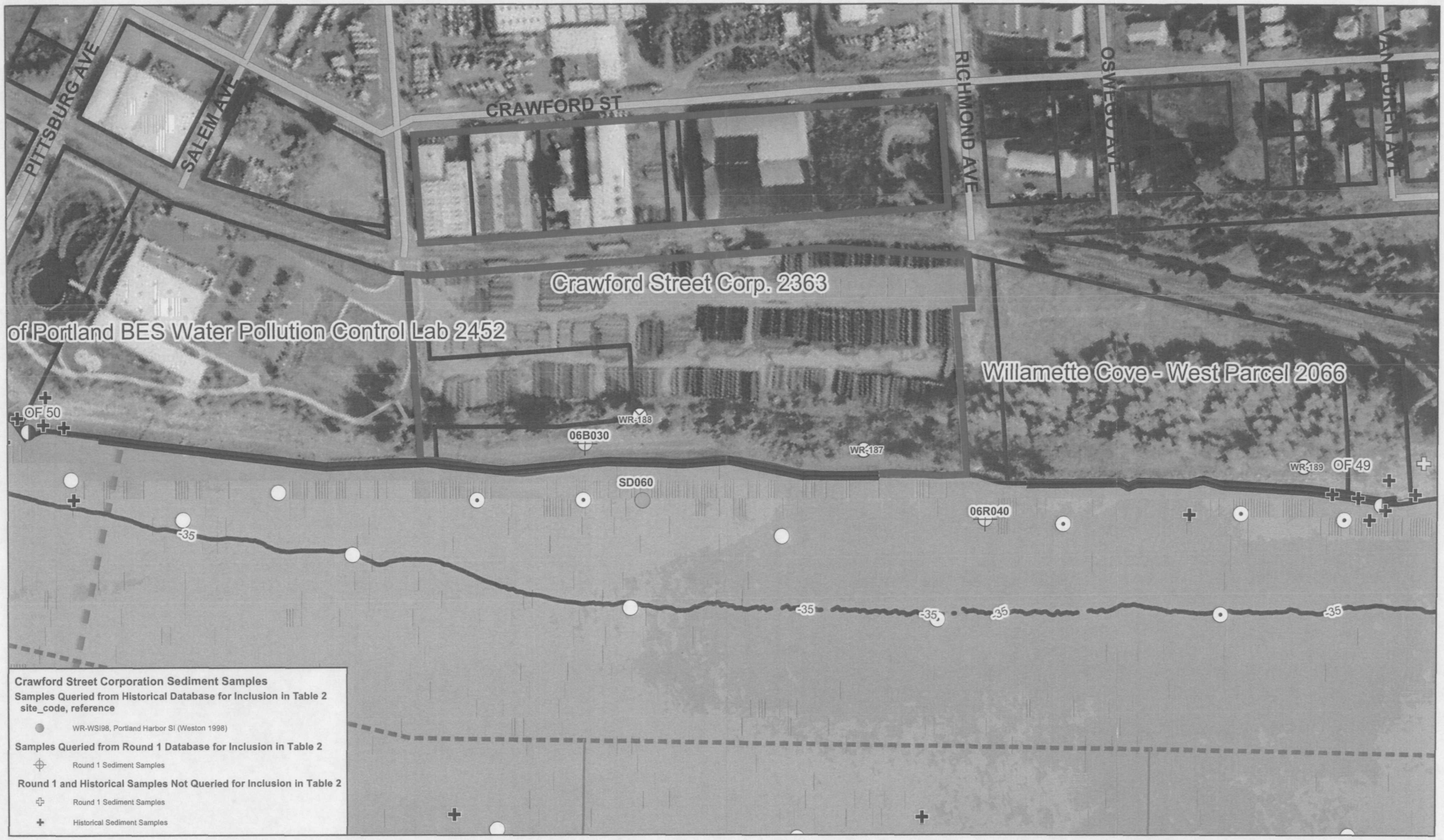

integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Crawford Street Corporation
ECSI 2363

TABLES

Table 1: Potential Sources and Transport Pathways Assessment
Table 2: Queried Sediment Chemistry Data

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Crawford Street Corporation #2363

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
A																									
Current site manufacturing and maintenance operations	✓	?	?	?	?		✓	✓		✓	✓		✓			✓						?		?	
Current and former site runoff	✓	?	?	?	?			✓		✓			✓			✓					✓	?	?	✓	✓
Imported sandblast fill material	✓	?	?					✓	✓	✓			✓			✓	✓				✓	?	✓	✓	✓
Former USTs		?	?		?	✓	✓	✓	✓	✓						✓									
Railroad right-of-way	✓	?	?	?	?		✓	✓									✓				✓	?		?	
Electrical transformer	?	?	?	?	?												✓				?	?	?	?	?
Historical facility operations	?	?	?	?	?			✓							✓		✓	✓		✓	✓	?	?	✓	?
Overwater Areas																									
B																									
Imported sandblast fill material								✓	✓	✓			✓			✓	✓				✓		✓	✓	✓
Historical dock operations (unknown)						✓	✓	✓					✓			✓							?	?	
Outfalls						✓	✓	✓					✓			✓					?		✓	✓	✓
Beach metal debris																✓					✓		✓	✓	✓
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychlorinated biphenols

Table 2. Queried Sediment Chemistry Data

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	2	0	0						3.8 U	3.9 U	3.85	3.8 U	3.8 U
surface	Aroclor 1242 (ug/kg)	2	0	0						3.8 U	3.9 U	3.85	3.8 U	3.8 U
surface	Aroclor 1248 (ug/kg)	2	0	0						3.8 U	8.1 U	5.95	3.8 U	3.8 U
surface	Aroclor 1254 (ug/kg)	2	0	0						8.1 U	31 U	19.6	8.1 U	8.1 U
surface	Aroclor 1260 (ug/kg)	2	2	100	16	42	29	16	16	16	42	29	16	16
surface	Aroclor 1221 (ug/kg)	2	0	0						7.6 U	7.8 U	7.7	7.6 U	7.6 U
surface	Aroclor 1232 (ug/kg)	2	0	0						3.8 U	3.9 U	3.85	3.8 U	3.8 U
surface	Polychlorinated biphenyl (ug/kg)	2	2	100	16	42	29	16	16	16	42	29	16	16
surface	Butyltin ion (ug/kg)	1	1	100	52 J	52 J	52	52 J	52 J	52 J	52 J	52	52 J	52 J
surface	Dibutyltin ion (ug/kg)	1	1	100	59	59	59	59	59	59	59	59	59	59
surface	Tributyltin ion (ug/kg)	1	1	100	350 J	350 J	350	350 J	350 J	350 J	350 J	350	350 J	350 J
surface	Tetrabutyltin (ug/kg)	1	0	0						5.9 U	5.9 U	5.9	5.9 U	5.9 U
surface	Total solids (percent)	2	2	100	65.6	91.2	78.4	65.6	65.6	65.6	91.2	78.4	65.6	65.6
surface	Total organic carbon (percent)	3	3	100	0.93	1.8	1.38	1.4	1.4	0.93	1.8	1.38	1.4	1.4
surface	Gravel (percent)	3	3	100	1.05	10.7	5.45	4.59	4.59	1.05	10.7	5.45	4.59	4.59
surface	Sand (percent)	1	1	100	40.95	40.95	41	40.95	40.95	40.95	40.95	41	40.95	40.95
surface	Very coarse sand (percent)	2	2	100	4.31	5.34	4.83	4.31	4.31	4.31	5.34	4.83	4.31	4.31
surface	Coarse sand (percent)	2	2	100	12	17.2	14.6	12	12	12	17.2	14.6	12	12
surface	Medium sand (percent)	2	2	100	37.3	54.5	45.9	37.3	37.3	37.3	54.5	45.9	37.3	37.3
surface	Fine sand (percent)	2	2	100	4.6	23	13.8	4.6	4.6	4.6	23	13.8	4.6	4.6
surface	Very fine sand (percent)	2	2	100	3.19	8.72	5.96	3.19	3.19	3.19	8.72	5.96	3.19	3.19
surface	Fines (percent)	1	1	100	58	58	58	58	58	58	58	58	58	58
surface	Silt (percent)	1	1	100	51.31	51.31	51.3	51.31	51.31	51.31	51.31	51.3	51.31	51.31
surface	Coarse silt (percent)	2	2	100	1.44	4.62	3.03	1.44	1.44	1.44	4.62	3.03	1.44	1.44
surface	Medium silt (percent)	2	2	100	1.02	1.23	1.13	1.02	1.02	1.02	1.23	1.13	1.02	1.02
surface	Fine silt (percent)	2	2	100	0.69	1.52	1.11	0.69	0.69	0.69	1.52	1.11	0.69	0.69
surface	Very fine silt (percent)	2	2	100	0.42	0.95	0.685	0.42	0.42	0.42	0.95	0.685	0.42	0.42
surface	Clay (percent)	1	1	100	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69
surface	8-9 Phi clay (percent)	2	2	100	0.32	0.57	0.445	0.32	0.32	0.32	0.57	0.445	0.32	0.32
surface	9-10 Phi clay (percent)	2	2	100	0.25	0.81	0.53	0.25	0.25	0.25	0.81	0.53	0.25	0.25
surface	>10 Phi clay (percent)	2	2	100	0.29	0.43	0.36	0.29	0.29	0.29	0.43	0.36	0.29	0.29
surface	Dalapon (ug/kg)	2	0	0						16 U	16 U	16	16 U	16 U
surface	Dicamba (ug/kg)	2	0	0						3.1 UJ	3.2 U	3.15	3.1 UJ	3.1 UJ
surface	MCPA (ug/kg)	2	0	0						3100 U	3200 U	3150	3100 U	3100 U
surface	Dichloroprop (ug/kg)	2	0	0						6.3 UJ	6.3 UJ	6.3	6.3 UJ	6.3 UJ
surface	2,4-D (ug/kg)	2	0	0						6.3 UJ	6.3 U	6.3	6.3 UJ	6.3 UJ
surface	Silvex (ug/kg)	2	0	0						1.6 UJ	1.6 U	1.6	1.6 UJ	1.6 UJ
surface	2,4,5-T (ug/kg)	2	0	0						1.6 U	1.6 U	1.6	1.6 U	1.6 U
surface	2,4-DB (ug/kg)	2	0	0						31 U	32 U	31.5	31 U	31 U
surface	Dinoseb (ug/kg)	2	0	0						3.1 U	3.2 U	3.15	3.1 U	3.1 U
surface	MCPP (ug/kg)	2	0	0						3100 U	3200 U	3150	3100 U	3100 U

Table 2. Queried Sediment Chemistry Data

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Aluminum (mg/kg)	3	3	100	17500	24700	20000	17900	17900	17500	24700	20000	17900	17900
surface	Arsenic (mg/kg)	3	3	100	4.4	9.9	6.43	5	5	4.4	9.9	6.43	5	5
surface	Cadmium (mg/kg)	3	3	100	0.1	0.4	0.21	0.13	0.13	0.1	0.4	0.21	0.13	0.13
surface	Chromium (mg/kg)	3	3	100	27.7	77	48.2	40	40	27.7	77	48.2	40	40
surface	Copper (mg/kg)	3	3	100	45.6	606	234	49.6	49.6	45.6	606	234	49.6	49.6
surface	Lead (mg/kg)	3	3	100	26 J	36	30	28	28	26 J	36	30	28	28
surface	Manganese (mg/kg)	1	1	100	397	397	397	397	397	397	397	397	397	397
surface	Mercury (mg/kg)	3	2	66.7	0.14	0.52	0.33	0.14	0.14	0.05 U	0.52	0.237	0.14	0.14
surface	Nickel (mg/kg)	3	3	100	21.3	41	30.1	28	28	21.3	41	30.1	28	28
surface	Selenium (mg/kg)	3	1	33.3	12	12	12	12	12	0.2 U	12	4.17	0.3 U	0.3 U
surface	Silver (mg/kg)	3	2	66.7	0.2	0.8	0.5	0.2	0.2	0.03 U	0.8	0.343	0.2	0.2
surface	Thallium (mg/kg)	1	0	0						4 U	4 U	4	4 U	4 U
surface	Zinc (mg/kg)	3	3	100	97.6	112	106	107	107	97.6	112	106	107	107
surface	Barium (mg/kg)	1	1	100	152	152	152	152	152	152	152	152	152	152
surface	Beryllium (mg/kg)	1	1	100	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
surface	Calcium (mg/kg)	1	1	100	6590 J	6590 J	6590	6590 J	6590 J	6590 J	6590 J	6590	6590 J	6590 J
surface	Cobalt (mg/kg)	1	1	100	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
surface	Iron (mg/kg)	1	1	100	32700	32700	32700	32700	32700	32700	32700	32700	32700	32700
surface	Magnesium (mg/kg)	1	1	100	5650	5650	5650	5650	5650	5650	5650	5650	5650	5650
surface	Potassium (mg/kg)	1	1	100	1340	1340	1340	1340	1340	1340	1340	1340	1340	1340
surface	Sodium (mg/kg)	1	1	100	816	816	816	816	816	816	816	816	816	816
surface	Vanadium (mg/kg)	1	1	100	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9	84.9
surface	2-Methylnaphthalene (ug/kg)	3	2	66.7	66	720	393	66	66	19 U	720	268	66	66
surface	Acenaphthene (ug/kg)	3	2	66.7	60	570	315	60	60	19 U	570	216	60	60
surface	Acenaphthylene (ug/kg)	3	2	66.7	57	2000	1030	57	57	19 U	2000	692	57	57
surface	Anthracene (ug/kg)	3	2	66.7	90	2100	1100	90	90	19 U	2100	736	90	90
surface	Fluorene (ug/kg)	3	2	66.7	56	1000	528	56	56	19 U	1000	358	56	56
surface	Naphthalene (ug/kg)	3	2	66.7	160	3000	1580	160	160	19 U	3000	1060	160	160
surface	Phenanthrene (ug/kg)	3	3	100	57	13000	4500	450	450	57	13000	4500	450	450
surface	Low Molecular Weight PAH (ug/kg)	3	3	100	57	21700	7540	873 A	873 A	57	21700	7540	873 A	873 A
surface	Dibenz(a,h)anthracene (ug/kg)	3	3	100	5 M	2700 J	934	98	98	5 M	2700 J	934	98	98
surface	Benz(a)anthracene (ug/kg)	3	3	100	40	4100 J	1490	330	330	40	4100 J	1490	330	330
surface	Benzo(a)pyrene (ug/kg)	3	3	100	51	7000 J	2520	510	510	51	7000 J	2520	510	510
surface	Benzo(b)fluoranthene (ug/kg)	3	3	100	61	2200 J	890	410	410	61	2200 J	890	410	410
surface	Benzo(g,h,i)perylene (ug/kg)	3	3	100	57	5900 J	2120	400	400	57	5900 J	2120	400	400
surface	Benzo(k)fluoranthene (ug/kg)	3	3	100	47	2400 J	929	340	340	47	2400 J	929	340	340
surface	Chrysene (ug/kg)	3	3	100	60	4200 J	1570	440	440	60	4200 J	1570	440	440
surface	Fluoranthene (ug/kg)	3	3	100	110	17000	5970	790	790	110	17000	5970	790	790
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	3	3	100	40	15000 J	5120	310	310	40	15000 J	5120	310	310
surface	Pyrene (ug/kg)	3	3	100	84	16000	5630	820	820	84	16000	5630	820	820
surface	Benzo(b+k)fluoranthene (ug/kg)	1	1	100	750 A	750 A	750	750 A	750 A	750 A	750 A	750	750 A	750 A

Table 2. Queried Sediment Chemistry Data

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	High Molecular Weight PAH (ug/kg)	3	3	100	555 M	76500 J	27200	4448 A	4448 A	555 M	76500 J	27200	4448 A	4448 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	1	1	100	5321 A	5321 A	5320	5321 A	5321 A	5321 A	5321 A	5320	5321 A	5321 A
surface	2,4'-DDD (ug/kg)	1	0	0						0.64 U	0.64 U	0.64	0.64 U	0.64 U
surface	2,4'-DDE (ug/kg)	1	0	0						4.6 U	4.6 U	4.6	4.6 U	4.6 U
surface	2,4'-DDT (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	4,4'-DDD (ug/kg)	2	1	50	4.9	4.9	4.9	4.9	4.9	0.49 U	4.9	2.7	0.49 U	0.49 U
surface	4,4'-DDE (ug/kg)	1	0	0						2.3 U	2.3 U	2.3	2.3 U	2.3 U
surface	4,4'-DDT (ug/kg)	1	0	0						1.8 U	1.8 U	1.8	1.8 U	1.8 U
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	2	1	50	4.9	4.9	4.9	4.9	4.9	2.3 U	4.9	3.6	2.3 U	2.3 U
surface	Aldrin (ug/kg)	1	0	0						0.42 U	0.42 U	0.42	0.42 U	0.42 U
surface	alpha-Hexachlorocyclohexane (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	beta-Hexachlorocyclohexane (ug/kg)	1	0	0						4.9 U	4.9 U	4.9	4.9 U	4.9 U
surface	delta-Hexachlorocyclohexane (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	gamma-Hexachlorocyclohexane (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	cis-Chlordane (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	trans-Chlordane (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	Oxychlordane (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	cis-Nonachlor (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	trans-Nonachlor (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	Dieldrin (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	alpha-Endosulfan (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	beta-Endosulfan (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	Endosulfan sulfate (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	Endrin (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	Endrin aldehyde (ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	Endrin ketone (ug/kg)	1	0	0						1.1 U	1.1 U	1.1	1.1 U	1.1 U
surface	Heptachlor (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	Heptachlor epoxide (ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	Methoxychlor (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Mirex (ug/kg)	1	0	0						2.2 U	2.2 U	2.2	2.2 U	2.2 U
surface	Toxaphene (ug/kg)	1	0	0						45 U	45 U	45	45 U	45 U
surface	2,3,4,6-Tetrachlorophenol (ug/kg)	2	0	0						96 U	98 U	97	96 U	96 U
surface	2,4,5-Trichlorophenol (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	2,4,6-Trichlorophenol (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	2,4-Dichlorophenol (ug/kg)	3	0	0						58 U	60 U	59	59 U	59 U
surface	2,4-Dimethylphenol (ug/kg)	3	0	0						20 U	59 U	45.7	58 U	58 U
surface	2,4-Dinitrophenol (ug/kg)	3	0	0						190 UJ	200 UJ	197	200 UJ	200 UJ
surface	2-Chlorophenol (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	2-Methylphenol (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	2-Nitrophenol (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	3	0	0						190 UJ	200 U	197	200 UJ	200 UJ

Table 2. Queried Sediment Chemistry Data

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	4-Chloro-3-methylphenol (ug/kg)	3	0	0						38 U	40 U	39	39 U	39 U
surface	4-Methylphenol (ug/kg)	3	1	33.3	230	230	230	230	230	19 U	230	89.7	20 U	20 U
surface	4-Nitrophenol (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	Pentachlorophenol (ug/kg)	3	1	33.3	41 M	41 M	41	41 M	41 M	19 U	99 UJ	53	41 M	41 M
surface	Phenol (ug/kg)	3	0	0						20 U	39 U	32.3	38 U	38 U
surface	2,3,4,5-Tetrachlorophenol (ug/kg)	2	0	0						96 U	98 U	97	96 U	96 U
surface	2,3,5,6-Tetrachlorophenol (ug/kg)	2	0	0						96 U	98 U	97	96 U	96 U
surface	Dimethyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	Diethyl phthalate (ug/kg)	3	1	33.3	48	48	48	48	48	20 U	48	29.3	20 U	20 U
surface	Dibutyl phthalate (ug/kg)	3	2	66.7	34	190	112	34	34	20 U	190	81.3	34	34
surface	Butylbenzyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	Di-n-octyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	3	2	66.7	84	210	147	84	84	84	210	161	190 U	190 U
surface	Azobenzene (ug/kg)	2	0	0						19 U	20 U	19.5	19 U	19 U
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	3	0	0						19 U	20 UJ	19.7	20 U	20 U
surface	2,4-Dinitrotoluene (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	2,6-Dinitrotoluene (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	2-Chloronaphthalene (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	2-Nitroaniline (ug/kg)	3	0	0						96 U	99 U	97.7	98 U	98 U
surface	3,3'-Dichlorobenzidine (ug/kg)	3	0	0						96 U	99 UJ	97.7	98 U	98 U
surface	3-Nitroaniline (ug/kg)	3	0	0						120 U	120 UJ	120	120 U	120 U
surface	4-Bromophenyl phenyl ether (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	4-Chloroaniline (ug/kg)	3	0	0						58 U	60 UJ	59	59 U	59 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	4-Nitroaniline (ug/kg)	3	0	0						96 U	99 UJ	97.7	98 U	98 U
surface	Aniline (ug/kg)	2	0	0						19 U	20 U	19.5	19 U	19 U
surface	Benzoic acid (ug/kg)	3	1	33.3	260 J	260 J	260	260 J	260 J	190 UJ	260 J	217	200 U	200 U
surface	Benzyl alcohol (ug/kg)	3	0	0						20 UJ	98 U	71.3	96 U	96 U
surface	Bis(2-chloroethoxy) methane (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	Bis(2-chloroethyl) ether (ug/kg)	3	0	0						38 U	40 U	39	39 U	39 U
surface	Carbazole (ug/kg)	3	3	100	5.4	1000 J	368	99 J	99 J	5.4	1000 J	368	99 J	99 J
surface	Dibenzofuran (ug/kg)	3	2	66.7	33	220	127	33	33	3.8 U	220	85.6	33	33
surface	Hexachlorobenzene (ug/kg)	3	0	0						0.19 U	20 U	13.4	20 U	20 U
surface	Hexachlorobutadiene (ug/kg)	3	0	0						0.54 U	39 U	19.8	20 U	20 U
surface	Hexachlorocyclopentadiene (ug/kg)	3	0	0						96 U	99 UJ	97.7	98 U	98 U
surface	Hexachloroethane (ug/kg)	3	0	0						3.8 U	20 U	9.9	5.9 U	5.9 U
surface	Isophorone (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	Nitrobenzene (ug/kg)	3	0	0						19 U	20 U	19.7	20 UJ	20 UJ
surface	N-Nitrosodimethylamine (ug/kg)	2	0	0						96 U	98 U	97	96 U	96 U
surface	N-Nitrosodipropylamine (ug/kg)	3	0	0						38 U	40 U	39	39 U	39 U
surface	N-Nitrosodiphenylamine (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U

Table 2. Queried Sediment Chemistry Data

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	1,2-Dichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	1,3-Dichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	1,4-Dichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U
surface	1,2,4-Trichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.7	20 U	20 U

SUPPLEMENTAL FIGURES

Figure 2-1. Site Plan (Bridgewater 2000)
Figure 1. Shoreline Features (Bridgewater 2001)
Figure 2-4. Columbia Forge Site Plan (Bridgewater 2000)
Figure 2-1. PA Sampling Locations (Bridgewater 2002b)
Figure 3-1. Historical Site Features (Bridgewater 2000)
Figure 3. Historical Site Features (SE/E 1988)
Figure 3-1. Black Sand Removal Areas (Bridgewater 2002a)
Figure 4-1. Post-Removal Soil Sample Locations (Bridgewater 2002a)
Figure 4-2. Post-Removal Soil Analytical Results (Bridgewater 2002a)

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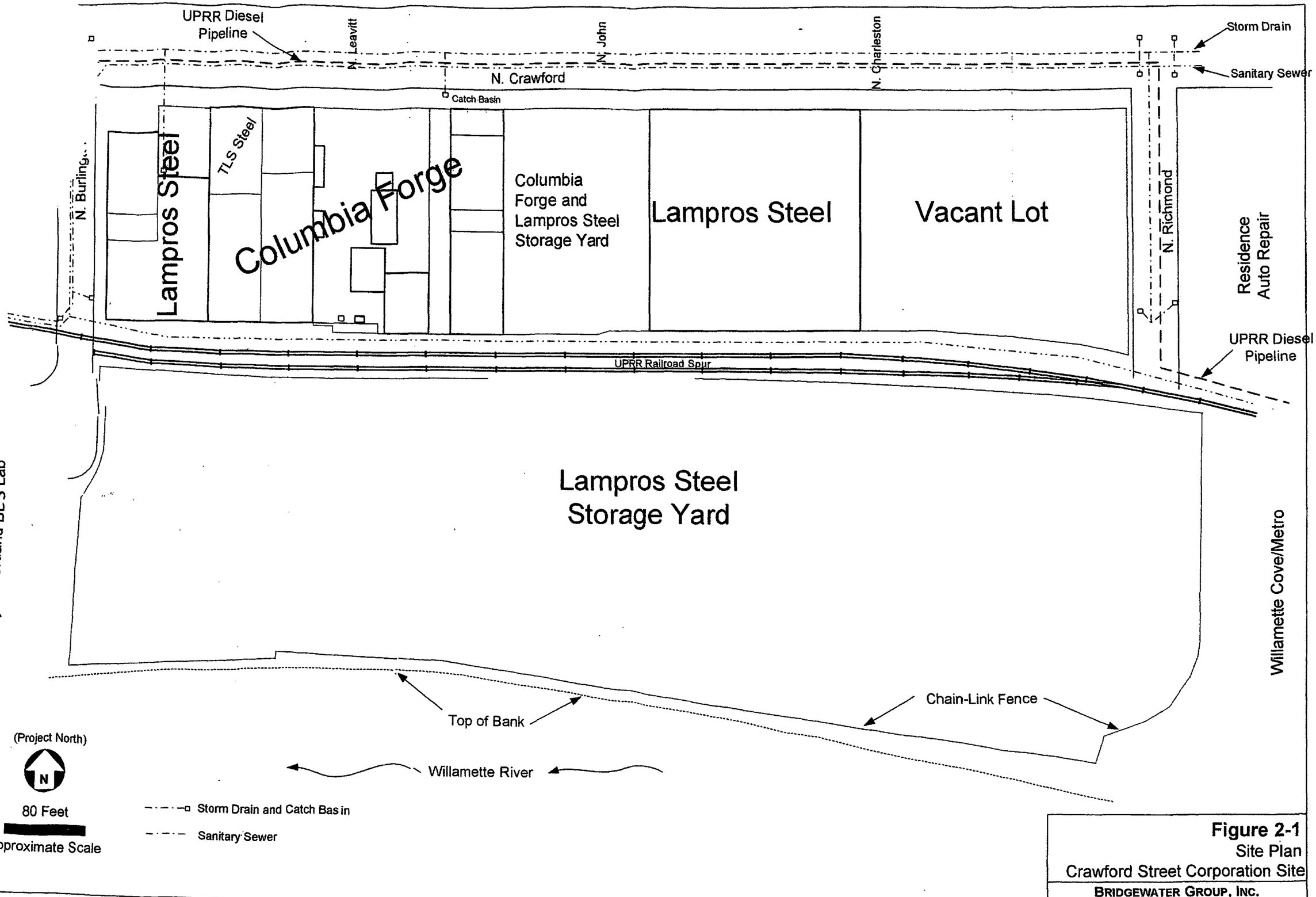


Figure 2-1
Site Plan
Crawford Street Corporation Site
BRIDGEWATER GROUP, INC.

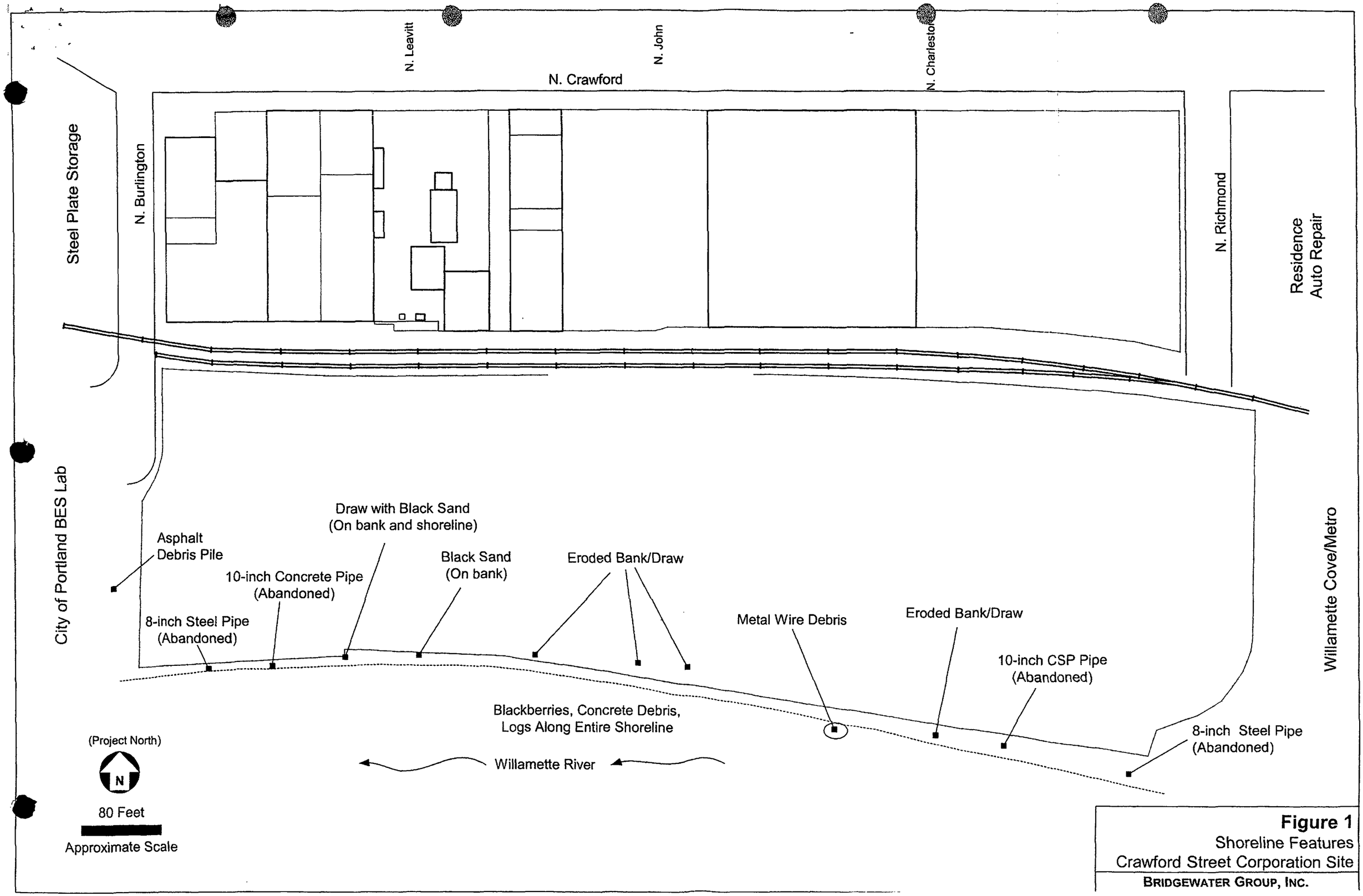


Figure 1
Shoreline Features
Crawford Street Corporation Site
BRIDGEWATER GROUP, INC.

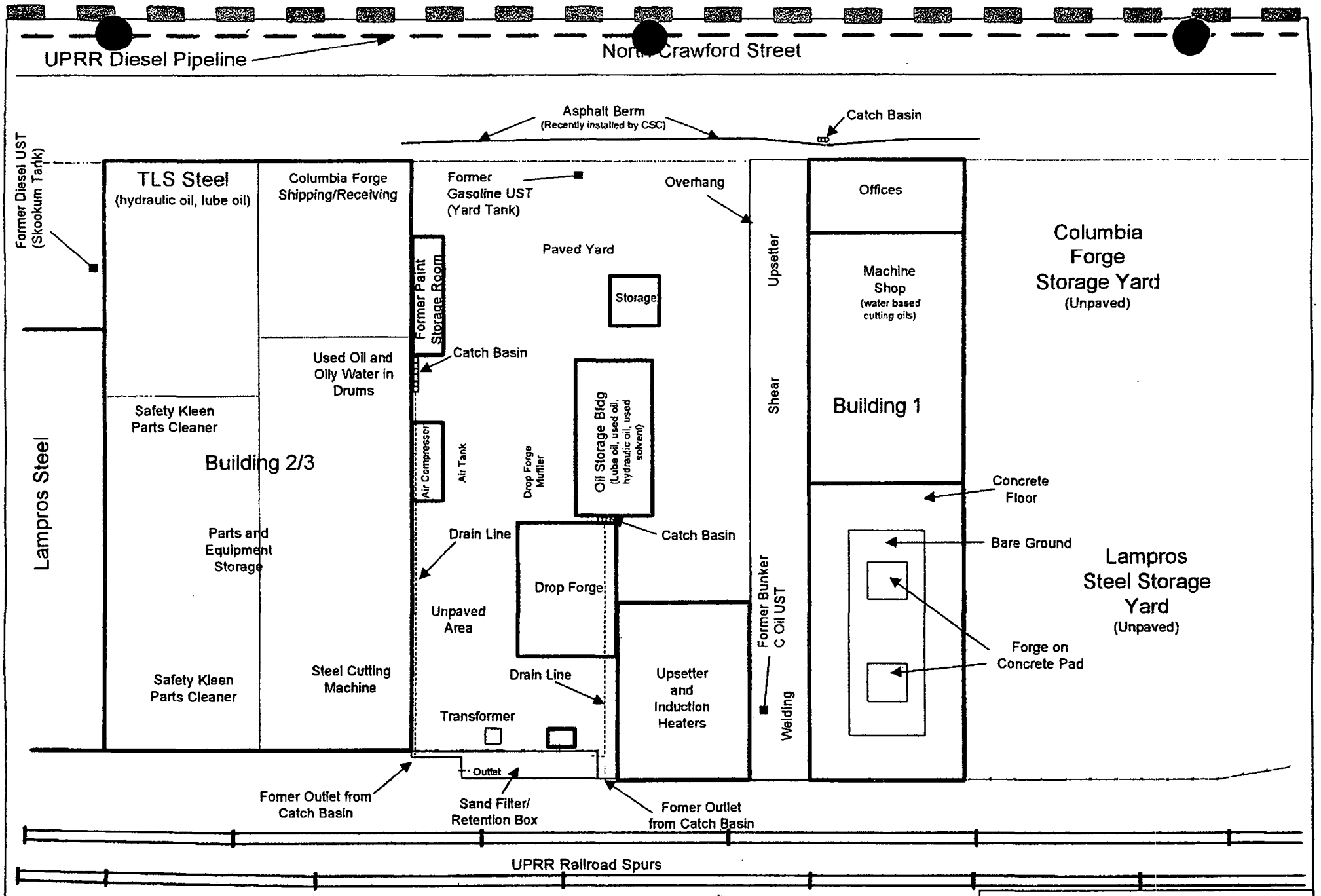


Figure 2-4
Columbia Forge Site Plan
Crawford Street Corporation Site
BRIDGEWATER GROUP, INC.

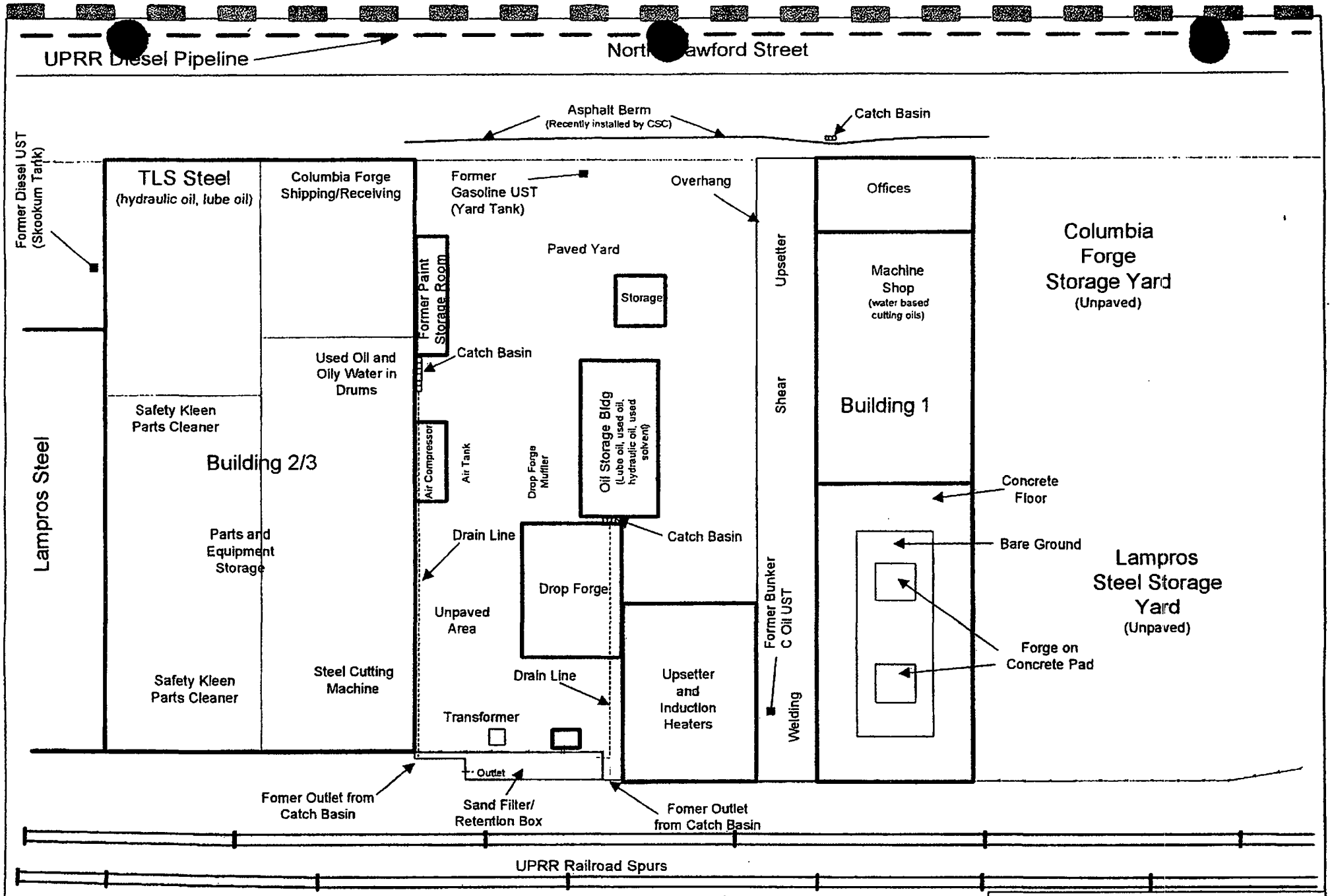


Figure 2-4
Columbia Forge Site Plan
Crawford Street Corporation Site
BRIDGEWATER GROUP, INC.

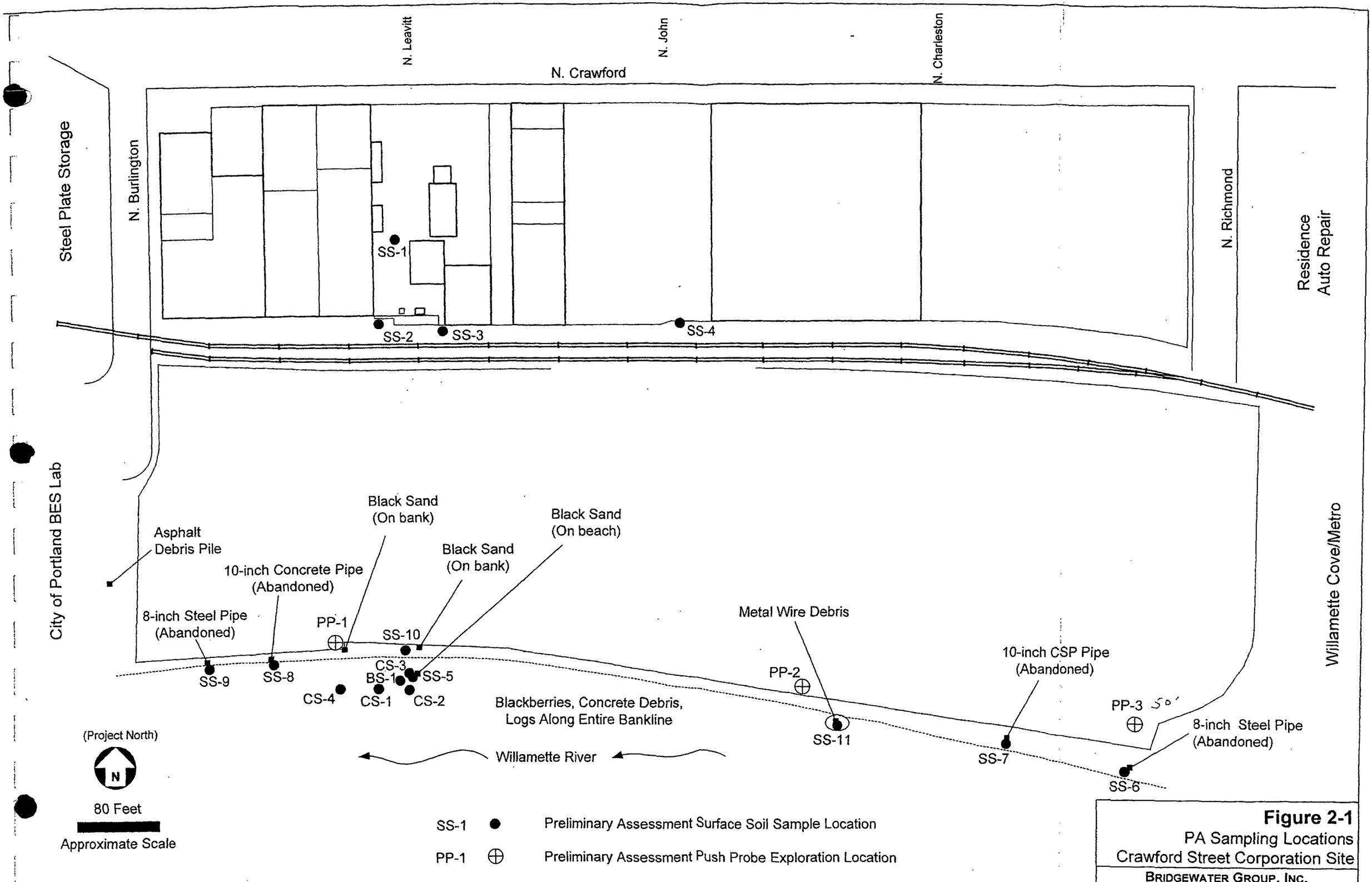


Figure 2-1
PA Sampling Locations
Crawford Street Corporation Site
BRIDGEWATER GROUP, INC.

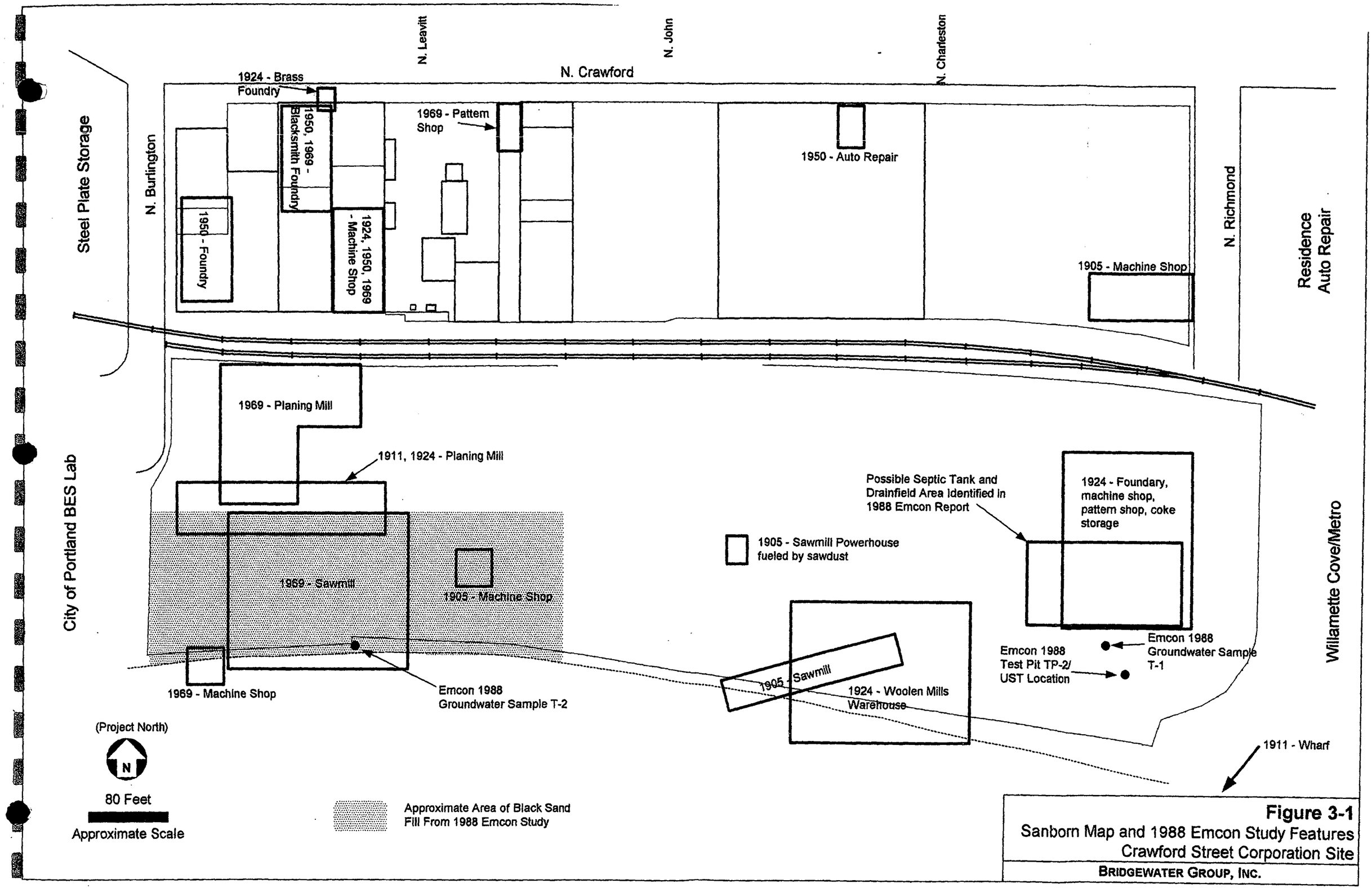
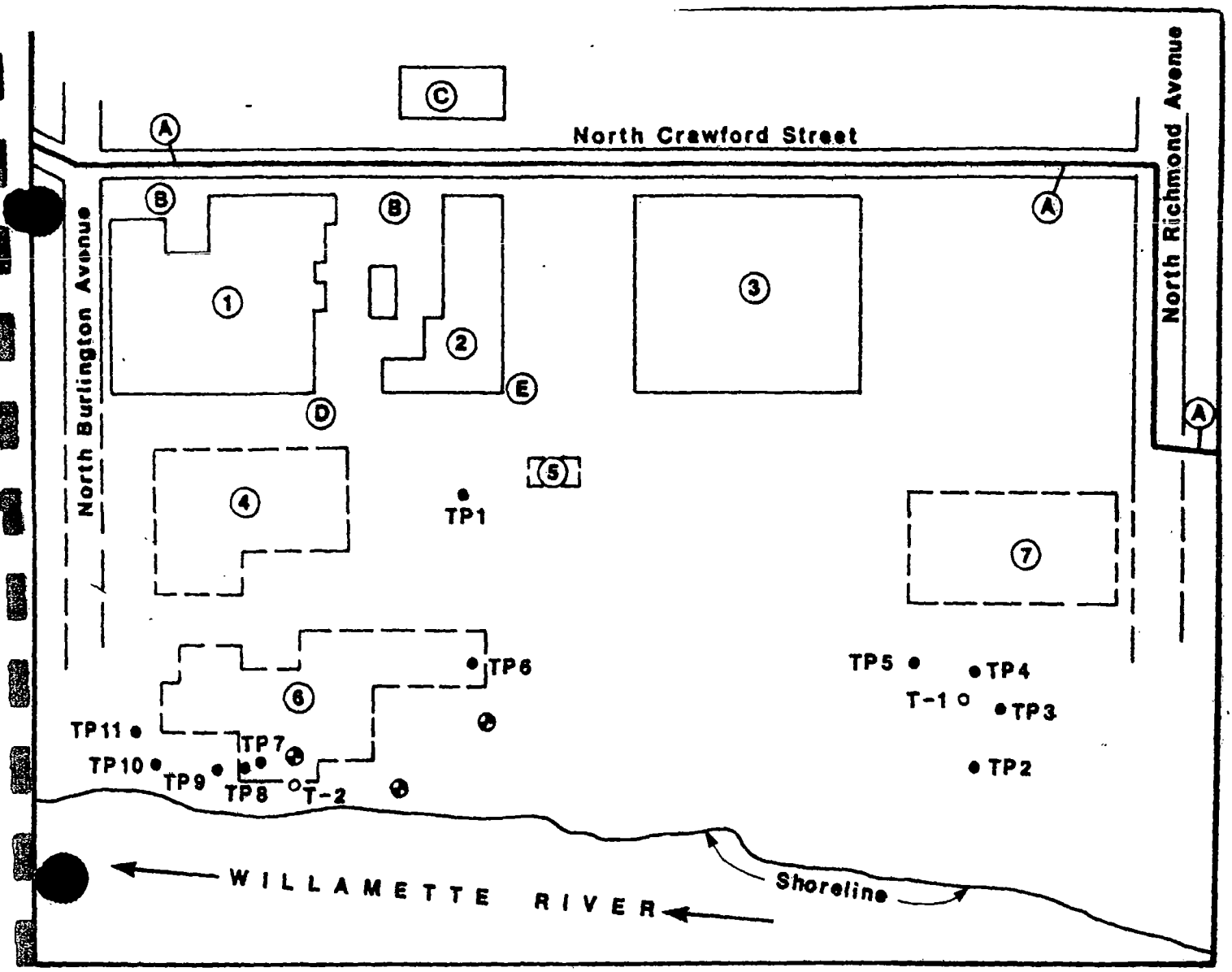


Figure 3-1
Sanborn Map and 1988 Emcon Study Features
Crawford Street Corporation Site

BRIDGEWATER GROUP, INC.



EXPLANATION

POTENTIAL OFFSITE CONTAMINANT SOURCES

- (A) 8-inch Union Pacific Railroad diesel pipeline
- (B) Former underground storage tanks
- (C) Underground storage tank and steamcleaning area, St. Johns Truck Service
- (D) Oily soil and surface water runoff
- (E) Compressor-blowdown oil, Columbia Forge

CURRENT AND FORMER (F) BUISNESS BUILDING

- (1) Skookum (F), Asset Recovery, Columbia Forge
- (2) Columbia Forge
- (3) Dry Shed (F), warehouse
- (4) Planing Mill (F)
- (5) Chip Bin (F)
- (6) Sawmill (F)
- (7) Wool Scouring (F), plywood storage (F), "Fibron Insulation" (F)

SAMPLE SITES

- Surface grab sample of sand fill. Samples composited for EP Toxicity Testing.
- ● Test Pit
- ○ Test Boring

N

0 125 250

Scale in Feet

≈ 164 ft

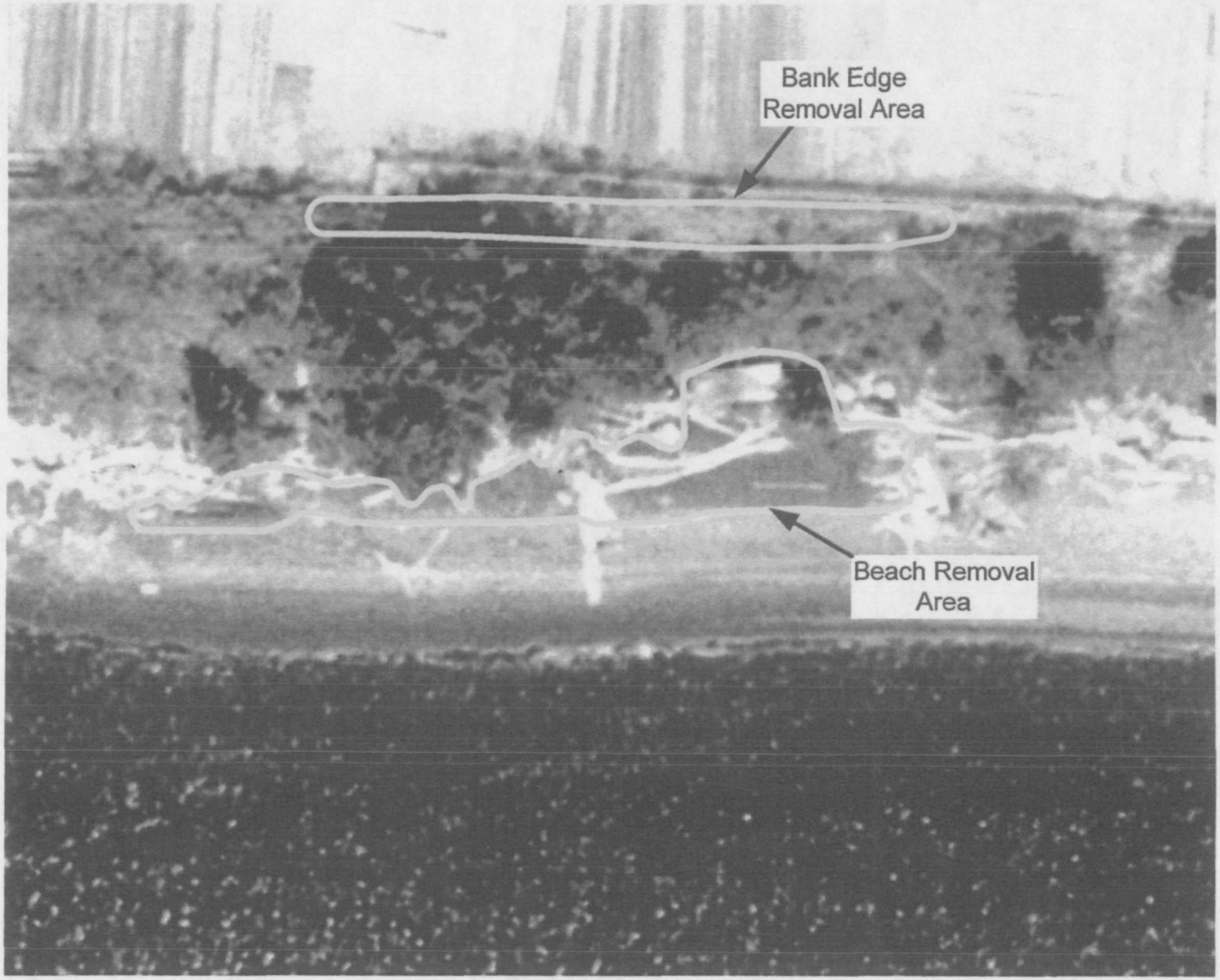
MMI (Lampros Steel Site)

Site Map

Sweet-Edwards / EMCON, Inc.

	INITIALS	DATE
DRAWN BY	jf	2/2/88
CHECKED BY		
REVISED		

Figure 3

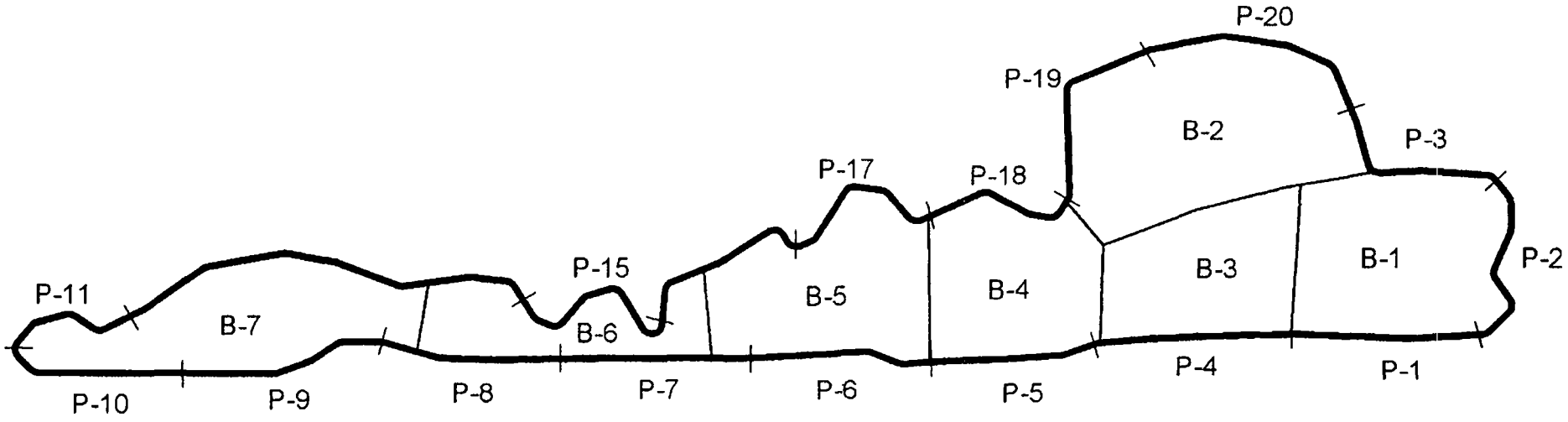


N
Project

Approximate Scale
30 feet

Figure 3-1
Black Sand Removal Areas
Crawford Street Corporation

BRIDGEWATER GROUP, INC.



B-7 Bottom Post-Removal Soil Sample Location

P-8 Perimeter Post-Removal Soil Sample Location

Approximate Scale

17 Feet

N

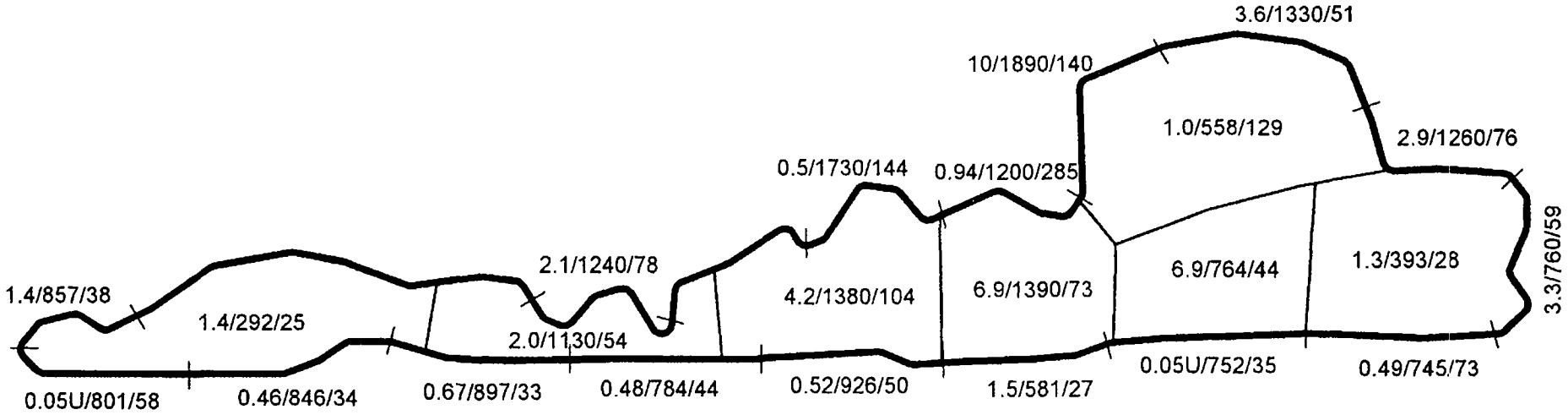
Project

See Figures 1-2 and 3-1 for orientation/location of removal area on site

Figure 4-1

Beach Removal Area Sample Locations
Crawford Street Corporation

BRIDGEWATER GROUP, INC.



0.67/897/33 Total PAH/ Copper/Nickel Concentrations in mg/kg

Approximate Scale

17 Feet

N

Project

See Figures 1-2 and 3-1 for orientation/location of removal area on site

Figure 4-2

PAH, Copper, and Nickel Concentrations in Post-Removal Soil Samples
Crawford Street Corporation

BRIDGEWATER GROUP, INC.

SUPPLEMENTAL TABLES

Table 3 and Figure 2. Historical Property Ownership (SE/E 1988)
Tables 2-1 through 2-4. Chemical Concentrations in Soil Samples (Bridgewater 2002b)
Tables 4-1 through 4-5. Concentrations in Removal Area Soil Samples (Bridgewater 2002a)

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part

TABLE 3
LIST OF PAST ONSITE PROPERTY OWNERSHIP
BY BUSINESSES

Block 1

Oregon Barrel Co., Marine Iron Works, Star Sand Co., American Marine Iron Works, Western Wool Warehouse, Portland Manufacturing Co., Portland Wood Products, Portland Woolen Mills, Lawrence Warehouse Co.

Block 2

Oregon Barrel Co., Central Lumber Co., Marine Iron Works, St. Johns Lumber Co., Marine Iron Works, American Marine Iron Works, Western Wool Warehouse, Beaver-Linnton Mills, L.B. Menefee Lumber Co., Lawrence Warehouse Co., Portland Woolen Mills, Portland Spruce Mills

Block 3

Central Lumber Co., St. Johns Lumber Co., Beaver-Linnton Mills, L.B. Menefee Lumber Co., Portland Spruce Mills, Skookum (logging equipment), Portland Lumber Co., Portland Manufacturing Co., Simpson Lumber Co.

Block 4

St. Johns Lumber Co., Beaver-Linnton Mills, Portland Lumber Mills, Portland Manufacturing Co., Portland Spruce Mills

Block 7

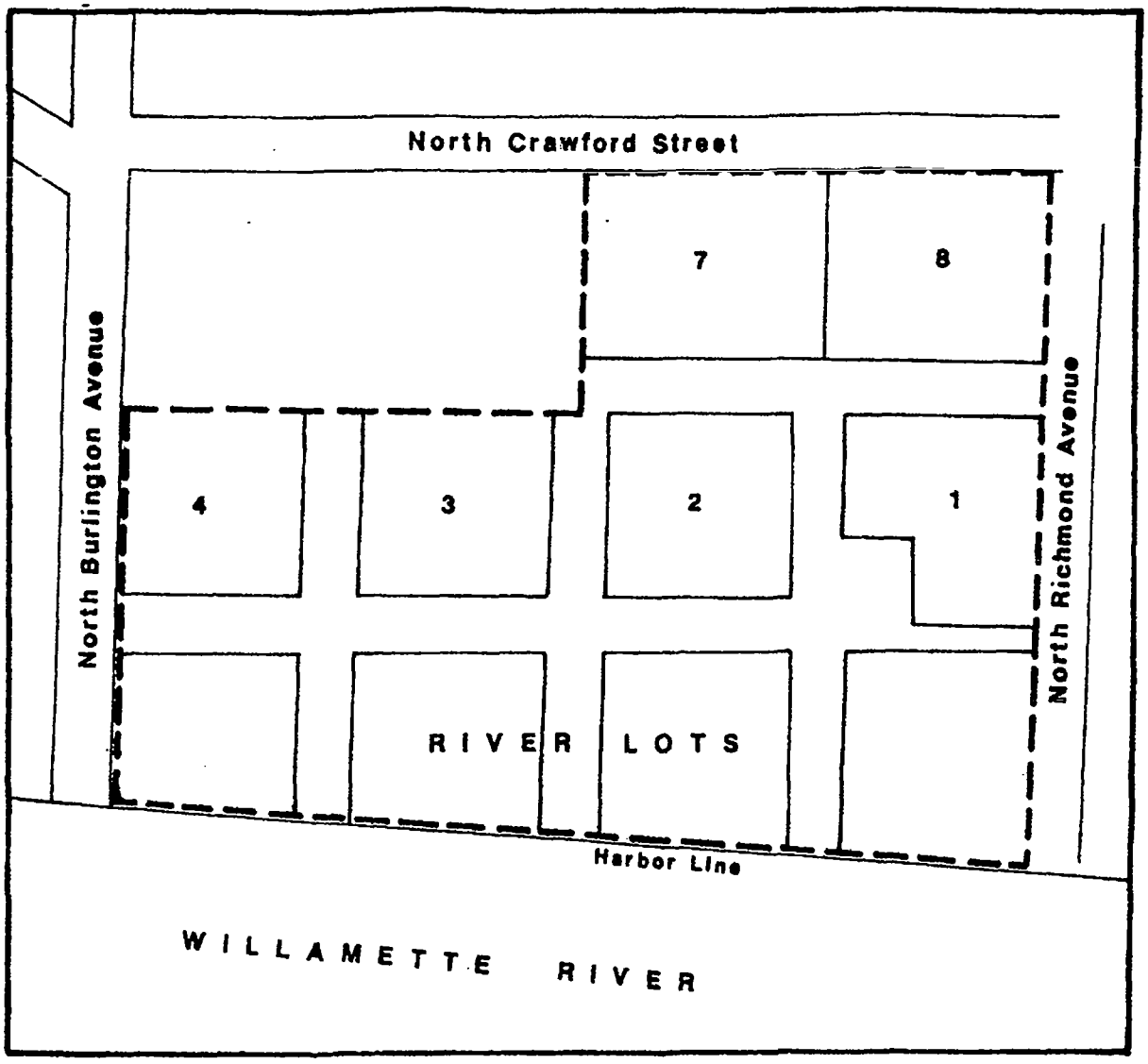
Portland General Electric, Portland Railway, Light and Power Co., Penninsula Iron Works, Portland Lumber Mills, Brand S Corp.

Block 8

Portland Steel Shipbuilding, Portland Stove and Range Manufacturing Co., Portland Lumber Mills

River Lots

Oregon Barrel Co., Central Lumber Co., Marine Iron Works, American Marine Iron Works, St. Johns Lumber Co., Western Wool Warehouse, Beaver-Linnton Mills, L.B. Menefee Lumber Co., Portland Manufacturing Co., Portland Spruce Mills, Portland Wood Products Co.



EXPLANATION

— — — Site Boundary

N

MMI (Lampros Steel Site)

Block and Lot Locations

Sweet-Edwards / EMCON, Inc.

	INITIALS	DATE
DRAWN BY	jf	2/2/88
CHECKED BY		
REVISED		

Figure 2

Table 2-1
Chemical Concentrations in Soil Samples - Petroleum Hydrocarbons
Crawford Street
All results in mg/kg

Sample	Location	Date	Sample Depth (ft)	Gasoline	Diesel	Heavy oil
SS-01	Columbia Forge Yard	4/26/2001	0.5	4 U	250 U	3130
SS-02	Railroad drainage	4/26/2001	0.5	4 U	1000 U	13500
SS-03	Railroad drainage	4/26/2001	0.5	4 U	250 U	5350
SS-04	Railroad drainage	4/26/2001	0.5	4 U	500 U	6350
PP-1-24	Waterfront boring - west	4/25/2001	24.0	4 U	25 U	50 U
PP-2-20	Waterfront boring - middle	4/24/2001	20.0	4.84	25 U	50 U
PP-3-24	Waterfront boring - east	4/24/2001	24.0	4 U	25 U	50 U
SS-06	Pipe outfall	4/24/2001	0.5	4.8	25 U	50 U
SS-07	Pipe outfall	4/24/2001	0.5	4 U	31.7	70.4
SS-09	Pipe outfall	4/24/2001	0.5	4 U	25 U	50 U
SS-05	Black sand - beach	4/24/2001	0.5	4 U	25 U	50 U
SS-10	Black sand - bank	4/26/2001	2.0	4 U	78.3	180
SS-08	Pipe outfall (black sand area)	4/24/2001	0.5	4 U	25 U	194
BS-1A	Black sand - beach	6/22/2001	0.5	NA	NA	NA
BS-1B	Black sand - beach	6/22/2001	0.5	NA	NA	NA
BS-1C	Black sand - beach	6/22/2001	0.5	NA	NA	NA
BS-1D	Black sand - beach	6/22/2001	0.5	NA	NA	NA
CS-1	Black sand - beach	7/17/2001	0.5	NA	NA	NA
CS-2	Black sand - beach	7/17/2001	0.5	NA	NA	NA
CS-3	Black sand - beach	7/17/2001	0.5	NA	NA	NA
CS-4	Black sand - beach	7/17/2001	0.5	NA	NA	NA
SS-11	Metal debris - beach	4/24/2001	0.5	NA	NA	NA

U - Not detected at noted reporting limit
NA - Not analyzed

Table 2-2
Chemical Concentrations in Soil Samples - SVOCs and PCBs
Crawford Street
All results in mg/kg

Sample	Location	Date	Sample Depth (ft)	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene	LPAHs	HPAHs	Total PAHs	PCBs
SS-01	Columbia Forge Yard	4/26/2001	0.5	0.067 U	0.067 U	0.067 U	0.067 U	0.067 U	0.123	0.0953	0.068	0.11	0.067 U	0.086	0.67 U	0.067 U	0.067 U	0.067 U	0.092		0.574	0.574	NA
SS-02	Railroad drainage	4/26/2001	0.5	0.134 U	0.134 U	0.134 U	2.68 U	0.67 U	0.67 U	0.67 U	0.67 U	2.68 U	0.67 U	1.34 U	0.67 U	0.67 U	0.134 U	0.134 U	2.68 U				NA
SS-03	Railroad drainage	4/26/2001	0.5	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U				NA
SS-04	Railroad drainage	4/26/2001	0.5	0.168 U	0.168 U	0.168 U	0.259	0.401	0.566	0.486	0.34	0.438	0.168 U	0.384	0.168 U	0.379	0.168 U	0.224	0.314	0.224	3.791	4.015	NA
PP-1-24	Waterfront boring - west	4/25/2001	24.0	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U				NA
PP-2-20	Waterfront boring - middle	4/24/2001	20.0	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U				NA
PP-3-24	Waterfront boring - east	4/24/2001	24.0	0.013 U	0.013 U	0.0134 U	0.0134 U	0.0134 U	0.0134 U	0.0134 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U	0.013 U				NA
SS-06	Pipe outfall	4/24/2001	0.5	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.334	0.33		0.33	NA
SS-07	Pipe outfall	4/24/2001	0.5	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U				NA
SS-09	Pipe outfall	4/24/2001	0.5	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U				NA
SS-05	Black sand - beach	4/24/2001	0.5	0.067 U	0.067 U	0.067 U	0.0683	0.0828	0.0811	0.0742	0.072	0.084	0.067 U	0.144	0.067 U	0.067 U	0.067 U	0.168	0.127	0.168	0.901	1.069	0.224
SS-10	Black sand - bank	4/26/2001	2.0	0.096	0.67 U	0.192	0.498	0.769	0.728	0.573	0.682	0.632	0.168	0.927	0.100	0.515	0.067 U	0.658	0.742	1.046	6.233	7.279	1.11
SS-08	Pipe outfall (black sand area)	4/24/2001	0.5	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	NA	NA	NA	NA
BS-1A	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BS-1B	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BS-1C	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BS-1D	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CS-1	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CS-2	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CS-3	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CS-4	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SS-11	Metal debris - beach	4/24/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				NA
DEQ Soil Screening Level Value				20											30		10						4
DEQ Sediment Screening Level Value				0.29	0.16	0.057	0.032	0.032		0.3	0.027	0.057	0.033	0.111	0.077	0.017	0.176	0.042	0.053	0.076	0.193	1.61	0.034
McDonald Consensus TECs (sediment)						0.0572	0.108	0.15				0.166	0.033	0.423	0.077		0.176	0.204	0.195			1.61	0.06
McDonald Consensus PECs (sediment)						0.845	1.05	1.45				1.29		2.23	0.536		0.561	1.17	1.52			22.8	0.676
NOAA SQRT TEL (sediment)							0.0317	0.0319				0.057		0.111				0.042	0.053				0.034
EPA PRG (industrial).				38000		100000	2.9	0.29	2.9		29	290	0.29	30000	33000	2.9	190		54000				1
DEQ Generic Remedy (industrial)																							7.5

U - Not detected at noted reporting limit
NA - Not analyzed

Table 2-3
Chemical Concentrations in Soil Samples - Total Metals
Crawford Street
All results in mg/kg

Sample	Location	Date	Sample Depth (ft)	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
SS-01	Columbia Forge Yard	4/26/2001	0.5	3.32	15.5	0.5 U	3.05	390	612	124	0.1 U	1240	0.5 U	1 U	0.5 U	265
SS-02	Railroad drainage	4/26/2001	0.5	1.18	10.9	0.815	0.5 U	812	136	106	0.1 U	81	0.846	1 U	0.5 U	246
SS-03	Railroad drainage	4/26/2001	0.5	1.3	18.4	0.5 U	2.43	125	247	123	0.1 U	409	0.588	1 U	0.5 U	526
SS-04	Railroad drainage	4/26/2001	0.5	0.918	9.69	0.5 U	0.814	48.7	172	184	0.136	62	0.502	1 U	0.5 U	375
PP-1-24	Waterfront boring - west	4/25/2001	24.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PP-2-20	Waterfront boring - middle	4/24/2001	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PP-3-24	Waterfront boring - east	4/24/2001	24.0	0.5 U	8.08	0.647	0.5 U	20.7	24.4	14.7	0.1 U	20.3	0.5 U	0.5 U	0.5 U	87.5
SS-06	Pipe outfall	4/24/2001	0.5	0.5 U	2.91	0.563	0.5 U	25.7	24.8	40.6	0.405	22	0.5 U	0.5 U	0.5 U	22.7 U
SS-07	Pipe outfall	4/24/2001	0.5	0.5 U	5.17	0.562	0.5 U	24.4	30.2	18.1	0.13	27.7	0.5 U	0.5 U	0.5 U	101
SS-09	Pipe outfall	4/24/2001	0.5	0.5 U	12.7	0.693	0.5 U	32.3	30.2	36.6	0.1 U	25.3	0.5 U	0.5 U	0.5 U	122
SS-05	Black sand - beach	4/24/2001	0.5	NA	NA	NA	0.5 U	202	NA	65.3	0.1 U	NA	NA	NA	NA	NA
SS-10	Black sand - bank	4/26/2001	2.0	NA	NA	NA	0.5 U	174	NA	140	0.1 U	NA	NA	NA	NA	NA
SS-08	Pipe outfall (black sand area)	4/24/2001	0.5	0.5 U	5.65	0.5 U	0.5 U	69	170	45.6	0.167	29	0.503	0.5 U	0.5 U	178
BS-1A	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	52.3	NA	NA	NA	NA	NA	NA
BS-1B	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	58.9	NA	NA	NA	NA	NA	NA
BS-1C	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	89	NA	NA	NA	NA	NA	NA
BS-1D	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	558	NA	NA	NA	NA	NA	NA
CS-1	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	42	NA	NA	NA	NA	NA	NA
CS-2	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	28	NA	NA	NA	NA	NA	NA
CS-3	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	2150	NA	NA	NA	NA	NA	NA
CS-4	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	NA	NA	26	NA	NA	NA	NA	NA	NA
SS-11	Metal debris - beach	4/24/2001	0.5	NA	12.6	NA	NA	82.7	122	29.4	NA	54.6	NA	NA	NA	209
Background Concentrations																
Clark County values (upland soil samples)					6	2	1	27	34	17	0.04	21				96
Portland Harbor values (beach samples)				5 U	5 U	0.7	0.6	41	60	30	0.1	32	15	1.4	13	118
DEQ Soil Screening Level Value				5	10	10	4	0.4	50	16	0.1	30	1	2	1	50
DEQ Sediment Screening Level Value				3	6		0.6	37	36	35	0.2	18		4.5		123
McDonald Consensus TECs (sediment)					9.79		0.99	43.4	31.6	35.8	0.18	22.7				121
McDonald Consensus PECs (sediment)					33		4.98	111	149	128	1.06	48.6				459
NOAA SQRT TEL (sediment)					5.9		0.596	37.3	35.7	35	0.174	18				123
EPA PRG (industrial)				820	2.7	2200	810	1E+05	76000	750	88	41000	10000	10000	130	10000

U - Not detected at noted reporting limit
NA - Not analyzed

Table 2-4
Chemical Concentrations in Soil Samples - TCLP Metals
Crawford Street
All results in mg/l

Sample	Location	Date	Sample Depth (ft)	TCLP Arsenic	TCLP Cadmium	TCLP Chromium	TCLP Copper	TCLP Lead	TCLP Mercury	TCLP Nickel	TCLP Zinc
SS-01	Columbia Forge Yard	4/26/2001	0.5	0.5 U	0.5 U	0.5 U	0.943	0.5 U	NA	1.07	3.22
SS-02	Railroad drainage	4/26/2001	0.5	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1.27
SS-03	Railroad drainage	4/26/2001	0.5	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1.4
SS-04	Railroad drainage	4/26/2001	0.5	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1.83
PP-1-24	Waterfront boring - west	4/25/2001	24.0	NA	NA	NA	NA	NA	NA	NA	NA
PP-2-20	Waterfront boring - middle	4/24/2001	20.0	NA	NA	NA	NA	NA	NA	NA	NA
PP-3-24	Waterfront boring - east	4/24/2001	24.0	0.5 U	NA	NA	NA	NA	NA	NA	NA
SS-06	Pipe outfall	4/24/2001	0.5	NA	NA	NA	NA	0.5 U	0.0002 U	NA	NA
SS-07	Pipe outfall	4/24/2001	0.5	0.5 U	NA	NA	NA	NA	0.0002 U	NA	NA
SS-09	Pipe outfall	4/24/2001	0.5	0.5 U	NA	NA	NA	0.5 U	NA	NA	0.765
SS-05	Black sand - beach	4/24/2001	0.5	NA	NA	0.5 U	NA	7.39	NA	NA	NA
SS-10	Black sand - bank	4/26/2001	2.0	NA	NA	0.5	NA	1.1	NA	NA	NA
SS-08	Pipe outfall (black sand area)	4/24/2001	0.5	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.0002 U	NA	1.45
BS-1A	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	16.8	NA	NA	NA
BS-1B	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA
BS-1C	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA
BS-1D	Black sand - beach	6/22/2001	0.5	NA	NA	NA	NA	NA	NA	NA	NA
CS-1	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	0.17	NA	NA	NA
CS-2	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	0.3	NA	NA	NA
CS-3	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	14.2	NA	NA	NA
CS-4	Black sand - beach	7/17/2001	0.5	NA	NA	NA	NA	0.23	NA	NA	NA
SS-11	Metal debris - beach	4/24/2001	0.5	0.5 U	NA	0.5 U	0.5 U	NA	NA	0.5 U	0.757
New Level II SLVs (freshwater/aquatic)							0.009	0.0025		0.1052	0.12

U - Not detected at noted reporting limit
NA - Not analyzed

Table 4-1
Petroleum Hydrocarbon Concentrations in Removal Area Soil Samples
Crawford Street
All results in mg/kg

Sample	Type	Gasoline	Diesel	Heavy Oil
B-1	Bottom	22.2 U	55.6 U	111 U
B-2	Bottom	22.2 U	55.6 U	111 U
B-3	Bottom	25 U	62.5 U	125 U
B-3D	Bottom	23.3 U	58.1 U	116 U
B-4	Bottom	22.5 U	56.2 U	112 U
B-5	Bottom	22 U	54.9 U	110 U
B-6	Bottom	21.7 U	54.3 U	109 U
B-7	Bottom	23.5 U	53.4	179
P-01	Perimeter	20.6 U	51.5 U	103 U
P-02	Perimeter	20.8 U	52.1 U	104 U
P-03	Perimeter	21.7 U	54.3 U	109 U
P-04	Perimeter	20.8 U	52.1 U	104 U
P-05	Perimeter	21.7 U	21.7 U	87
P-06	Perimeter	20.4 U	51 U	102 U
P-07	Perimeter	20.2 U	50.5 U	101 U
P-07D	Perimeter	20.4 U	51 U	102 U
P-08	Perimeter	20.2 U	50.5 U	101 U
P-09	Perimeter	21.5 U	21.5 U	53.8 U
P-10	Perimeter	20.4 U	51 U	102 U
P-11	Perimeter	21.3 U	21.3 U	56.9
P-15	Perimeter	20.4 U	51 U	102 U
P-17	Perimeter	20.2 U	50.5 U	101 U
P-18	Perimeter	21.5 U	53.8 U	108 U
P-19	Perimeter	20.6 U	30.1	68.6
P-20	Perimeter	21.5 U	53.8 U	108 U

U - Not detected at noted reporting limit
NA - Not analyzed

Table 4-2
PAHs Concentrations in Removal Area Soil Samples
Crawford Street
All results in mg/kg

Sample	Type	Acenaphthene (L)	Acenaphthylene (L)	Anthracene (L)	Benzo(a)anthracene (H)	Benzo(a)pyrene (H)	Benzo(b)fluoranthene (H)	Benzo(g,h,i)perylene (H)	Benzo(k)fluoranthene (H)	Chrysene (H)	Dibenzo(a,h)anthracene (H)	Fluoranthene (H)	Fluorene (L)	Indeno(1,2,3-cd)pyrene (H)	Naphthalene (L)	Phenanthrene (L)	Pyrene (H)	LPAHs	HPAHs	Total PAHs
B-1	Bottom	0.05 U	0.05 U	0.1	0.08	0.095	0.065	0.05 U	0.1	0.12	0.05 U	0.215	0.05 U	0.05 U	0.05 U	0.18	0.205	0.38	0.96	1.34
B-2	Bottom	0.05 U	0.05 U	0.05	0.07	0.095	0.06	0.095	0.09	0.11	0.05 U	0.165	0.05 U	0.055	0.05 U	0.09	0.017	0.24	0.78	1.02
B-3	Bottom	0.105	0.055	0.575	0.405	0.495	0.315	0.295	0.435	0.48	0.09	1.06	0.2	0.235	0.14	1.04	1.01	2.12	4.82	6.94
B-3D	Bottom	0.105	0.065	0.51	0.5	0.585	0.385	0.47	0.645	0.595	0.05 U	1.21	0.17	0.35	0.09	1.04	1.54	1.98	6.31	8.29
B-4	Bottom	0.095	0.055	0.445	0.435	0.525	0.37	0.345	0.485	0.545	0.1	1.04	0.17	0.275	0.085	0.925	1	1.78	5.12	6.90
B-5	Bottom	0.075	0.05 U	0.225	0.24	0.28	0.205	0.245	0.275	0.305	0.065	0.69	0.11	0.19	0.055	0.64	0.585	1.13	3.08	4.21
B-6	Bottom	0.05 U	0.05 U	0.13	0.115	0.175	0.115	0.165	0.155	0.165	0.05 U	0.265	0.05 U	0.105	0.05 U	0.205	0.28	0.44	1.57	2.00
B-7	Bottom	0.05 U	0.05 U	0.05	0.08	0.135	0.09	0.165	0.105	0.12	0.05 U	0.16	0.05 U	0.1	0.05 U	0.08	0.185	0.23	1.17	1.40
P-01	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.065	0.05 U	0.05 U	0.05 U	0.05 U	0.07	0.15	0.34	0.49
P-02	Perimeter	0.05 U	0.05 U	0.13	0.22	0.23	0.18	0.18	0.215	0.285	0.05 U	0.605	0.05 U	0.13	0.05 U	0.46	0.515	0.69	2.59	3.28
P-03	Perimeter	0.05 U	0.05 U	0.205	0.19	0.21	0.155	0.05 U	0.23	0.26	0.05 U	0.47	0.05	0.05 U	0.05 U	0.385	0.54	0.72	2.13	2.85
P-04	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
P-05	Perimeter	0.05 U	0.05 U	0.18	0.085	0.08	0.055	0.05 U	0.09	0.115	0.05 U	0.25	0.05 U	0.05 U	0.05 U	0.25	0.25	0.53	1.00	1.53
P-06	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.07	0.05 U	0.05 U	0.05 U	0.05	0.07	0.18	0.34	0.52
P-07	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05	0.05 U	0.05 U	0.05 U	0.05	0.055	0.18	0.31	0.48
P-07D	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.065	0.05 U	0.05 U	0.05 U	0.05	0.08	0.18	0.35	0.52
P-08	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05	0.05 U	0.11	0.05 U	0.05 U	0.05 U	0.09	0.115	0.22	0.45	0.67
P-09	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05	0.05 U	0.05 U	0.05 U	0.05 U	0.06	0.15	0.31	0.46
P-10	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
P-11	Perimeter	0.05 U	0.05 U	0.07	0.075	0.14	0.11	0.05 U	0.085	0.15	0.05 U	0.195	0.05 U	0.05 U	0.05 U	0.145	0.26	0.32	1.09	1.41
P-15	Perimeter	0.05 U	0.05 U	0.21	0.11	0.115	0.07	0.05 U	0.145	0.145	0.05 U	0.31	0.065	0.05 U	0.06	0.29	0.415	0.68	1.39	2.06
P-17	Perimeter	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.065	0.05 U	0.05 U	0.05 U	0.05 U	0.08	0.15	0.35	0.50
P-18	Perimeter	0.05 U	0.05 U	0.05	0.055	0.065	0.05	0.05 U	0.085	0.075	0.05 U	0.135	0.05 U	0.05 U	0.05 U	0.085	0.16	0.24	0.70	0.94
P-19	Perimeter	0.075	0.085	0.5	0.6	0.885	0.56	0.69	0.78	0.845	0.05 U	1.49	0.15	0.47	0.095	0.795	2.06	1.70	8.41	10.11
P-20	Perimeter	0.065	0.05 U	0.16	0.195	0.275	0.21	0.275	0.285	0.245	0.05 U	0.49	0.09	0.185	0.05 U	0.475	0.57	0.84	2.76	3.60
DEQ Sediment Screening Level Value		0.29	0.16	0.057	0.032	0.032		0.3	0.027	0.057	0.033	0.111	0.077	0.017	0.176	0.042	0.053	0.076	0.193	1.61
McDonald Consensus PECs				0.845	1.05	1.45				1.29		2.23	0.536		0.561	1.17	1.52			22.8

U - Not detected at noted reporting limit
NA - Not analyzed

Table 4-3
PCB Concentrations in Removal Area Soil Samples
Crawford Street
All results in mg/kg

Sample	Type	PCBs
B-1	Bottom	0.05 U
B-2	Bottom	0.05 U
B-3	Bottom	0.05 U
B-3D	Bottom	0.05 U
B-4	Bottom	0.05 U
B-5	Bottom	0.05 U
B-6	Bottom	0.05 U
B-7	Bottom	0.05 U
P-01	Perimeter	0.05 U
P-02	Perimeter	0.05 U
P-03	Perimeter	0.05 U
P-04	Perimeter	0.05 U
P-05	Perimeter	0.05 U
P-06	Perimeter	0.05 U
P-07	Perimeter	0.05 U
P-07D	Perimeter	0.05 U
P-08	Perimeter	0.05 U
P-09	Perimeter	0.05 U
P-10	Perimeter	0.05 U
P-11	Perimeter	0.05 U
P-15	Perimeter	0.05 U
P-17	Perimeter	0.05 U
P-18	Perimeter	0.05 U
P-19	Perimeter	0.05 U
P-20	Perimeter	0.05 U

DEQ Sediment Screening Level Value	0.034
McDonald Consensus PECs	0.676

U - Not detected at noted reporting limit
NA - Not analyzed

Table 4-4
Total Metals Concentrations in Removal Area Soil Samples
Crawford Street
All results in mg/kg

Sample	Type	Chromium	Copper	Lead	Mercury	Nickel	Zinc
B-1	Bottom	50.8	396	46.5	0.1 U	28.1	152
B-2	Bottom	75.9	558	1890	0.21	129	262
B-3	Bottom	99.3	764	240	0.1 U	44.4	282
B-3D	Bottom	100	968	84.6	0.12	67.3	384
B-4	Bottom	139	1390	265	0.1 U	72.8	302
B-5	Bottom	144	1380	45.6	0.1 U	104	246
B-6	Bottom	79.2	1130	36.3	0.1 U	54	183
B-7	Bottom	33.2	292	30.6	0.1 U	24.5	132
P-01	Perimeter	104	745	20.5	0.1 U	73.1	107
P-02	Perimeter	92.7	760	48.3	0.1 U	59.2	157
P-03	Perimeter	137	1260	404	0.1 U	75.9	279
P-04	Perimeter	95.5	752	14.4	0.1 U	34.6	94.7
P-05	Perimeter	61.1	581	50.7	0.1 U	26.9	139
P-06	Perimeter	111	926	20.5	0.1 U	50.2	102
P-07	Perimeter	89.6	784	18.5	0.1 U	43.7	111
P-07D	Perimeter	86.5	718	13.9	0.1 U	34.9	106
P-08	Perimeter	98.6	897	11.6	0.1 U	33.4	98.6
P-09	Perimeter	84.2	846	15.4	0.1 U	34.1	103
P-10	Perimeter	111	801	14.3	0.1 U	58.3	101
P-11	Perimeter	87.4	857	48.5	0.1 U	37.6	111
P-15	Perimeter	120	1240	26.1	0.1 U	77.8	146
P-17	Perimeter	116	1730	55.9	0.1 U	144	167
P-18	Perimeter	101	1200	3130	0.1 U	285	314
P-19	Perimeter	179	1890	656	0.1 U	140	312
P-20	Perimeter	142	1330	434	0.1 U	50.8	269
DEQ Sediment Screening Level Value		37	36	35	0.2	18	123
McDonald Consensus PECs		111	149	128	1.06	48.6	459

U - Not detected at noted reporting limit
NA - Not analyzed

Table 4-5
TCLP Lead Concentrations in Removal Area Soil Samples
Crawford Street
All results in mg/l

Sample	Type	TCLP Lead
B-1	Bottom	NA
B-2	Bottom	23
B-3	Bottom	0.06
B-3D	Bottom	NA
B-4	Bottom	NA
B-5	Bottom	NA
B-6	Bottom	NA
B-7	Bottom	NA
P-01	Perimeter	NA
P-02	Perimeter	NA
P-03	Perimeter	1.27
P-04	Perimeter	NA
P-05	Perimeter	NA
P-06	Perimeter	NA
P-07	Perimeter	NA
P-07D	Perimeter	NA
P-08	Perimeter	NA
P-09	Perimeter	NA
P-10	Perimeter	NA
P-11	Perimeter	NA
P-15	Perimeter	NA
P-17	Perimeter	NA
P-18	Perimeter	3.9
P-19	Perimeter	NA
P-20	Perimeter	NA

U - Not detected at noted reporting limit
NA - Not analyzed

Equilon Property

(Equilon Terminal Sales & Marketing / Equilon Pipeline Containment)

EQUILON PROPERTY
CSM Site Summary

EQUILON PROPERTY

EQUILON TERMINAL SALES & MARKETING

Oregon DEQ ECSI #: 169

3800 NW St. Helens Rd.
DEQ Site Mgr: Matt McClincy
Latitude: 45.5503°
Longitude: -122.72°
Township/Range/Section: 1N/1E/19

EQUILON PIPELINE CONTAINMENT

Oregon DEQ ECSI #: 2117

4500 NW Front Ave. (Block)
DEQ Site Mgr: Matt McClincy
Latitude: 45.5528°
Longitude: -122.7222°
Township/Range/Section: 1N/1E/19

River Mile: 8.8 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Equilon Enterprises Terminal (the Terminal) to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

The Terminal (upland) is located 0.4 miles from the river and it is unlikely that transport mechanisms such as overland flow including soil erosion or migration of soil particulate (dust) would result in significant migration at the site. However the site drainage structure is conducive for the migration of contaminants to the river either through stormwater sheet runoff or discharge of potentially contaminated groundwater (SECOR 2001).

1.2. Riverbank Erosion

The riverbank in the vicinity of the dock is composed of fill materials deposited there sometime after 1936 (DEQ 1999). According to Figure 2-3 of Appendix B (Ecological Risk Assessment Approach) of the Portland Harbor Work Plan (Integral et al. 2004), the bank in the vicinity of Equilon's dock is described as a river beach. Evidence of bank erosion is unknown.

1.3. Groundwater

The historic wooden flume located beneath the Terminal and utilities located beneath Front and Yeon Avenues have been identified as potential preferential pathways. The DEQ has determined that additional investigation is required to evaluate these potential preferential pathways and

determine whether the identified petroleum hydrocarbon plumes at the Terminal and the pipeline corridor reach the Willamette River (DEQ 2004a,b).

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

The Equilon facility includes a dock on the Willamette where petroleum products are transferred from vessels to an underground pipeline corridor that extends upgradient beneath the Gunderson property to the main bulk petroleum facility. As described in Section 8.3 below, several spills have occurred overwater during product transfer operations.

Stormwater runoff from tank farms, loading rack operations, and tank-bottom draw for water accumulation in the ASTs is collected and routed through an oil/water separator and carbon treatment system. The treated water is discharged to the City of Portland sewer system and eventually discharges to the river at City outfall #18.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Equilon dock and loading area is located along the west side of the river at approximately RM 8.7. It is surrounded by property owned by Gunderson. The river in this area is widening and the offshore channel environment is depositional based on the site physical information compiled in the Programmatic Work Plan (Integral et al. 2004). The Sediment Trend Analysis® (STA) results suggest that that the nearshore area off of the dock and loading area is one of dynamic equilibrium (i.e., sediment moving into and out of the area without a net loss or gain) downstream. The STA® data indicate that the offshore center and eastern portion of the reach is depositional. The time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) support the STA® results, showing that the nearshore area above the –20 ft NAVD88 contour along the Equilon dock shows either no change or small-scale sediment erosion or deposition. Net sediment accumulation is evident offshore (i.e., beyond the –25 ft out to the –40 ft NAVD88 contour). Periodic monitoring from July 2002 to January 2004 of beach at the Equilon site at elevations of +7, +9, and +14 ft (NAVD88) show variable results (Anchor 2004). The low stake, +7, shows net erosion of about 18 cm over the measurement period; this is consistent with the nearshore bathymetric change data. The middle stake, +9, showed two cycles of sediment accretion (up to 20 cm) in the summer/fall followed by erosion back to the baseline level in the winter/spring periods. The high stake, +14, showed little change through December 2002 and then small-scale erosion (8 cm) through the remainder of the observation period (to January 2004).

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Sources: DEQ 1999, 2004

Activity		Date(s)/Comments
PA/XPA	☒	PA equivalent (Terminal) – 9/28/1992 PA equivalent (pipeline)– 4/22/1999
RI	☒	Uplands RI – 8/31/1995 (GTI 1994) RI (primary action)-Includes both sites (terminal and pipeline) –

		8/16/2000 (started) (SECOR 2001)
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☒	Under Fed. Program-Terminal 8/23/1984

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Not ranked

4. SITE OWNER HISTORY

Sources: SECOR 2001, DEQ 2004

Owner/Occupant	Type of Operation	Years
Equilon Enterprises, LLC (Equilon)	Storage/distribution of gasoline, diesel and ethanol	1998 - present
Texaco Refining/Marketing, Inc	Storage/distribution of petroleum, bunker fuel, jet fuel, and lubrication oil	1928 - 1998
California Petroleum	Construction of facility	1926 - 1928

5. PROPERTY DESCRIPTION

Equilon Enterprises, LLC (formerly Texaco) Terminal (Terminal) is located primarily in an industrial area approximately 0.4 miles upland from the Equilon's loading dock. The dock structure is located along the Willamette River adjacent to RM 8.7. Fuel transfer pipelines connect to the Terminal through a corridor that the extends north from the Terminal beneath Yeon Street, the UPRR yard, Front Street, and the Gunderson facility to a loading dock on the south bank of the river. Land use within 0.5 miles of the site is zoned industrial/moderately dense commercial. There are no residences within 1,000 feet of the site. Forest Park is located 0.25 mile southwest and upgradient from the site.

The topography in the immediate vicinity of the Terminal slopes northeast at approximately 0 to 3 percent toward the Willamette River. The downgradient land use is industrial (Palagyi 1999). The Terminal is bordered by Christenson Oil (petroleum distributor) to the south, McWhorter facility (paint/varnishing manufacturing plant) to the northeast, American Steel, LLC (steel production plant) to the east, Union Pacific Railroad yard to the north, and NW Express Avenue to the west (SECOR 2001, DEQ 2004a).

Terminal Area

The upland Terminal area occupies approximately 18.8 acres and is divided into five areas: offices, maintenance facilities, truck loading rack, west tank farm, and the east tank farm [see Supplemental Figure 3 from SECOR (2000)]. A concrete fire-containment wall encircles each tank farm. The west tank farm contains four aboveground storage tanks (ASTs), three gasoline tanks, and an ethanol tank that is enclosed with a secondary containment wall made of concrete. The ethanol AST is also unlike the other ASTs in that this tank rests on an impervious plastic liner. The east tank farm contains 11 ASTs, three slop-oil tanks, seven diesel tanks, and one gasoline tank (SECOR 2001).

Three underground storage tanks (USTs) are also located on the Terminal property adjacent to the truck loading racks. The 1,000-gallon double-walled fiberglass tank (installed in 1993) stores slop/oil water mixtures. A 1,000-gallon vapor knock-out tank and a 10,000-gallon oil/water spill tank are unregulated because they are a process flow-through tank and part of a wastewater collection system, respectively (SECOR 2001).

A large oil/water separator (OWS), estimated capacity of 84,000 gallons, is located in the north-central area of the property. The OWS receives stormwater runoff from the tank farms and tank bottom draw for water accumulation in the ASTs. The discharge from the OWS empties into a drainage culvert where the culvert enters the property at the south (i.e., beneath St Helens Road), then crosses between the west and east tank farms, and exits the site near the OWS [see Supplemental Figure 3 from SECOR (2000)]. The culvert ultimately discharges to the Willamette River through the City of Portland storm sewer system. The culvert was revamped in 1993 with 48-inch diameter, high-density, polyethylene plastic; however, prior to this construction the culvert consisted of an open timber-lined flume.

Pipeline Corridor

A pipeline corridor is located between the Terminal facility and the dock, as shown in Supplemental Figure 2 from SECOR (2000). The corridor is approximately 4 to 6 feet below ground surface, and containment channels or concrete culverts have been constructed along the length of this corridor in various sites to increase the structural integrity of the containment walls for countering effects from surface loads. There are twelve pipelines in the containment, five of which are active. These five pipelines include two 8-inch diameter gasoline pipelines, one 12-inch diameter diesel pipeline, one 6-inch diameter diesel pipeline, and one 6-inch-diameter slop oil/water return pipeline (SECOR 2001).

Dock Area

According to DEQ (1999), aerial photographs from 1936 show that the dock extended about 550 feet from the bank. Since that time the shoreline has been filled and now the dock is approximately 200 feet from the bank. The dock layout is L-shaped, with about 400 feet of berthing length at the dock pier head. According to the Multnomah County Assessors office, Equilon Enterprises owns the triangular-shaped section of land adjacent to the north side of the dock. No information on this parcel is provided in the reports referenced.

Equilon Enterprises applied for a temporary use permit from the Oregon Division of State Lands in 2002 to replace the existing timber fending system with pipe pile fenders; to furnish new pipe pile for the pier head, deck piping, and mooring dolphin walkway; to furnish new structural framing for approach deck; and to install a new equipment platform. A diagram showing these upgrades is attached (see Marine Unloading Dock Application for Permit). It is not known if these upgrades have been completed.

6. CURRENT SITE USE

Equilon Enterprises, LLC, owns the former Texaco Bulk Terminal and Pipeline and currently operates it as Shell Oil. The site occupies approximately 9.8 acres including a bulk terminal, a fuel dock on the Willamette River, and a pipeline connecting the dock and bulk terminal. The Terminal stores and distributes petroleum products (diesel, gasoline, ethanol). The product is received at the Terminal by barge delivery or from two large underground pipelines owned by Olympic Pipe Line Company. Pipelines that feed the Terminal are part of a trunk line that is located at NW Yeon Avenue. The stored petroleum product is transferred into tank trucks or barges by a dedicated underground pipeline system that is associated with the loading racks or dock facility (e.g., pipelines connecting the Terminal to the dock on river), respectively.

The DEQ identified the site as a high priority during its review of sites that have a potential impact or have impacted the Portland Harbor section of the Willamette River. Equilon entered into a voluntary agreement with DEQ on August 16, 2000, to perform a remedial investigation of the facility and implement any necessary source control measures. Equilon has independently conducted considerable investigation and cleanup of releases at the bulk terminal and along the pipeline on the Gunderson property. DEQ approved a work plan to perform the pre-remedial investigation assessment in September 2001, and a remedial investigation is currently ongoing (DEQ 2004a).

7. SITE USE HISTORY

The site was constructed in 1926 and has been used for bulk petroleum storage since that time. California Petroleum operated the site for two years before Texaco purchased the property in 1928. In 1998, ownership and operation of the property transferred to Equilon. In 2002, Shell Oil Products assumed ownership and operation of the property.

Bunker C fuel was stored on the property using ASTs (east tank farm) until 1984, at which time maintenance and storage operations for this product were terminated along with the removal of the truck loading rack.

Lubricating oil was stored on the property using ASTs (east tank farm) until 1985, at which time the lubricant storage operation was relocated to Seattle, Washington. The ASTs used to store this product were dismantled at the time of terminating the maintenance and storage operations. Containerized lubricating oil was also stored on property that had been previously own by Texaco. Six acres along the southeast property boundary were sold to American Steel, LLC in 1986, including a storage building for maintaining lube oil.

Drum cleaning operations were also performed in a building that no longer exists on the property (i.e., the southern corner of the east tank farm). This drum maintenance building was included in the transfer of the previously mentioned six acres. At that time the recovered product and rinse water from the drum cleaning operations were added to the bunker fuel being stored on site. This activity was terminated in 1984.

Jet fuel was stored on the property using ASTs (east tank farm) until 1987, when the distribution of jet fuel was terminated.

In 1983, Texaco initiated an investigation in response to the discovery of a hydrocarbon sheen on surface waters of the drainage ditch sited adjacent to the OWS. Groundwater monitoring identified the presence of phase-separated hydrocarbons (constituents ranging from No.2 diesel to No. 2 fuel oil) down to about 14 feet below grade surface. The variations in element results indicate 2 or more historical spills have occurred in the vicinity since the line-leak tests conducted concurrent with the investigation did not identify a source (spring 1983/84). Nonetheless, approximately 30,000-gallons of phase-separated hydrocarbons were estimated to be associated with soils based on penetration depth measurements. A recovery well was installed in November 1983. Groundwater monitoring provided data on the effectiveness of extraction activities such as, an estimated total volume of 31,231 gallons of phase-separated hydrocarbons were recovered from December 1983 to 1986 (GTI 1994).

In 1998, a trenching contractor accidentally ruptured one of the pipelines within the corridor, releasing over 300 gallons of bunker fuel to the ground. A soil and groundwater investigation was subsequently performed to evaluate petroleum hydrocarbon contamination around the pipelines located under the Gunderson facility. Gasoline-range contamination was detected in soils and groundwater. However, it was not clear if the pipeline was the only source of the petroleum detected in the soil and groundwater or if the contamination had reached the Willamette River. Equilon has since constructed a soil vapor extraction and air-sparge system on the Gunderson property to remediate the soil and groundwater from the pipeline release (DEQ 2004a).

The report of gasoline vapors coming from sewer lines and near the vicinity of Gunderson's parking lot initiated a request from DEQ to propose additional source control measures to aid in the capture and removal of LNAPL (light non-aqueous phase liquid) seepage onsite (DEQ fact sheet). Prior to 2000, the history of control measures include several system upgrades to alleviate malfunctions in the treatment system such as, replacement of pumps, meters and sensors, upgrading of piping, and installation of new electrical service. Focused petroleum hydrocarbon sampling beyond the north property boundary was also proposed in a *Pre-remedial Investigation Assessment Workplan* (SECOR 2001) to re-evaluate the effectiveness of remedial actions.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of the historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

Historic petroleum product releases have occurred from activities such as tank and pipeline flushing/cleaning, load rack drain maintenance, sand blasting ASTs, and importing/exporting fuel. Product releases also include malfunctions in the OWS (e.g., release of separate phase hydrocarbons). Sludge and residual products from these activities were discharged onto unpaved surfaces and included grounds adjacent to ASTs and the drainage ditch running through the Terminal facility. The pipeline corridor represents a current potential source area (SECOR 2001). Some areas have been assessed and remediated, but the areas beneath the UPRR rail lines and Gunderson building have not (SECOR 2001).

Significant portions of the shoreline area were filled sometime after 1936, and DEQ suspects that the fill may have covered contaminated sediment (DEQ 1999).

Subsurface soil and groundwater contain hydrocarbons, lead, and solvent constituents as a result of historical releases in the general vicinity of the diesel storage area (east tank farm), gasoline tank and loading rack, and the boiler and pump buildings. There is a potential for releases of petroleum from the facility to reach the Willamette (DEQ 1999).

8.2. Overwater Activities

☒ Yes ☐ No

Petroleum products have been loaded and unloaded on the dock since 1926 (see Section 8.3). The dock is currently active and represents a current potential source area (SECOR 2001).

8.3. Spills

Known or documented spills at the Equilon Enterprises site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
1/8/04	Gas, water, diesel	Unknown	Soil	Yes
6/12/99	Diesel	175	Containment area	Yes
1999	Bunker C (residuals)	300	Subsurface	Yes
1998	Diesel	2	Stormwater system	Yes
2/14/96	Petroleum fuel	82	Containment area	Yes
1996	Gasoline/Diesel	4	Marine loading facility	Yes
1994	Diesel	2	Overwater	Yes
1993	Diesel	100	Unpaved surface	Yes
1992	Diesel	25	Overwater	Yes
1989	Diesel	20	Overwater	Yes
1988	Diesel	200	Overwater	Yes
1983	Diesel	30,000	Unpaved surface	Yes

9. PHYSICAL SITE SETTING

Information regarding the geology and hydrogeology of the Terminal and pipeline corridor was available from the pre-remedial investigation assessment work plan (SECOR 2001). Several phases of investigation have been conducted at both of these areas starting as early as 1983. Several investigative borings and over 45 monitoring wells have been completed at the Terminal. In addition, 12 monitoring wells located at the adjacent McWhorter property have also been used by Equilon to assess the extent of groundwater contamination originating from the Terminal. Eighteen monitoring wells have been installed along the pipeline corridor to assess releases from the pipeline (GeoEngineers 2003b).

9.1. Geology

Fill and alluvial sediments have been encountered in all borings completed at the site. Two distinct stratigraphic units were observed beneath the Terminal and the pipeline corridor: 1) upper sand unit, and 2) lower silt unit. The upper sand unit extends from surface grade to about 20 feet bgs over much of the area and consists of sand with laterally discontinuous lenses of silty gravel. The sand thins and pinches out along the southern Terminal boundary and at least in part consists of dredge sand fill material. The lower silt unit consists of native alluvial sandy to clayey silt that appears to be laterally continuous across the area. The lower boundary of this unit has not been encountered during subsurface investigations at the Terminal or the pipeline corridor (SECOR 2001).

9.2. Hydrogeology

The depth to groundwater at the Terminal ranges from 8 to 12 feet bgs. Groundwater elevations fluctuate seasonally as much as 3 feet. In the pipeline corridor, the depth to groundwater ranges from 14 to 24 feet bgs with seasonal water level fluctuations as much as 10 feet. The general groundwater flow direction is northeasterly toward the Willamette River with a gradient from approximately 0.02 (southwest side of Terminal) to 0.002 feet per foot near the river (SECOR 2001).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations

☒ Yes ☐ No

Upland Terminal Area

Soil impacts have been identified across major portions of the Terminal site. In general, diesel-and heavy oil-range hydrocarbons were identified in the east tank farm and in the central pipeline corridor areas of the site. Gasoline-range hydrocarbons were identified in the south-central portion of the site and in limited areas within the east tank farm (SECOR 2001).

The maximum concentrations detected in soils at the Terminal site (SECOR 2001) were as follows.

Analyte	Minimum Concentration Shallow Soils (< 3 ft bgs) (mg/kg)	Maximum Concentration Deeper Soils (> 3 ft bgs) (mg/kg)
Total Petroleum Hydrocarbons (TPH)		
TPH-G	600	1,900
TPH-D	10,700	10,700
TPH-O	6,400	16,000
Volatile Organic Compounds (VOCs)		
Benzene	ND	4.1
Semivolatile Organic Coumpounds (SVOCs)		
Naphthalene	11	18
Benzo(a)pyrene	2.4	0.064
Metals		
Lead	800	395

mg/kg = milligrams per kilogram (ppm)

Dock Pipeline Corridor Area

During the initial site assessment, significant impacts were identified in vadose-zone soils in the vicinity of MW-3. The maximum concentrations were 166 mg/kg benzene and 4,490 mg/kg TPH-G. In December 1999, additional sampling was conducted after the SVE system had been in operation for over 1.5 years. The maximum concentrations were 1.31 mg/kg benzene and 241 mg/kg TPH-G (SECOR 2001).

In 2002, eight borings were advanced along the Shell Pipeline Corridor (Foxwell 2002, pers. comm.). A total of 36 soil samples were collected. Minimum and maximum concentrations are provided below.

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Total Petroleum Hydrocarbons (TPH)		
TPH-Gx	<5.6	2,200 E[1]
TPH-Dx	<30	170
Volatile Organic Compounds (VOCs)		
Benzene	<0.0011	0.14
Ethylbenzene	<0.0011	2.7
Toluene	<0.0011	0.032
Xylene	<0.0011	7.0

mg/kg = milligrams per kilogram (ppm)

[1] Compound positively detected but concentration is below reporting limit.

All boring soil samples with detections were located approximately 20-35 feet from the pipeline corridor.

An evaluation of soil exposure risks using the chemical data that was available concluded that concentrations in surface soils associated with Terminal operations and pipeline containment area (between Front Street and Gunderson) are below applicable risk- based calculations concentrations (RBCs; SECOR 2001) for human health, with the exception of benzo(a)pyrene and dibenzo(a,h)anthracene, which slightly exceeded their respective

RBCs. In addition, SECOR (2001) compared soil concentrations to RBCs for the "leachate to groundwater" pathway for industrial groundwater.The benzene concentration slightly exceeded the RBC based on this pathway. (SECOR 2001).

10.1.2. Riverbank Samples

☐ Yes ☒ No

10.1.3. Summary

The Terminal facility has a number of potential source areas including ASTs, USTs, truck loading rack, OWS, and aboveground drainage piping. These areas have been characterized over the last 10 years, and limited remediation has been conducted as detailed in later sections (Section 11). Five of the 12 product lines are still active within the pipeline corridor and represent current potential source areas.

An evaluation of soil exposure risks using the chemical data that was available concluded that concentrations in surface and subsurface soils associated with Terminal operations and pipeline containment area (between Front Avenue and Gunderson) were below applicable RBCs for human health, with the exception of benzo(a)pyrene and dibenzo(a,h)anthracene, which slightly exceeded their respective RBCs (SECOR 2001).

10.2. Groundwater

10.2.1. Groundwater Investigations

☒ Yes ☐ No

Extensive groundwater investigations have been conducted at the Terminal and the pipeline corridor during various phases of work (SECOR 2001) as described below.

Terminal

In 1983, a groundwater investigation was conducted in relation to the discovery of free product in a drainage ditch at the Terminal. In 1991, several temporary well points were completed in three areas: 1) the diesel storage area (east tank farm), 2) the gasoline storage area (west tank farm), and 3) the boiler house, pump house, and parking area. In 1993, a Focused RI/FS was completed at the Terminal and included the installation of approximately 23 monitoring wells located throughout the site. In addition, 12 monitoring wells located at the adjacent McWhorter property have also been used by Equilon to assess the extent of groundwater contamination originating from the Terminal. Periodic groundwater monitoring has been conducted at the Terminal since 1983 (SECOR 2001). See Supplemental Figure 3 from SECOR (2000) for well locations.

Pipeline Corridor

In 1997, ten monitoring wells were installed in the pipeline corridor to assess groundwater conditions between Front Avenue and the Gunderson building (SECOR 2001), near the location of the 1998 pipe rupture. Eight additional monitoring wells were installed in the pipeline corridor area between the Gunderson building and the dock in an area referred to as the Riverfront Area (GeoEngineers 2002). These wells were installed on either side of the pipeline and parallel to the river. See Supplemental Figure 3 from SECOR (2002) for well locations.

10.2.2. NAPL (Historic & Current)

☒ Yes ☐ No

Terminal

In the 1980s, LNAPL, primarily of diesel-range hydrocarbons, was observed in nine of the Terminal monitoring wells. In 1983, a groundwater remediation system was installed to

recover the LNAPL. By 1986, the system had recovered 33,231 gallons of separate-phase hydrocarbons (SECOR 2001). Current groundwater monitoring at the Terminal indicates that LNAPL is present in monitoring well VW-1 with a thickness of 0.02 feet (GeoEngineers 2003b).

Pipeline Corridor

Historically, maximum concentrations of gasoline and related constituents detected in groundwater in the pipeline corridor area (in the vicinity of MW-3) indicate the presence of LNAPL (SECOR 2001). In 1999, a groundwater remediation system was installed in the MW-3 area. Recent data indicate much lower levels of gasoline and related constituents in this area and no indications of LNAPL (GeoEngineers 2003b).

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

Dissolved-phase petroleum hydrocarbon plumes have been identified at the Terminal and pipeline corridor (SECOR 2001).

Plume Characterization Status ☐ Complete ☒ Incomplete

Terminal

According to the DEQ, additional investigation is required to determine the potential for migration of the identified petroleum hydrocarbon plume originating at the Terminal to reach the Willamette River (DEQ 2004a).

Pipeline Corridor

According to the DEQ, additional investigation is required to determine the potential for migration of the identified hydrocarbon plumes originating in the pipeline corridor to reach the Willamette River (DEQ 2004b).

Plume Extent

Based on groundwater monitoring observations, the thickness and extent of separate-phase hydrocarbons at the Terminal have decreased over the monitoring period. The dissolved-phase-hydrocarbon impacts tend to be highest near the central pipeline corridor and the OWS (SECOR 2001). Recent monitoring data indicate that the petroleum hydrocarbon impacts in groundwater occupy most of the area beneath the Terminal (GeoEngineers 2003a). Groundwater data collected from the McWhorter site located northeast and downgradient of the Terminal indicate that the petroleum hydrocarbon impacts likely extend offsite (DEQ 2004a).

Pipeline Corridor

Gasoline and diesel-range hydrocarbons were detected at monitoring well MW-11 located between Front Avenue and the riverfront. The lateral extent of petroleum hydrocarbon impacts between Front Avenue to the river is uncertain based on the lack of groundwater data in this area. PAHs were detected in five of the seven riverfront monitoring wells. Methyl tert butyl ether (MTBE) was detected in groundwater samples collected from monitoring wells MW-12 and MW-13, which are located in the riverfront area (GeoEngineers 2003a).

Min/Max Detections (Current situation)

Groundwater analytical data collected at the Terminal and pipeline corridor were available in the pre-remedial investigation assessment work plan (SECOR 2001) and the most recent annual groundwater monitoring report conducted in June 17, 2003 (GeoEngineers 2003a). The June 17, 2003 data is summarized below, groundwater data previous to this sampling

event is included in Supplemental Table 3 (the pre-remedial investigation data) from SECOR 2001, and Supplemental Table 4 (the ongoing remedial investigation data) from GeoEngineers 2003b.

Terminal

2003 Groundwater Analytical Data (GeoEngineers 2003a)

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Total Petroleum Hydrocarbons (TPH)		
Gasoline-range	<0.25	153,000
Diesel-range	<0.25	23,000
Heavy oil-range	<0.5	53,400
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	<0.1	4.8
Anthracene	<0.1	<10
Fluorene	<0.1	27
Naphthalene	<0.1	21
Phenanthrene	<0.1	17
Pyrene	<0.1	14
Volatile Organic Compounds (VOCs)		
Benzene	<1.0	NA
Toluene	<1.0	NA
Ethylbenzene	<1.0	NA
Total xylenes	<1.0	NA

µg/L = micrograms per liter
NA = not analyzed

Pipeline Corridor

2003 Groundwater Analytical Data (GeoEngineers 2003a)

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Total Petroleum Hydrocarbons (TPH)		
Gasoline-range	<0.25	20,000
Diesel-range	<0.25	620
Heavy oil-range	<0.5	<0.75
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	<0.1	0.61
Anthracene	<0.1	0.34
Fluorene	<0.1	0.12
Naphthalene	<0.1	0.25
Phenanthrene	<0.1	0.38
Pyrene	<0.1	0.15
Volatile Organic Compounds (VOCs)		
Benzene	<1.0	11
Toluene	<1.0	1.0
Ethylbenzene	<1.0	10
Total xylenes	<1.0	98
Naphthalene	<1.0	15
Isopropylbenzene	<1.0	43
n-Propylbenzene	<1.0	30
sec-Butylbenzene	<1.0	6
MTBE	<1.0	2

µg/L = micrograms per liter

Current Plume Data

The most recent available groundwater data indicate that concentrations of petroleum hydrocarbons have decreased relative to historical data collected at both the Terminal and pipeline corridor; the decreased concentrations are likely the result of groundwater remediation activities conducted at these sites (SECOR 2001).

Preferential Pathways

The historic wooden flume and subsurface utilities located between the Terminal and the Willamette River (particularly beneath Yeon and Front Avenues) were identified as potential preferential pathways. Prior to 1993, an open drainage flume crossed the Terminal property and channeled an intermittent stream from Forest Park as well as stormwater discharge from the OWS. The flume discharged to the storm sewer system and City outfall #18 at the Willamette River. In 1993, a 48-inch diameter pipe was installed in the flume. The timber-lined structure was left in place and backfill material was placed around the pipe. SECOR (2001) has indicated that this potential preferential pathway will be further evaluated (SECOR 2001).

Several utilities beneath Front Street, including a storm drain line and sanitary sewer line, are located at depths of approximately 15 to 17 feet bgs, which is at or near the seasonal high groundwater level. These utility structures are considered potential preferential pathways and will be further evaluated (SECOR 2001).

Downgradient Plume Monitoring Points (min/max detections)

Terminal

Confirmed petroleum hydrocarbon releases at the McWhorter property, located downgradient from the Terminal, complicate efforts to determine the downgradient extent of the Terminal plume and therefore identification of appropriate downgradient monitoring points.

Pipeline Corridor

The seven riverfront monitoring wells are located in the downgradient portion of the pipeline corridor but are also located perpendicular to the general groundwater flow direction. Samples collected from all of the wells have had detections of petroleum hydrocarbons and/or MTBE. Available monitoring data are insufficient to assess water quality in the downgradient portion of these plumes.

Groundwater analytical data collected from the seven riverfront monitoring wells pipeline corridor were available in the pre-remedial investigation assessment work plan (SECOR 2001) and the most recent annual groundwater monitoring report conducted in June 17, 2003 (GeoEngineers 2003a). The June 17, 2003 data is summarized below, groundwater data previous to this sampling event is included as supplemental tables to this report, Table 3 is the pre-remedial investigation data (SECOR 2001), Table 4 is the ongoing remedial investigation data (GeoEngineers 2003).

2003 Groundwater Analytical Data (GeoEngineers 2003a)

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Total Petroleum Hydrocarbons (TPH)		
Gasoline-range	<0.25	20,000
Diesel-range	<0.25	620
Heavy oil-range	<0.5	<0.75
Polycyclic Aromatic Hydrocarbons (PAHs)		
Acenaphthene	<0.1	0.61
Anthracene	<0.1	0.34
Fluorene	<0.1	0.12
Naphthalene	<0.1	0.25
Phenanthrene	<0.1	0.38
Pyrene	<0.1	0.15
Volatile Organic Compounds (VOCs)		
Benzene	<1.0	11
Toluene	<1.0	1.0
Ethylbenzene	<1.0	10
Total xylenes	<1.0	98
Naphthalene	<1.0	15
Isopropylbenzene	<1.0	43
n-Propylbenzene	<1.0	30
sec-Butylbenzene	<1.0	6
MTBE	<1.0	2

µg/L = micrograms per liter

Visual Seep Sample Data

☒ Yes ☐ No

A seep was identified around the backfill of City outfall #18 located at the Equilon dock facility during the 2002 Seep Reconnaissance Survey (GSI 2003). Available records indicate that the seep has not been sampled.

Nearshore Porewater Data

N/A

Groundwater Plume Temporal Trend

In general, concentrations of petroleum hydrocarbons detected in samples collected from monitoring wells located at the Terminal and pipeline corridor have decreased over the monitoring period, which is likely the result of groundwater remediation activities conducted at these sites (SECOR 2001).

10.2.4. Summary

Terminal

Groundwater investigation has been conducted at the Terminal since 1983 and has included regular groundwater monitoring from over 40 monitoring wells. In addition, data collected from 12 monitoring wells located downgradient at the McWhorter property have been used to assess petroleum hydrocarbon impacts originating from the Terminal. The general groundwater flow direction for the vicinity is to the northeast, from the main Terminal site, passing under the McWhorter and Gunderson properties, toward the west bank of the Willamette River. In 1983, a groundwater remediation system was initiated at the Terminal to recover LNAPL (primarily of diesel-range hydrocarbons). By 1986, the system had recovered 33,231 gallons of separate-phase hydrocarbons, which is likely the cause for decreasing PAH and diesel contamination concentration trends observed at the monitoring wells. Integral notes that according to the 2002 to 2003 groundwater monitoring data (GeoEngineers 2003a), maximum concentrations of gasoline and heavy-oil contamination concentrations show considerable increases since pre-remedial investigation recorded values (see Supplemental Tables 3 and 4). DEQ has determined that additional investigation is required to evaluate potential preferential pathways and determine whether the identified petroleum hydrocarbon plume originating at the Terminal reaches the Willamette River (DEQ 2004a).

Pipeline Corridor

The historic wooden flume and subsurface utilities located between the Terminal and the Willamette River (particularly beneath Yeon and Front Avenues) were identified as potential preferential pathways. In 1993, a 48-inch diameter pipe was installed in the flume. The timber-lined structure was left in place and backfill material was placed around the pipe. Beginning in 1997, groundwater investigations have been conducted in the pipeline corridor and now include regular groundwater monitoring of an 18-well network. Groundwater monitoring data indicated that LNAPL was present in the Front Avenue area of the corridor. Groundwater remediation at the suspected pipeline release area reduced contaminant levels. Integral notes that according to the 2002 to 2003 groundwater monitoring data (GeoEngineers 2003a), gasoline, diesel, PAHs and VOCs were detected in the wells that are between 280 and 120 feet from the west bank of the Willamette river.

DEQ has determined that additional investigation is required to evaluate potential preferential pathways and determine whether the identified petroleum hydrocarbon plumes originating in the pipeline corridor reaches the Willamette River (DEQ 2004b).

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit [Current or Past] ☒ Yes ☐ No

Historically, the facility had one permit for industrial stormwater discharge. Currently, stormwater is routed through an OWS (installation date unknown); the wastewater permit for this discharge is included in Section 10.3.5.

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN12T	87693	10/30/1992 – 6/9/1995	Unknown	Standard as required by permit.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☒ Yes ☐ No

Currently, stormwater runoff from tank farms, loading rack operations, and tank-bottom draw from water accumulation for ASTs is collected and routed through an OWS and carbon treatment system. The treated water is discharged to the City of Portland sewer system and eventually discharges to the river at City outfall #18.

As requested by the City, several water samples were collected from sanitary sewer manholes during the 1997 response activities and contained gasoline-range hydrocarbons. Benzene, toluene, and xylene, were detected in Manhole #1. Ethylbenzene and gasoline were detected in Manhole #2 (DEQ 2004b).

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☒ Yes ☐ No

The Terminal facility has two current NPDES permits, one to discharge water routed through the oil/water separator, and one to discharge treated wastewater from the hydrocarbon water treatment system (e.g., non-hazardous water such as purge water from groundwater monitoring and truck maintenance operations). The GEN13 (oily stormwater/oil/water separator discharge) permit expired in December 2004, but a renewal application was submitted to DEQ in summer 2004 (DEQ 2004a)

Permit Type	Permit No.	Start Date	Outfalls	Volumes	Parameters/Frequency
Individual NPDES-IW-N	3516	1981- 1992	Unknown	Unknown	Unknown
1300 J	Unknown	1988 -1995	Unknown	Unknown	Standard
GEN13	10841	1992 - present	City outfall #18	Unknown	Standard[1]
GEN15A	10840	1997 - present	City outfall #18	Unknown	Standard[2]

[1]Flow, oil and grease. May also include pH, total suspended solids, metals, ethanol, and MTBE.
[2]Flow, pH, TPH, BETX. May include lead.

10.3.6. Wastewater Data

☒ Yes ☐ No

Routine monitoring data are collected according to the facility's permit requirements.

10.3.7. Summary

Stormwater runoff from tank farms, loading rack operations, and tank-bottom draw for water accumulation in the ASTs is collected and routed through an OWS and carbon treatment system. The treated water is discharged to the City of Portland sewer system and eventually discharges to the river at City outfall #18. Contributions of contaminants from stormwater discharge would be expected to be greater historically, prior to treatment system installation.

Several water samples collected from sewer manholes in 1997 contained detectable concentrations of gasoline-range hydrocarbons (DEQ 2000b).

10.4. Sediment

10.4.1. River Sediment Data

☒ Yes ☐ No

Sediment sampling locations in the vicinity of Equilon are shown on Figure 1. In 1989, Ogden Beeman and Associates, Inc. collected a composite sample from three locations in the vicinity of the dock (Fugiel 1989). In September 1997, Roy F. Weston collected three shallow sediment samples (SD140, SD142, and SD143) and one deeper core composite sample (SD143A) were collected in the vicinity of the Equilon (former Texaco) Dock Facility. Analytes detected in sediment during these investigations are summarized in Table 2.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

In 1969, approximately 558 cubic yards of sludge was removed from the OWS and placed on the unpaved surface area near the OWS. In 1984, six surface soil samples were collected and analyzed for the presence of the element lead. Results indicated no detectable concentrations of lead for samples.

In December 1993, two USTs (10,000-gallon flush oil tank and 1,000-gallon vapor recovery tank) sited near the truck loading rack were removed from the Terminal facility. Concurrent with the UST decommissioning, approximately 872 tons of contaminated soil were excavated and transported to Oregon Hydrocarbon, Inc. for disposal. Details describing the investigation and UST decommissioning activities are provided in the report, *Limited Subsurface Environmental Investigation Related to Underground Storage Tank Decommissioning* (Palagyi 1999, pers. comm.); however, the report is currently not in DEQ files.

In 1995, approximately 36 tons of lead-impacted soil were excavated from the east tank farm and disposed of at the Waste Management hazardous waste facility in Arlington, Oregon. The lead-impacted soil resulted from the historic sandblasting activities associated with ASTs maintenance operations.

In 1995, approximately 215 tons of hydrocarbon-impacted soil (containing TPH-D and TPH-K concentrations of 10,700 mg/kg) were excavated from the southern corner of east tank farm

and disposed of at the TPS/Oregon Hydrocarbon facility in Portland, Oregon (GTI 1994).

In 1995, an unregulated UST was removed from the northeast section of the truck loading rack. Approximately 280 tons of hydrocarbon-impacted soil were excavated and transported off site concurrent with the UST decommissioning activities (SECOR 2001).

In 1998, Texaco installed an air sparge/soil vapor extraction system for the pipeline containment that is located on the Gunderson property (4500 NW Front Ave [block]) as a result of soil and gas investigations identifying substantial gasoline impacts to soil and groundwater (ECSI #2117). This remediation system is ongoing.

In 1998, an abandoned pipeline was damaged during the installation of a fiber optic cable. This resulted in the release of 300 gallons of bunker C fuel that had been placed in pipeline to prevent the pipeline from oxidizing. This release occurred in the vicinity of the previously mentioned ongoing soil-gas remediation project (ECSI #2117). Phase-separated hydrocarbon-impacted soil were excavated and removed off of the site.

11.2. Groundwater Cleanup/Source Control

Terminal

In 1983, a recovery well was installed as part of a groundwater remediation system at the Terminal to recover the LNAPL observed in groundwater. The recovery well extracted dissolved-phase and separate-phase hydrocarbons at approximately 40 gallons per minute. Approximately 22,000 gallons of separate-phase hydrocarbons were recovered during the first year of operation. By 1986, the system had recovered 33,231 gallons of separate-phase hydrocarbons. From 1987 through 1990, the system operated intermittently with diminishing recovery of separate-phase hydrocarbons. In February 1990, active remediation ceased at the Terminal (SECOR 2001).

Pipeline Corridor

In 1998, a soil vapor extraction and air-sparge system was installed at the suspected pipeline release area near Front Avenue to remediate vadose-zone soils and groundwater. Six soil vapor extraction wells and four air-sparge wells were included in the system. In 1999, two of the four sparge wells were replaced due to silt accumulation in the wells (SECOR 2001). Based on the recent monitoring report, the remediation system continues to operate in this area (GeoEngineers 2003b).

11.3. Other

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Figure 5. Shell Portland Pipeline Corridor Groundwater Results (GeoEngineers 2003b)
Figure 3. Equilon Terminal Site Map (SECOR 2000)
Figure 2. Site Location Map (SECOR 2000)
Figure 3. Shell Pipeline and Monitoring Well Location Map (May 15, 2002) (SECOR 2002)
Marine Unloading Dock Application for Permit (no figure number)

Supplemental Tables:

Table 3. Soil Sample Snalytical Result Summary (SECOR 2001)
Table 4. Summary of Groundwater Chemical Analytical Data VOCs in Water GeoEngineers 2003b)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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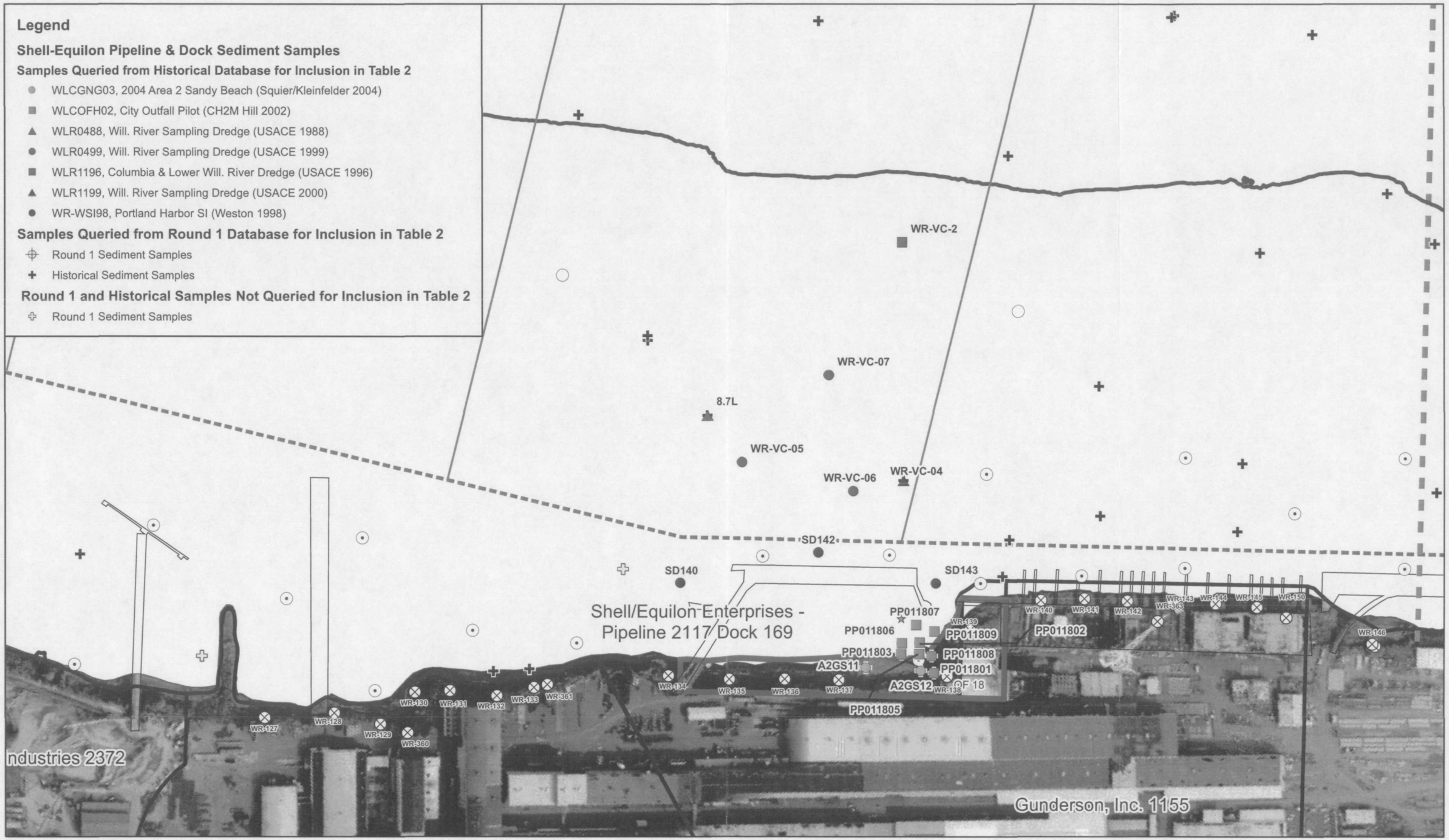

Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Shell/Equilon
Pipeline and Dock
ECSI 3295

DRAFT

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 100 200 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: Thursday, December 30, 2004

File Name: Fig2_ShellEquilon_Terminal_SummaryMap.mxd

Legend

Site Boundary

General Groundwater Flow

Contaminant Type

Petroleum related

Extent of impacted groundwater
For details related to interpretation,
refer to Table ___ in CSM document

Single or isolated detection of COI's.
Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area.
Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Equilon Enterprises LLC Bulk Terminal
Upland Groundwater Quality Overview

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Groundwater Solutions Inc.

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Map Creation Date: Thursday, December 30, 2004

File Name: Fig2_ShellEquilon_Pipeline_SummaryMap.mxd

Legend

Site Boundary

Estimated Groundwater Flow

Contaminant Type

Petroleum related

Extent of impacted groundwater
For details related to interpretation, refer to Table ___ in CSM document

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Equilon Enterprises LLC (Texaco Pipeline)
Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources
Table 2. Queried Sediment Chemistry Data

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Equilon Property #169, #2117

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs																Potential Complete Pathway				
						TPH			VOCs																	
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Storm Sewer Sediment	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	*[Others - List]*	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																										
Pipe Containment	✓	✓	✓	✓		✓	✓	✓	✓				✓										?			
ASTs	✓	✓					✓	✓	✓				✓													
Drainage Ditch	✓	✓	✓			✓	✓	✓	✓				✓										?			
Foundary Sand	✓	✓														✓										
Overwater Areas																										
Dock Operations				✓	✓		✓	✓	✓				✓												✓	
Other Areas/Other Issues																										

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	12	0	0						5.94 U	67 U	16.7	6.3 U	67 U
surface	Aroclor 1242 (ug/kg)	12	0	0						2.83 U	67 U	14.3	3 U	67 U
surface	Aroclor 1248 (ug/kg)	12	10	83.3	32.6	508	218	154	407	10 UG	508	188	147	407
surface	Aroclor 1254 (ug/kg)	12	10	83.3	18.7	159	80	68.3	115	10 UG	159	73	67 U	115
surface	Aroclor 1260 (ug/kg)	12	9	75	3 J	97.5	42.5	37.3	74	3 J	97.5	38.1	36.5	74
surface	Aroclor 1262 (ug/kg)	9	0	0						3.14 U	3.64 U	3.33	3.25 U	3.6 U
surface	Aroclor 1268 (ug/kg)	9	0	0						3.14 U	3.64 U	3.33	3.25 U	3.6 U
surface	Aroclor 1221 (ug/kg)	12	0	0						2.26 U	134 U	25	2.4 U	134 U
surface	Aroclor 1232 (ug/kg)	12	0	0						3.84 U	67 U	15.1	4.08 U	67 U
surface	Polychlorinated biphenyls (ug/kg)	12	12	100	3 A	640 A	280	237.2 A	606 A	3 A	640 A	280	237.2 A	606 A
surface	Butyltin ion (ug/kg)	5	3	60	0.6 J	20.3	9.34	7.11	7.11	0.6 J	20.3	7.88	5.7 U	7.11
surface	Dibutyltin ion (ug/kg)	5	3	60	1 B	86	30.6	4.73	4.73	1 B	86	20.6	5.7 U	5.7 U
surface	Dibutyltin ion (ug/l)	1	0	0						0.06 U	0.06 U	0.06	0.06 U	0.06 U
surface	Tributyltin ion (ug/kg)	5	4	80	4.83	1830	464	5 B	17	4.83	1830	373	5.7 U	17
surface	Tributyltin ion (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
surface	Tetrabutyltin (ug/kg)	4	0	0						2.25 U	5.7 U	4.11	2.78 U	5.7 U
surface	Tetrabutyltin (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
surface	Total solids (percent)	10	10	100	56.4	82	71.2	73.08	77.77	56.4	82	71.2	73.08	77.77
surface	Total organic carbon (percent)	13	13	100	0.154	2.45	0.984	1	1.82	0.154	2.45	0.984	1	1.82
surface	Acid Volatile Sulfides (mg/kg)	1	1	100	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
surface	Total volatile solids (percent)	1	1	100	5	5	5	5	5	5	5	5	5	5
surface	Gravel (percent)	3	3	100	0.09	0.41	0.213	0.14	0.14	0.09	0.41	0.213	0.14	0.14
surface	Sand (percent)	4	4	100	8.9	47	21.7	11.83	18.94	8.9	47	21.7	11.83	18.94
surface	Fines (percent)	3	3	100	80.65	90.96	86.6	88.08	88.08	80.65	90.96	86.6	88.08	88.08
surface	Silt (percent)	4	4	100	42.1	82.57	68.4	72.01	76.81	42.1	82.57	68.4	72.01	76.81
surface	Clay (percent)	4	4	100	8.39	11.27	9.8	8.64	10.9	8.39	11.27	9.8	8.64	10.9
surface	Mean grain size (mm)	1	1	100	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079
surface	Median grain size (mm)	1	1	100	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
surface	Dalapon (ug/kg)	9	0	0						0.132 U	0.165 U	0.146	0.144 U	0.161 U
surface	Dicamba (ug/kg)	9	0	0						0.135 U	0.169 U	0.15	0.148 U	0.165 U
surface	MCPA (ug/kg)	9	0	0						0.258 U	0.323 U	0.286	0.282 U	0.314 U
surface	Dichloroprop (ug/kg)	9	0	0						0.217 U	0.272 U	0.241	0.238 U	0.265 U
surface	2,4-D (ug/kg)	9	0	0						0.228 U	0.286 U	0.253	0.25 U	0.279 U
surface	Silvex (ug/kg)	9	0	0						0.22 U	0.276 U	0.244	0.241 U	0.268 U
surface	2,4,5-T (ug/kg)	9	0	0						0.269 U	0.337 U	0.298	0.295 U	0.328 U
surface	2,4-DB (ug/kg)	9	0	0						0.165 U	0.206 U	0.183	0.18 U	0.201 U
surface	Dinoseb (ug/kg)	9	0	0						0.188 U	0.236 U	0.209	0.206 U	0.23 U
surface	MCPP (ug/kg)	9	0	0						0.115 U	0.144 U	0.128	0.126 U	0.14 U
surface	Aluminum (mg/kg)	12	12	100	5430	41000	14300	7540	40300	5430	41000	14300	7540	40300
surface	Aluminum (mg/l)	1	1	100	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
surface	Antimony (mg/kg)	14	11	78.6	1.1 J	6.86	2.36	2.02	2.6 J	1.1 J	6.86	2.99	2.17 J	6 UJ
surface	Antimony (mg/l)	1	0	0						0.05 U	0.05 U	0.05	0.05 U	0.05 U
surface	Arsenic (mg/kg)	15	12	80	2.1	11.3	6.77	5.7	10.8	2.1	11.3	6.48	5.7	10.8
surface	Arsenic (mg/l)	1	1	100	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
surface	Cadmium (mg/kg)	15	13	86.7	0.0638 J	0.897	0.539	0.59	0.759	0.0638 J	0.897	0.52	0.512 J	0.759
surface	Cadmium (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U
surface	Chromium (mg/kg)	15	15	100	17.6	71	35.9	32.6	54	17.6	71	35.9	32.6	54
surface	Chromium (mg/l)	1	0	0						0.005 U	0.005 U	0.005	0.005 U	0.005 U
surface	Copper (mg/kg)	15	15	100	26.2	98.9 B	59.9	56.9 B	83.3	26.2	98.9 B	59.9	56.9 B	83.3
surface	Copper (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Lead (mg/kg)	15	15	100	10.1	210 B	100	97.6 B	185 B	10.1	210 B	100	97.6 B	185 B
surface	Lead (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Manganese (mg/kg)	5	5	100	367	791	599	632	694	367	791	599	632	694
surface	Manganese (mg/l)	1	1	100	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
surface	Mercury (mg/kg)	15	14	93.3	0.04	0.453	0.2	0.189	0.334 J	0.0103 U	0.453	0.187	0.189	0.334 J
surface	Mercury (mg/l)	1	0	0						0.0001 U	0.0001 U	0.0001	0.0001 U	0.0001 U
surface	Nickel (mg/kg)	15	15	100	16.3 B	65.6	24	20 B	30	16.3 B	65.6	24	20 B	30
surface	Nickel (mg/l)	1	0	0						0.01 U	0.01 U	0.01	0.01 U	0.01 U
surface	Selenium (mg/kg)	14	4	28.6	0.614 J	14	8.65	10	10	0.417 U	14	2.9	0.491 U	10
surface	Selenium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Silver (mg/kg)	15	13	86.7	0.0855 J	0.8	0.312	0.199 J	0.7	0.0855 J	0.8	0.324	0.205 J	0.7
surface	Silver (mg/l)	1	0	0						0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U
surface	Thallium (mg/kg)	5	2	40	10	11	10.5	10	10	0.373 U	11	5.36	5 U	10
surface	Thallium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Zinc (mg/kg)	15	15	100	59	419	220	246 B	284 B	59	419	220	246 B	284 B
surface	Zinc (mg/l)	1	1	100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
surface	Barium (mg/kg)	5	5	100	114	284	182	177	186	114	284	182	177	186
surface	Barium (mg/l)	1	1	100	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187	0.187
surface	Beryllium (mg/kg)	5	5	100	0.45	1.19	0.684	0.6	0.7	0.45	1.19	0.684	0.6	0.7
surface	Beryllium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Calcium (mg/kg)	3	3	100	5960 J	8460	7550	8240 J	8240 J	5960 J	8460	7550	8240 J	8240 J
surface	Calcium (mg/l)	1	1	100	145	145	145	145	145	145	145	145	145	145
surface	Cobalt (mg/kg)	3	3	100	14.8	19	17.3	18.1	18.1	14.8	19	17.3	18.1	18.1
surface	Cobalt (mg/l)	1	1	100	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
surface	Iron (mg/kg)	3	3	100	34500	43400	40300	43000	43000	34500	43400	40300	43000	43000
surface	Iron (mg/l)	1	1	100	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4
surface	Magnesium (mg/kg)	3	3	100	5240	7260	6530	7100	7100	5240	7260	6530	7100	7100
surface	Magnesium (mg/l)	1	1	100	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4	48.4
surface	Potassium (mg/kg)	3	3	100	1190	1280	1240	1260	1260	1190	1280	1240	1260	1260
surface	Potassium (mg/l)	1	1	100	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
surface	Sodium (mg/kg)	3	3	100	693	1070 J	915	983	983	693	1070 J	915	983	983
surface	Sodium (mg/l)	1	1	100	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6
surface	Titanium (mg/kg)	2	2	100	1840	2010	1930	1840	1840	1840	2010	1930	1840	1840
surface	Vanadium (mg/kg)	3	3	100	86.3	108	100	106	106	86.3	108	100	106	106
surface	Vanadium (mg/l)	1	1	100	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
surface	2-Methylnaphthalene (ug/kg)	15	9	60	12.4 J	210	68.4	33.3	147	2.82 U	6600 U	594	26.7	1650 U
surface	Acenaphthene (ug/kg)	17	11	64.7	1 J	515	86.3	24.5	189	1 J	6600 U	544	23.8	1650 U
surface	Acenaphthylene (ug/kg)	17	7	41.2	1 J	51.2	18.6	16	23.3	1 J	6600 U	518	16.5	1650 U
surface	Anthracene (ug/kg)	17	12	70.6	1 JB	834	106	20	170	1 JB	6600 U	563	20	1650 U
surface	Fluorene (ug/kg)	17	8	47.1	2 J	616	111	33	122	2 J	6600 U	542	20 U	1650 U
surface	Naphthalene (ug/kg)	19	8	42.1	4 J	132	39.6	17.1	66.1	4 J	6600 U	494	20 U	1650 U
surface	Phenanthrene (ug/kg)	17	14	82.4	12	4820	476	70.5	695	12	6600 U	878	110	4820
surface	Low Molecular Weight PAH (ug/kg)	15	14	93.3	21 A	1186 A	296	172.7 A	679 A	13.4 UA	1186 A	277	172.7 A	679 A
surface	Dibenz(a,h)anthracene (ug/kg)	17	1	5.88	2 J	2 J	2	2 J	2 J	2 J	6600 U	511	4.22 U	1650 U
surface	Benz(a)anthracene (ug/kg)	17	11	64.7	11	1880	271	69.4	405	9.32 U	6600 U	663	60.1	1880
surface	Benzo(a)pyrene (ug/kg)	17	10	58.8	5 J	1670	279	55	499	5 J	6600 U	652	48	1670
surface	Benzo(b)fluoranthene (ug/kg)	8	6	75	15	1500	283	40	64	15	6600 U	1240	55	1650 U
surface	Benzo(g,h,i)perylene (ug/kg)	17	8	47.1	13	1140	195	28	256	2.52 U	6600 U	578	22	1650 U
surface	Benzo(k)fluoranthene (ug/kg)	8	6	75	11	1540	283	32	56	11	6600 U	1240	37	1650 U
surface	Chrysene (ug/kg)	17	11	64.7	18	2080	307	86	419	8.97 U	6600 U	686	83.2	2080

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Fluoranthene (ug/kg)	17	15	88.2	20.6	4900	522	155	737	20.6	6600 U	946	200	4900
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	17	8	47.1	11	974	158	32	118	3.56 U	6600 U	561	20.9	1650 U
surface	Pyrene (ug/kg)	17	15	88.2	25 B	3950	463	140	790	25 B	6600 U	893	145	3950
surface	Benzo(b+k)fluoranthene (ug/kg)	15	11	73.3	26 A	3040 A	433	111 A	603	6.72 U	3040 A	319	101 A	603
surface	High Molecular Weight PAH (ug/kg)	15	15	100	135 A	19600 A	2100	524 A	3106 A	135 A	19600 A	2100	524 A	3106 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	15	15	100	156 A	26400 A	2780	729 A	4188 A	156 A	26400 A	2780	729 A	4188 A
surface	2,4'-DDD (ug/kg)	9	6	66.7	6.07 P	24	13	9.42 P	17.5 P	4.71 U	24	10.3	8.81 P	17.5 P
surface	2,4'-DDE (ug/kg)	9	2	22.2	7.77 P	8.21 P	7.99	7.77 P	7.77 P	4.58 U	8.21 P	5.6	5.16 U	7.77 P
surface	2,4'-DDT (ug/kg)	9	0	0						4.58 U	5.79 U	5.06	5.16 U	5.38 U
surface	4,4'-DDD (ug/kg)	10	10	100	0.4 J	82.7	30.6	18.5	54.5	0.4 J	82.7	30.6	18.5	54.5
surface	4,4'-DDE (ug/kg)	10	10	100	0.8 J	124	51	34.1	78.9	0.8 J	124	51	34.1	78.9
surface	4,4'-DDT (ug/kg)	10	1	10	0.2 J	0.2 J	0.2	0.2 J	0.2 J	0.2 J	0.75 U	0.61	0.61 U	0.696 U
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	10	10	100	1.4 A	178.5 A	81.6	51.4 A	158.1 A	1.4 A	178.5 A	81.6	51.4 A	158.1 A
surface	Aldrin (ug/kg)	10	8	80	4.35 P	28.6 P	12.2	7.77 P	24.2 P	1.16 U	28.6 P	10.1	5.87 P	24.2 P
surface	alpha-Hexachlorocyclohexane (ug/kg)	10	1	10	1.03 J	1.03 J	1.03	1.03 J	1.03 J	0.711 U	2 UG	0.93	0.801 U	1.03 J
surface	beta-Hexachlorocyclohexane (ug/kg)	10	8	80	1.19 JP	7.03	3.13	2.37	4.91	1.14 U	7.03	2.82	2.31 JP	4.91
surface	delta-Hexachlorocyclohexane (ug/kg)	10	0	0						0.878 U	2 UG	1.07	0.99 U	1.11 U
surface	gamma-Hexachlorocyclohexane (ug/kg)	10	0	0						0.874 U	2 UG	1.07	0.986 U	1.11 U
surface	cis-Chlordane (ug/kg)	9	9	100	1.66 JP	18.4 P	10.9	10.1 P	17.3 P	1.66 JP	18.4 P	10.9	10.1 P	17.3 P
surface	trans-Chlordane (ug/kg)	9	9	100	3.46 P	25.3 P	13.3	13.6 P	19.9 P	3.46 P	25.3 P	13.3	13.6 P	19.9 P
surface	Oxychlordane (ug/kg)	9	0	0						4.58 U	5.79 U	5.06	5.16 U	5.38 U
surface	cis-Nonachlor (ug/kg)	9	1	11.1	6.88	6.88	6.88	6.88	6.88	4.58 U	6.88	5.23	5.16 U	5.79 U
surface	trans-Nonachlor (ug/kg)	9	8	88.9	8.640001 P	19.1	12.6	10.4	15.3	5.38 U	19.1	11.8	10.4	15.3
surface	Dieldrin (ug/kg)	10	0	0						0.751 U	2 UG	0.947	0.846 U	0.95 U
surface	alpha-Endosulfan (ug/kg)	10	3	30	1.38 JP	4.95 P	3.41	3.91	3.91	0.997 U	4.95 P	1.88	1.14 U	3.91
surface	beta-Endosulfan (ug/kg)	10	0	0						0.884 U	2 UG	1.08	0.997 U	1.12 U
surface	Endosulfan sulfate (ug/kg)	10	4	40	1.72 JP	3.88 JP	2.85	2.06 JP	3.74 JP	0.852 U	3.88 JP	1.81	1.05 U	3.74 JP
surface	Endrin (ug/kg)	10	0	0						0.826 U	2 UG	1.02	0.931 U	1.04 U
surface	Endrin aldehyde (ug/kg)	10	0	0						0.933 U	2 UG	1.13	1.05 U	1.18 U
surface	Endrin ketone (ug/kg)	9	0	0						0.643 U	0.814 U	0.711	0.725 U	0.755 U
surface	Heptachlor (ug/kg)	10	0	0						0.788 UJ	2 UG	0.984	0.888 U	0.997 U
surface	Heptachlor epoxide (ug/kg)	10	0	0						0.836 U	2 UG	1.03	0.942 U	1.06 U
surface	Methoxychlor (ug/kg)	10	0	0						3.15 U	4 UG	3.54	3.55 U	3.99 U
surface	Toxaphene (ug/kg)	10	0	0						14.3 U	30 UG	17.3	16.2 U	18.1 U
surface	Chlordane (cis & trans) (ug/kg)	10	0	0						3.22 U	10 UG	4.21	3.63 U	4.08 U
surface	Diesel fuels (mg/kg)	13	10	76.9	16.2 JV	369 V	150	120 V	265 JV	16.2 JV	369 V	140	120 V	265 JV
surface	Gasoline (mg/kg)	2	0	0						20 U	20 U	20	20 U	20 U
surface	Heavy oil (mg/kg)	4	4	100	89	1450	435	100	100	89	1450	435	100	100
surface	Lube Oil (mg/kg)	9	8	88.9	149	734	388	266	681 J	3.22 U	734	345	266	681 J
surface	2,3,4,6-Tetrachlorophenol (ug/kg)	5	0	0						9.63 U	12.5 U	10.9	10.8 U	11 U
surface	Tetrachlorophenol (ug/kg)	9	0	0						28.9 U	34.4 U	31.8	31.8 U	34.2 U
surface	2,4,5-Trichlorophenol (ug/kg)	14	0	0						27.5 U	6600 U	629	31.7 U	1650 U
surface	2,4,6-Trichlorophenol (ug/kg)	14	0	0						20.3 U	6600 U	624	23.4 U	1650 U
surface	2,4-Dichlorophenol (ug/kg)	14	0	0						16.8 U	6600 U	614	19.4 U	1650 U
surface	2,4-Dimethylphenol (ug/kg)	14	1	7.14	18.4 J	18.4 J	18.4	18.4 J	18.4 J	16.8 U	20000 U	1800	19 U	5000 U
surface	2,4-Dinitrophenol (ug/kg)	14	0	0						36.7 U	40000 U	3640	42.3 U	10000 U
surface	2-Chlorophenol (ug/kg)	14	0	0						19 U	6600 U	610	24.5 U	1650 U
surface	2-Methylphenol (ug/kg)	14	0	0						18.3 U	6600 U	606	20 U	1650 U
surface	2-Nitrophenol (ug/kg)	14	0	0						21.4 U	6600 U	625	24.7 U	1650 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	14	0	0						56.5 U	20000 U	1870	65.2 U	5000 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	4-Chloro-3-methylphenol (ug/kg)	14	3	21.4	33.1 J	306	136	68 J	68 J	16.8 U	6600 U	635	33.1 J	1650 U
surface	4-Methylphenol (ug/kg)	12	5	41.7	45 J	950	417	290	730	22.6 U	950	188	25.4 U	730
surface	4-Nitrophenol (ug/kg)	23	0	0						0.131 U	20000 U	1110	30.3 U	99 U
surface	Pentachlorophenol (ug/kg)	23	4	17.4	2.59	8.45	4.54	3.21	3.9	0.168 U	20000 U	1110	33.5 U	99 U
surface	Phenol (ug/kg)	14	0	0						19 U	6600 U	615	32.7 U	1650 U
surface	3- and 4-Methylphenol Coelution (ug/kg)	2	0	0						1650 U	6600 U	4130	1650 U	1650 U
surface	Phenols (ug/kg)	1	0	0						600 U	600 U	600	600 U	600 U
surface	Dimethyl phthalate (ug/kg)	14	0	0						16.8 U	6600 U	605	19 U	1650 U
surface	Diethyl phthalate (ug/kg)	14	0	0						19 U	6600 U	612	27.8 U	1650 U
surface	Dibutyl phthalate (ug/kg)	14	1	7.14	185 J	185 J	185	185 J	185 J	19 U	20000 U	1890	142 U	5000 U
surface	Butylbenzyl phthalate (ug/kg)	14	4	28.6	30	385	179	148 J	153 J	19 U	6600 U	657	32 U	1650 U
surface	Di-n-octyl phthalate (ug/kg)	14	1	7.14	190	190	190	190	190	19 U	6600 U	632	43.8 U	1650 U
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	14	11	78.6	138 J	2700	870	399	2650	62.7 U	40000 U	4260	399	10000 U
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	2,4-Dinitrotoluene (ug/kg)	14	0	0						19.9 U	10000 U	928	22.9 U	2500 U
surface	2,6-Dinitrotoluene (ug/kg)	14	0	0						27.5 U	10000 U	933	31.7 U	2500 U
surface	2-Chloronaphthalene (ug/kg)	14	0	0						4.58 U	6600 U	597	5.29 U	1650 U
surface	2-Nitroaniline (ug/kg)	14	0	0						19.9 U	6600 U	624	22.9 U	1650 U
surface	3,3'-Dichlorobenzidine (ug/kg)	14	0	0						16.8 U	20000 U	1820	19.4 U	5000 U
surface	3-Nitroaniline (ug/kg)	14	0	0						26 U	20000 U	1830	30 U	5000 U
surface	4-Bromophenyl phenyl ether (ug/kg)	14	0	0						19 U	6600 U	608	21.7 U	1650 U
surface	4-Chloroaniline (ug/kg)	14	0	0						14.2 UJ	40000 U	3590	16.4 UJ	10000 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	14	0	0						19 U	6600 U	612	27.4 U	1650 U
surface	4-Nitroaniline (ug/kg)	14	0	0						26 U	6600 U	628	30 U	1650 U
surface	Aniline (ug/kg)	9	0	0						76.5 UJ	91 UJ	84	84 UJ	90.5 UJ
surface	Benzoic acid (ug/kg)	14	1	7.14	276 J	276 J	276	276 J	276 J	52 U	20000 U	1880	59.9 U	5000 U
surface	Benzyl alcohol (ug/kg)	14	0	0						19 U	6600 U	616	34.3 U	1650 U
surface	Bis(2-chloroethoxy) methane (ug/kg)	14	0	0						18.3 U	6600 U	606	20 U	1650 U
surface	Bis(2-chloroethyl) ether (ug/kg)	14	0	0						29.2 UJ	6600 U	618	33.7 UJ	1650 U
surface	Carbazole (ug/kg)	12	0	0						19 U	71 U	54	62.2 U	70.6 U
surface	Dibenzofuran (ug/kg)	15	3	20	2 J	45 J	22.7	21	21	2 J	6600 U	567	19.9 U	1650 U
surface	Hexachlorobenzene (ug/kg)	23	2	8.7	3.2 P	5.44 P	4.32	3.2 P	3.2 P	2.29 U	6600 U	370	17.6 U	20 U
surface	Hexachlorobutadiene (ug/kg)	25	0	0						2.29 U	20000 U	1020	14.7 U	200 U
surface	Hexachlorocyclopentadiene (ug/kg)	14	0	0						21.5 U	20000 U	1820	24.9 U	5000 U
surface	Hexachloroethane (ug/kg)	23	0	0						2.29 U	20000 U	1100	20 U	34.6 U
surface	Isophorone (ug/kg)	14	0	0						19 U	6600 U	609	22.9 U	1650 U
surface	Nitrobenzene (ug/kg)	14	0	0						19 U	6600 U	608	22.4 UJ	1650 U
surface	N-Nitrosodimethylamine (ug/kg)	9	0	0						16.8 U	20 U	18.5	18.5 U	19.9 U
surface	N-Nitrosodipropylamine (ug/kg)	14	0	0						16.8 U	6600 U	610	19.4 U	1650 U
surface	N-Nitrosodiphenylamine (ug/kg)	14	0	0						12.2 U	6600 U	602	14.1 U	1650 U
surface	Bis(2-chloroisopropyl) ether (ug/kg)	11	0	0						39.7 U	6600 U	786	44.6 U	1650 U
surface	1,1,1,2-Tetrachloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,1,1-Trichloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,1,2,2-Tetrachloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,1,2-Trichloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,1-Dichloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Vinylidene chloride (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,2,3-Trichloropropane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,2-Dichloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,2-Dichloropropane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Methylethyl ketone (ug/kg)	2	0	0						1000 U	1000 U	1000	1000 U	1000 U
surface	Methyl N-butyl ketone (ug/kg)	2	0	0						1000 U	1000 U	1000	1000 U	1000 U
surface	Methyl isobutyl ketone (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	Acetone (ug/kg)	2	0	0						2500 U	2500 U	2500	2500 U	2500 U
surface	Benzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Bromochloromethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Bromodichloromethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Bromoform (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Bromomethane (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	Carbon disulfide (ug/kg)	2	0	0						1000 U	1000 U	1000	1000 U	1000 U
surface	Carbon tetrachloride (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Chlorodibromomethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Chloroethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Chloroform (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Chloromethane (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	cis-1,3-Dichloropropene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Methylene bromide (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Dichlorodifluoromethane (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	Ethylbenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Isopropylbenzene (ug/kg)	2	0	0						200 U	200 U	200	200 U	200 U
surface	m,p-Xylene (ug/kg)	2	0	0						200 U	200 U	200	200 U	200 U
surface	Methylene chloride (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	Methyl tert-butyl ether (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	o-Xylene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Styrene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Tetrachloroethene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Toluene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	trans-1,2-Dichloroethene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	trans-1,3-Dichloropropene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Trichloroethene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Trichlorofluoromethane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Vinyl chloride (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,1-Dichloropropene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,2-Dibromo-3-chloropropane (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	1,3,5-Trimethylbenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,3-Dichloropropane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	2,2-Dichloropropane (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	2-Chlorotoluene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	4-Chlorotoluene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Bromobenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	cis-1,2-Dichloroethene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Ethylene dibromide (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	n-Butylbenzene (ug/kg)	2	0	0						500 U	500 U	500	500 U	500 U
surface	n-Propylbenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	p-Cymene (ug/kg)	2	0	0						200 U	200 U	200	200 U	200 U
surface	Pseudocumene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Sec-butylbenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	tert-Butylbenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	Chlorobenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,2-Dichlorobenzene (ug/kg)	16	0	0						15.7 U	20000 U	1590	18.6 U	5000 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	1,3-Dichlorobenzene (ug/kg)	16	0	0						19 U	20000 U	1590	23.6 U	5000 U
surface	1,4-Dichlorobenzene (ug/kg)	16	0	0						19 U	20000 U	1590	26.9 U	5000 U
surface	1,2,3-Trichlorobenzene (ug/kg)	2	0	0						100 U	100 U	100	100 U	100 U
surface	1,2,4-Trichlorobenzene (ug/kg)	16	0	0						12.7 U	6600 U	540	15 U	1650 U
subsurface	Aroclor 1016 (ug/kg)	4	0	0						17 U	20 U	17.8	17 U	17 U
subsurface	Aroclor 1242 (ug/kg)	4	0	0						17 U	20 U	17.8	17 U	17 U
subsurface	Aroclor 1248 (ug/kg)	4	0	0						17 U	20 U	17.8	17 U	17 U
subsurface	Aroclor 1254 (ug/kg)	4	0	0						17 U	20 U	17.8	17 U	17 U
subsurface	Aroclor 1260 (ug/kg)	4	0	0						17 U	20 U	17.8	17 U	17 U
subsurface	Aroclor 1221 (ug/kg)	4	0	0						33 U	39 U	35.3	34 U	35 U
subsurface	Aroclor 1232 (ug/kg)	4	0	0						17 U	20 U	17.8	17 U	17 U
subsurface	Polychlorinated biphenyls (ug/kg)	4	0	0						33 UA	39 UA	35.3	34 UA	35 UA
subsurface	Butyltin ion (ug/kg)	1	0	0						270 U	270 U	270	270 U	270 U
subsurface	Butyltin ion (ug/l)	2	0	0						0.02 U	0.036 U	0.028	0.02 U	0.02 U
subsurface	Dibutyltin ion (ug/kg)	1	0	0						270 U	270 U	270	270 U	270 U
subsurface	Dibutyltin ion (ug/l)	2	1	50	0.32	0.32	0.32	0.32	0.32	0.036 U	0.32	0.178	0.036 U	0.036 U
subsurface	Tributyltin ion (ug/kg)	1	0	0						270 U	270 U	270	270 U	270 U
subsurface	Tributyltin ion (ug/l)	2	1	50	0.13	0.13	0.13	0.13	0.13	0.036 U	0.13	0.083	0.036 U	0.036 U
subsurface	Tetrabutyltin (ug/kg)	1	0	0						270 U	270 U	270	270 U	270 U
subsurface	Tetrabutyltin (ug/l)	2	1	50	0.15	0.15	0.15	0.15	0.15	0.036 U	0.15	0.093	0.036 U	0.036 U
subsurface	Total solids (percent)	4	4	100	53.4	59.1	55.7	54.1	56.3	53.4	59.1	55.7	54.1	56.3
subsurface	Total organic carbon (percent)	7	7	100	1.2	5.6	2.34	2	2.4	1.2	5.6	2.34	2	2.4
subsurface	Total volatile solids (percent)	5	5	100	6.58	8.22	7.54	7.66	7.86	6.58	8.22	7.54	7.66	7.86
subsurface	2,3,7,8-Tetrachlorodibenzo-p-dioxin (ng/kg)	1	0	0						0.76 U	0.76 U	0.76	0.76 U	0.76 U
subsurface	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (ng/kg)	1	0	0						1.4 U	1.4 U	1.4	1.4 U	1.4 U
subsurface	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (ng/kg)	1	0	0						2 U	2 U	2	2 U	2 U
subsurface	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (ng/kg)	1	1	100	15 B	15 B	15	15 B	15 B	15 B	15 B	15	15 B	15 B
subsurface	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (ng/kg)	1	1	100	7.5 J	7.5 J	7.5	7.5 J	7.5 J	7.5 J	7.5 J	7.5	7.5 J	7.5 J
subsurface	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (ng/kg)	1	1	100	220 B	220 B	220	220 B	220 B	220 B	220 B	220	220 B	220 B
subsurface	Octachlorodibenzo-p-dioxin (ng/kg)	1	1	100	2000 B	2000 B	2000	2000 B	2000 B	2000 B	2000 B	2000	2000 B	2000 B
subsurface	2,3,7,8-Tetrachlorodibenzofuran (ng/kg)	1	1	100	3.2 B	3.2 B	3.2	3.2 B	3.2 B	3.2 B	3.2 B	3.2	3.2 B	3.2 B
subsurface	1,2,3,7,8-Pentachlorodibenzofuran (ng/kg)	1	0	0						1.2 U	1.2 U	1.2	1.2 U	1.2 U
subsurface	2,3,4,7,8-Pentachlorodibenzofuran (ng/kg)	1	0	0						1.8 U	1.8 U	1.8	1.8 U	1.8 U
subsurface	1,2,3,4,7,8-Hexachlorodibenzofuran (ng/kg)	1	0	0						3.5 U	3.5 U	3.5	3.5 U	3.5 U
subsurface	1,2,3,6,7,8-Hexachlorodibenzofuran (ng/kg)	1	0	0						2.4 U	2.4 U	2.4	2.4 U	2.4 U
subsurface	1,2,3,7,8,9-Hexachlorodibenzofuran (ng/kg)	1	0	0						0.17 U	0.17 U	0.17	0.17 U	0.17 U
subsurface	2,3,4,6,7,8-Hexachlorodibenzofuran (ng/kg)	1	0	0						1.5 U	1.5 U	1.5	1.5 U	1.5 U
subsurface	1,2,3,4,6,7,8-Heptachlorodibenzofuran (ng/kg)	1	1	100	33 B	33 B	33	33 B	33 B	33 B	33 B	33	33 B	33 B
subsurface	1,2,3,4,7,8,9-Heptachlorodibenzofuran (ng/kg)	1	0	0						3.4 U	3.4 U	3.4	3.4 U	3.4 U
subsurface	Octachlorodibenzofuran (ng/kg)	1	1	100	94 B	94 B	94	94 B	94 B	94 B	94 B	94	94 B	94 B
subsurface	Gravel (percent)	4	4	100	0.35	2.9	1.34	0.8	1.3	0.35	2.9	1.34	0.8	1.3
subsurface	Sand (percent)	6	6	100	14.17	43.7	31.2	28.4	42.1	14.17	43.7	31.2	28.4	42.1
subsurface	Fines (percent)	6	6	100	55.1	85.83	67.9	66.7	73.36	55.1	85.83	67.9	66.7	73.36
subsurface	Silt (percent)	6	6	100	49.1	71.3	57.5	55.9	61.3	49.1	71.3	57.5	55.9	61.3
subsurface	Clay (percent)	6	6	100	4.9	16.33	10.5	6	15.7	4.9	16.33	10.5	6	15.7
subsurface	Mean grain size (mm)	5	5	100	0.0351	0.269	0.132	0.113	0.192	0.0351	0.269	0.132	0.113	0.192
subsurface	Median grain size (mm)	5	5	100	0.02	0.057	0.0386	0.043	0.048	0.02	0.057	0.0386	0.043	0.048
subsurface	Dalapon (ug/kg)	4	0	0						82 U	94 U	86.5	84 U	86 U
subsurface	Dicamba (ug/kg)	4	0	0						33 U	38 U	34.8	34 U	34 U
subsurface	MCPA (ug/kg)	4	0	0						16 U	19 U	17.3	17 U	17 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median		95th
subsurface	Dichloroprop (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	2,4-D (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	Silvex (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	2,4,5-T (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	2,4-DB (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	Dinoseb (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	MCPP (ug/kg)	4	0	0						16 U	19 U	17.3	17	U	17 U
subsurface	Aluminum (mg/kg)	1	1	100	31900	31900	31900	31900	31900	31900	31900	31900	31900		31900
subsurface	Antimony (mg/kg)	6	1	16.7	1.1 JB	1.1 JB	1.1	1.1 JB	1.1 JB	1.1 JB	140 U	86	120	U	130 U
subsurface	Arsenic (mg/kg)	6	6	100	2.4 J	9	4.45	3.6	4.7	2.4 J	9	4.45	3.6		4.7
subsurface	Cadmium (mg/kg)	6	2	33.3	0.29 J	5.3	2.8	0.29 J	0.29 J	0.29 J	5.3	2	1.5	U	1.8 U
subsurface	Chromium (mg/kg)	1	1	100	157	157	157	157	157	157	157	157	157		157
subsurface	Copper (mg/kg)	6	6	100	33	124	51.5	37	44	33	124	51.5	37		44
subsurface	Lead (mg/kg)	6	2	33.3	26	1080	553	26	26	26	1080	216	41	U	64 U
subsurface	Manganese (mg/kg)	1	1	100	483	483	483	483	483	483	483	483	483		483
subsurface	Mercury (mg/kg)	6	5	83.3	0.08	0.37	0.21	0.19 J	0.3	0.08	0.37	0.197	0.13	U	0.3
subsurface	Nickel (mg/kg)	6	6	100	20	30.7	23.3	21	24	20	30.7	23.3	21		24
subsurface	Selenium (mg/kg)	1	1	100	8	8	8	8	8	8	8	8	8		8
subsurface	Silver (mg/kg)	6	3	50	0.068 J	3.4	1.35	0.57 J	0.57 J	0.068 J	3.4	1.08	0.76	U	0.89 U
subsurface	Thallium (mg/kg)	1	0	0						5 U	5 U	5	5	U	5 U
subsurface	Zinc (mg/kg)	6	6	100	83	583	178	93	120	83	583	178	93		120
subsurface	Barium (mg/kg)	1	1	100	274	274	274	274	274	274	274	274	274		274
subsurface	Beryllium (mg/kg)	1	1	100	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44		0.44
subsurface	Calcium (mg/kg)	1	1	100	6420	6420	6420	6420	6420	6420	6420	6420	6420		6420
subsurface	Cobalt (mg/kg)	1	1	100	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.6		17.6
subsurface	Iron (mg/kg)	1	1	100	36500	36500	36500	36500	36500	36500	36500	36500	36500		36500
subsurface	Magnesium (mg/kg)	1	1	100	5750	5750	5750	5750	5750	5750	5750	5750	5750		5750
subsurface	Potassium (mg/kg)	1	1	100	1210	1210	1210	1210	1210	1210	1210	1210	1210		1210
subsurface	Sodium (mg/kg)	1	1	100	714 J	714 J	714	714 J	714 J	714 J	714 J	714	714	J	714 J
subsurface	Titanium (mg/kg)	1	1	100	1870	1870	1870	1870	1870	1870	1870	1870	1870		1870
subsurface	Vanadium (mg/kg)	1	1	100	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9		91.9
subsurface	2-Methylnaphthalene (ug/kg)	6	1	16.7	2000	2000	2000	2000	2000	2.8 U	2000	336	2.9	U	3.2 U
subsurface	Acenaphthene (ug/kg)	6	0	0						2.8 U	910 U	154	2.9	U	3.2 U
subsurface	Acenaphthylene (ug/kg)	6	1	16.7	4.3	4.3	4.3	4.3	4.3	2.9 U	910 U	155	3.2	U	4.3
subsurface	Anthracene (ug/kg)	6	3	50	3	7	4.47	3.4	3.4	2.9 U	910 U	155	3.2	U	7
subsurface	Fluorene (ug/kg)	6	0	0						2.8 U	910 U	154	2.9	U	3.2 U
subsurface	Naphthalene (ug/kg)	6	1	16.7	5	5	5	5	5	2.8 U	910 U	155	3.1	U	5
subsurface	Phenanthrene (ug/kg)	6	5	83.3	6.7	1100	228	12	13	3.2 U	1100	190	7.3		13
subsurface	Low Molecular Weight PAH (ug/kg)	6	5	83.3	7.3 A	1100 A	232	15.4 A	24.6 A	3.2 UA	1100 A	194	13.7	A	24.6 A
subsurface	Dibenz(a,h)anthracene (ug/kg)	6	0	0						2.8 U	910 U	154	2.9	U	3.2 U
subsurface	Benz(a)anthracene (ug/kg)	6	4	66.7	4.7	13	8.1	5.3	9.4	3.2 U	910 U	158	5.3		13
subsurface	Benzo(a)pyrene (ug/kg)	6	3	50	4.7	13	8.73	8.5	8.5	2.8 U	910 U	157	4.7		13
subsurface	Benzo(b)fluoranthene (ug/kg)	6	4	66.7	7.9	17	12.7	13	13	3.2 U	910 U	161	13		17
subsurface	Benzo(g,h,i)perylene (ug/kg)	6	0	0						2.8 U	910 U	154	2.9	U	3.2 U
subsurface	Benzo(k)fluoranthene (ug/kg)	6	2	33.3	4.8	6.7	5.75	4.8	4.8	2.8 U	910 U	155	3.2	U	6.7
subsurface	Chrysene (ug/kg)	6	4	66.7	8.2	16	11.4	8.5	13	3.2 U	910 U	160	8.5		16
subsurface	Fluoranthene (ug/kg)	6	5	83.3	3.8	26	16	17	21	3.8	910 U	165	17		26
subsurface	Indeno(1,2,3-cd)pyrene (ug/kg)	6	1	16.7	5.5	5.5	5.5	5.5	5.5	2.8 U	910 U	155	3.1	U	5.5
subsurface	Pyrene (ug/kg)	6	5	83.3	5.1	23	16.4	18	22	5.1	910 U	165	18		23
subsurface	Benzo(b+k)fluoranthene (ug/kg)	6	4	66.7	7.9 A	23.7 A	15.6	13 A	17.8 A	3.2 UA	910 UA	163	13	A	23.7 A

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
subsurface	High Molecular Weight PAH (ug/kg)	6	5	83.3	8.9 A	108.7 A	66.8	71.4 A	89.2 A	8.9 A	910 UA	207	71.4 A	108.7 A
subsurface	Polycyclic Aromatic Hydrocarbons (ug/kg)	6	6	100	8.9 A	1100 A	249	96 A	122.4 A	8.9 A	1100 A	249	96 A	122.4 A
subsurface	4,4'-DDD (ug/kg)	5	1	20	1.2 J	1.2 J	1.2	1.2 J	1.2 J	1.2 J	3.9 U	3.06	3.4 U	3.5 U
subsurface	4,4'-DDE (ug/kg)	5	1	20	1.8 J	1.8 J	1.8	1.8 J	1.8 J	1.8 J	3.9 U	3.18	3.4 U	3.5 U
subsurface	4,4'-DDT (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	5	1	20	3 A	3 A	3	3 A	3 A	3 A	3.9 UA	3.42	3.4 UA	3.5 UA
subsurface	Aldrin (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	alpha-Hexachlorocyclohexane (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	beta-Hexachlorocyclohexane (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	delta-Hexachlorocyclohexane (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	gamma-Hexachlorocyclohexane (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	Dieldrin (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	alpha-Endosulfan (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	beta-Endosulfan (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	Endosulfan sulfate (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	Endrin (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	Endrin aldehyde (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	Endrin ketone (ug/kg)	5	0	0						3.3 U	3.9 U	3.52	3.5 U	3.5 U
subsurface	Heptachlor (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	Heptachlor epoxide (ug/kg)	5	0	0						1.7 U	2 U	1.78	1.7 U	1.8 U
subsurface	Methoxychlor (ug/kg)	5	0	0						17 U	20 U	17.8	17 U	18 U
subsurface	Toxaphene (ug/kg)	5	0	0						170 U	200 U	178	170 U	180 U
subsurface	Chlordane (cis & trans) (ug/kg)	5	0	0						17 U	20 U	17.8	17 U	18 U
subsurface	2,4,5-Trichlorophenol (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	2,4,6-Trichlorophenol (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	2,4-Dichlorophenol (ug/kg)	5	0	0						14 U	2700 U	552	15 U	16 U
subsurface	2,4-Dimethylphenol (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	2,4-Dinitrophenol (ug/kg)	5	0	0						14 U	9100 UJ	1830	15 U	16 U
subsurface	2-Chlorophenol (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	2-Methylphenol (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	2-Nitrophenol (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	4,6-Dinitro-2-methylphenol (ug/kg)	5	0	0						14 U	9100 UJ	1830	15 U	16 U
subsurface	4-Chloro-3-methylphenol (ug/kg)	5	0	0						14 U	1800 U	372	15 U	16 U
subsurface	4-Methylphenol (ug/kg)	1	0	0						910 U	910 U	910	910 U	910 U
subsurface	4-Nitrophenol (ug/kg)	9	0	0						14 U	4500 U	522	33 U	38 U
subsurface	Pentachlorophenol (ug/kg)	10	4	40	9.4 J	16	13.6	13 J	16	9.4 J	4500 U	464	16	19 U
subsurface	Phenol (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	3- and 4-Methylphenol Coelution (ug/kg)	5	5	100	4.8 J	110	41.4	29	48	4.8 J	110	41.4	29	48
subsurface	Dimethyl phthalate (ug/kg)	6	1	16.7	3.1 J	3.1 J	3.1	3.1 J	3.1 J	3.1 J	910 U	162	14 U	16 U
subsurface	Diethyl phthalate (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	Dibutyl phthalate (ug/kg)	6	5	83.3	4.4 JB	7.3 JB	5.26	5 JB	5 JB	4.4 JB	910 U	156	5 JB	7.3 JB
subsurface	Butylbenzyl phthalate (ug/kg)	6	3	50	3.4 J	3.8 J	3.67	3.8 J	3.8 J	3.4 J	910 U	158	3.8 J	14 U
subsurface	Di-n-octyl phthalate (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	Bis(2-ethylhexyl) phthalate (ug/kg)	6	6	100	11 JB	5000	862	39 B	47 B	11 JB	5000	862	39 B	47 B
subsurface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	2,4-Dinitrotoluene (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	2,6-Dinitrotoluene (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	2-Chloronaphthalene (ug/kg)	5	0	0						2.8 U	910 U	184	2.9 U	3.2 U
subsurface	2-Nitroaniline (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	3,3'-Dichlorobenzidine (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U

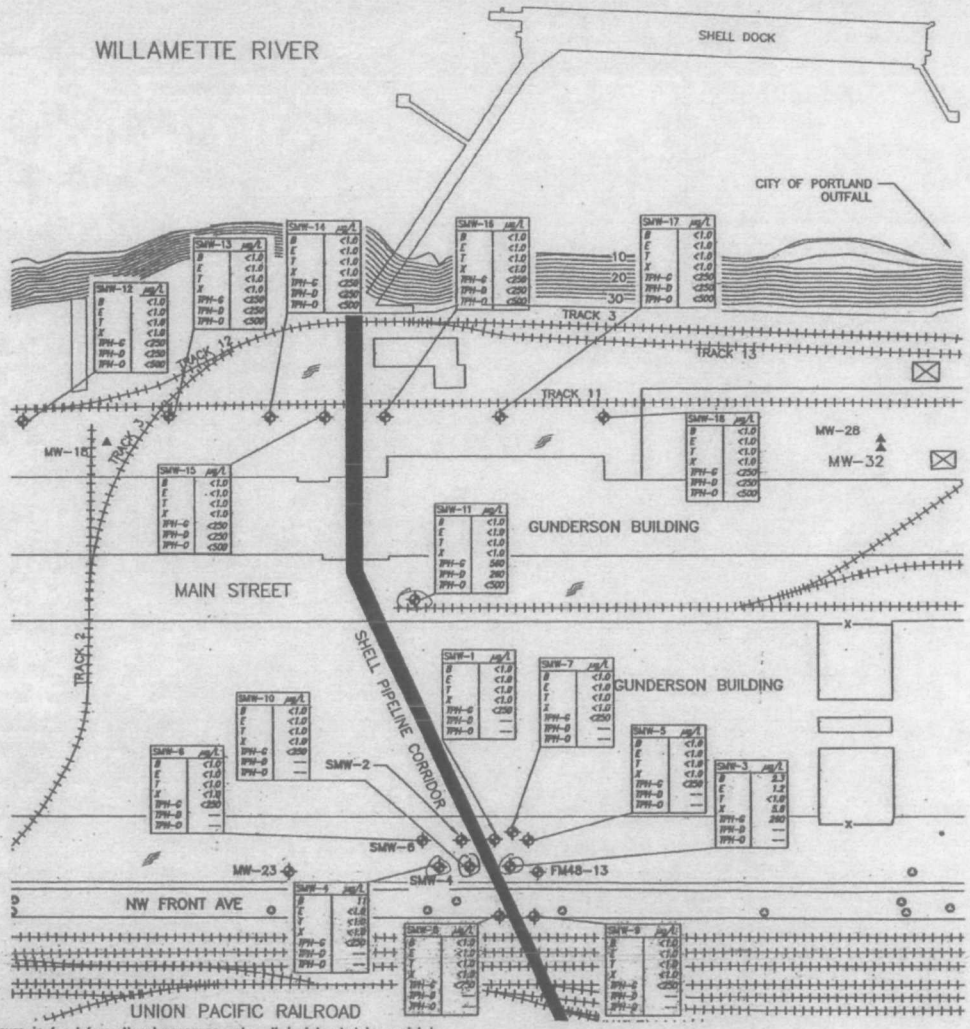
Table 2. Queried Sediment Chemistry Data.

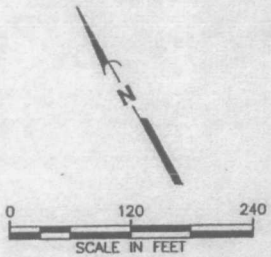
Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
subsurface	3-Nitroaniline (ug/kg)	5	0	0						14 U	5500 U	1110	15 U	16 U
subsurface	4-Bromophenyl phenyl ether (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	4-Chloroaniline (ug/kg)	5	0	0						14 U	2700 U	552	15 U	16 U
subsurface	4-Chlorophenyl phenyl ether (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	4-Nitroaniline (ug/kg)	5	0	0						14 U	4500 UJ	912	15 U	16 U
subsurface	Benzoic acid (ug/kg)	6	1	16.7	9.7 J	9.7 J	9.7	9.7 J	9.7 J	9.7 J	9100 U	1530	15 U	16 U
subsurface	Benzyl alcohol (ug/kg)	6	2	33.3	5.7 J	7.3 J	6.5	5.7 J	5.7 J	5.7 J	910 U	161	14 U	16 U
subsurface	Bis(2-chloroethoxy) methane (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	Bis(2-chloroethyl) ether (ug/kg)	5	0	0						14 U	1800 U	372	15 U	16 U
subsurface	Carbazole (ug/kg)	1	0	0						910 UJ	910 UJ	910	910 UJ	910 UJ
subsurface	Dibenzofuran (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	Hexachlorobenzene (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	Hexachlorobutadiene (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	Hexachlorocyclopentadiene (ug/kg)	5	0	0						14 U	4500 U	912	15 U	16 U
subsurface	Hexachloroethane (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	Isophorone (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	Nitrobenzene (ug/kg)	5	0	0						14 U	910 U	194	15 U	16 U
subsurface	N-Nitrosodipropylamine (ug/kg)	5	0	0						14 U	1800 U	372	15 U	16 U
subsurface	N-Nitrosodiphenylamine (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	1,2-Dichlorobenzene (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	1,3-Dichlorobenzene (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	1,4-Dichlorobenzene (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U
subsurface	1,2,4-Trichlorobenzene (ug/kg)	6	0	0						14 U	910 U	164	15 U	16 U

SUPPLEMENTAL FIGURES

Figure 5. Shell Portland Pipeline Corridor Groundwater Results (GeoEngineers 2003b)
Figure 3. Equilon Terminal Site Map (SECOR 2000)
Figure 2. Site Location Map (SECOR 2000)
Figure 3. Shell Pipeline and Monitoring Well Location Map (May 15, 2002) (SECOR 2002)
Marine Unloading Dock Application for Permit (no figure number)

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.





LEGEND

- SUBJECT PROPERTY LINE BOUNDARY
- RAILROAD – AERIAL
- MW-10 GUNDERSON MONITORING WELL
- SMW-1 SHELL MONITORING WELL
- MANHOLE
- ASPHALT – AERIAL
- NOT ANALYZED

	ANALYTE
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X	XYLENES
TPH-G	GASOLINE
TPH-D	DIESEL
TPH-O	OIL

-- NOT SAMPLED OR NOT ANALYZED

(ND) NOT DETECTED AT OR ABOVE THE LABORATORY METHOD REPORTING LIMIT

Note 1. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

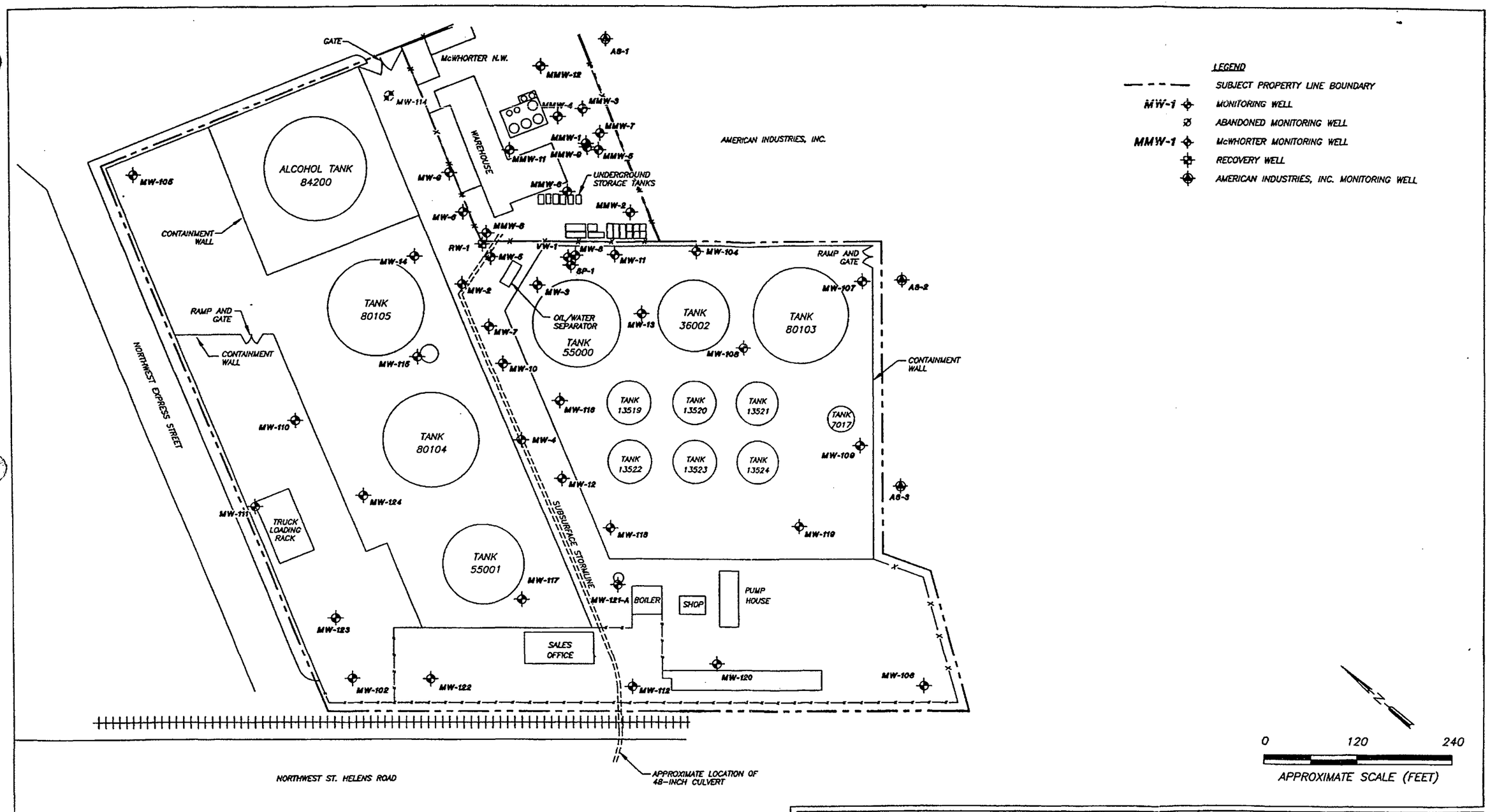
Reference: Map prepared based on SECOR 2002, drawing based on digital aerial information from Spencer B. Gress Inc. Survey completed by Robert A. Johnson (Johnson Land Surveying), Tigard, Oregon 2002.

Portland\P:\9\9876105\01\Cad\gw_bx1pipeline.dwg CWB:rlf 05/05/03

GeoEngineers

SHELL PORTLAND PIPELINE CORRIDOR GROUNDWATER RESULTS MARCH 2003

FIGURE 5



SECOR
International Incorporated
015

EQUILON TERMINAL SITE MAP

EQUILON BULK TERMINAL SAP NO. 357083
3800 NW ST. HELENS RD
PORTLAND, OREGON

FIGURE: **3**

JOB#: 015.08835.004 APPR: DWN: KSM DATE: 10/06/00

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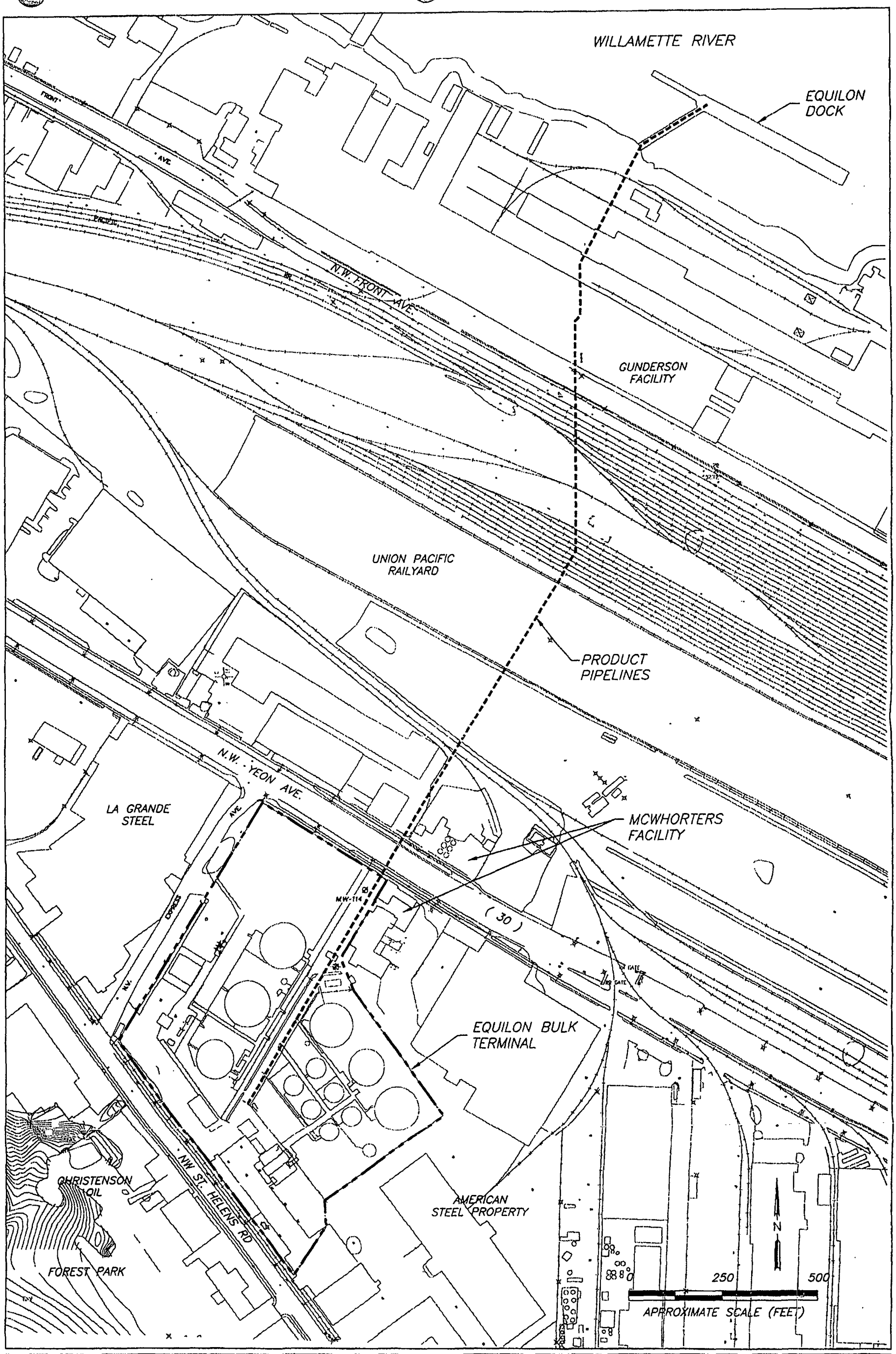

SECOR
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SITE LOCATION MAP

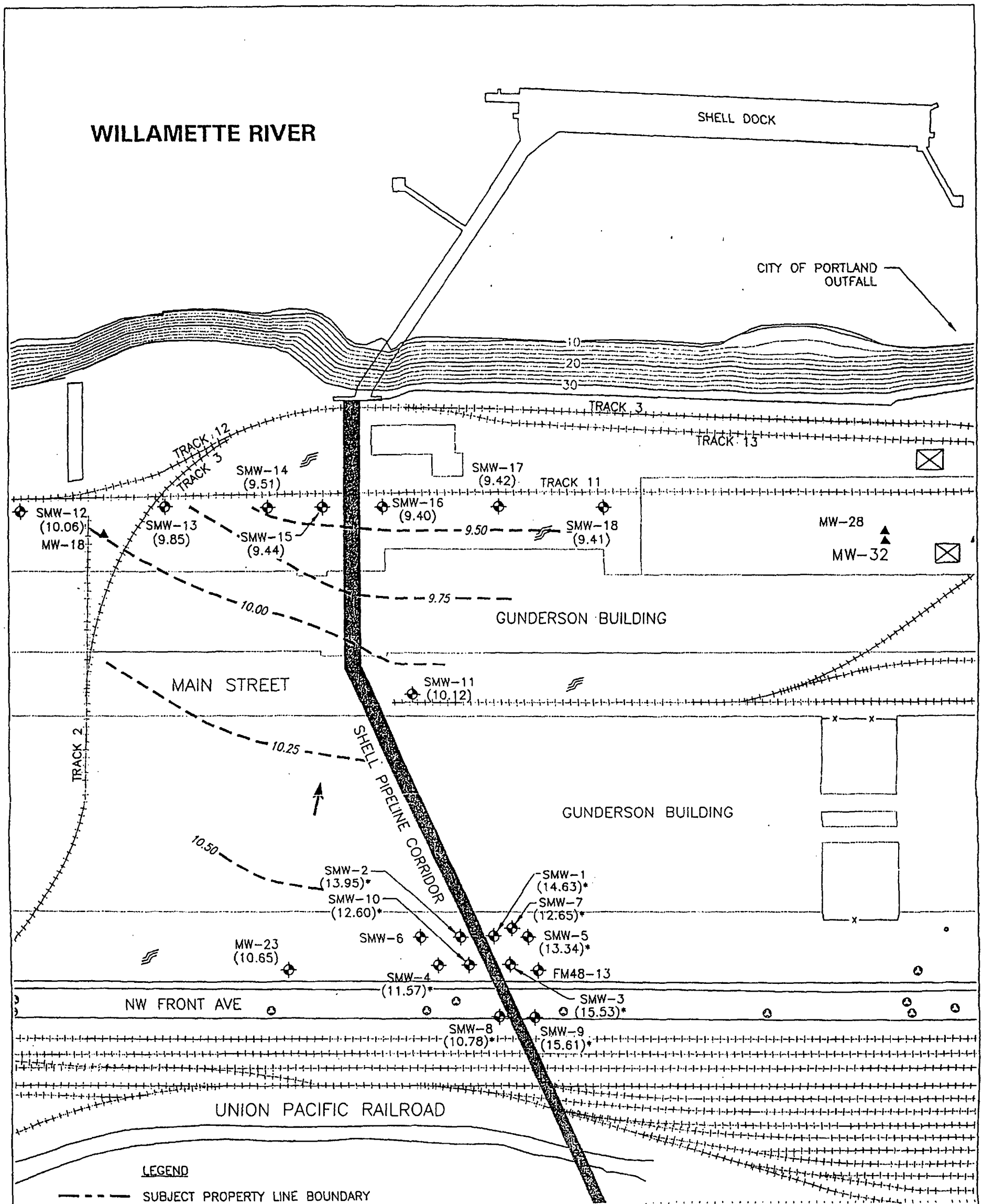
EQUILON BULK TERMINAL SAP NO. 357083
3800 NW ST HELENS ROAD
PORTLAND, OREGON

FIGURE: **2**

JOB#: 015.08835.004 APPR: DWN: KPM DATE: 10/05/00

F:/FILES/PORTLAND/EQUIVA/357083/08835

DWG: 15-8835-0042



LEGEND

- SUBJECT PROPERTY LINE BOUNDARY
- RAILROAD – AERIAL
- MW-10 GUNDERSON MONITORING WELL
- SMW-1 SHELL MONITORING WELL
- MANHOLE
- ASPHALT – AERIAL
- INFERRED GROUNDWATER FLOW DIRECTION
- INFERRED GROUNDWATER ELEVATION CONTOUR (FEET)
- (9.85) RELATIVE GROUNDWATER ELEVATION (FEET)
- (NM) NOT MEASURED

NOTES

CONTOUR INTERVAL = 0.25 FT

GROUNDWATER ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

* INDICATES GROUNDWATER ELEVATION NOT USED TO GENERATE CONTOURS.

N

0 100 200

APPROXIMATE SCALE (FEET)

REF: THIS MAP WAS PREPARED USING DIGITAL AERIAL INFORMATION FROM SPENCER B. GROSS INC., SURVEY INFORMATION FROM ROBERT E. MEYER CONSULTANTS (1991)

SECOR
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(503) 691-2030/692-7074 (FAX)

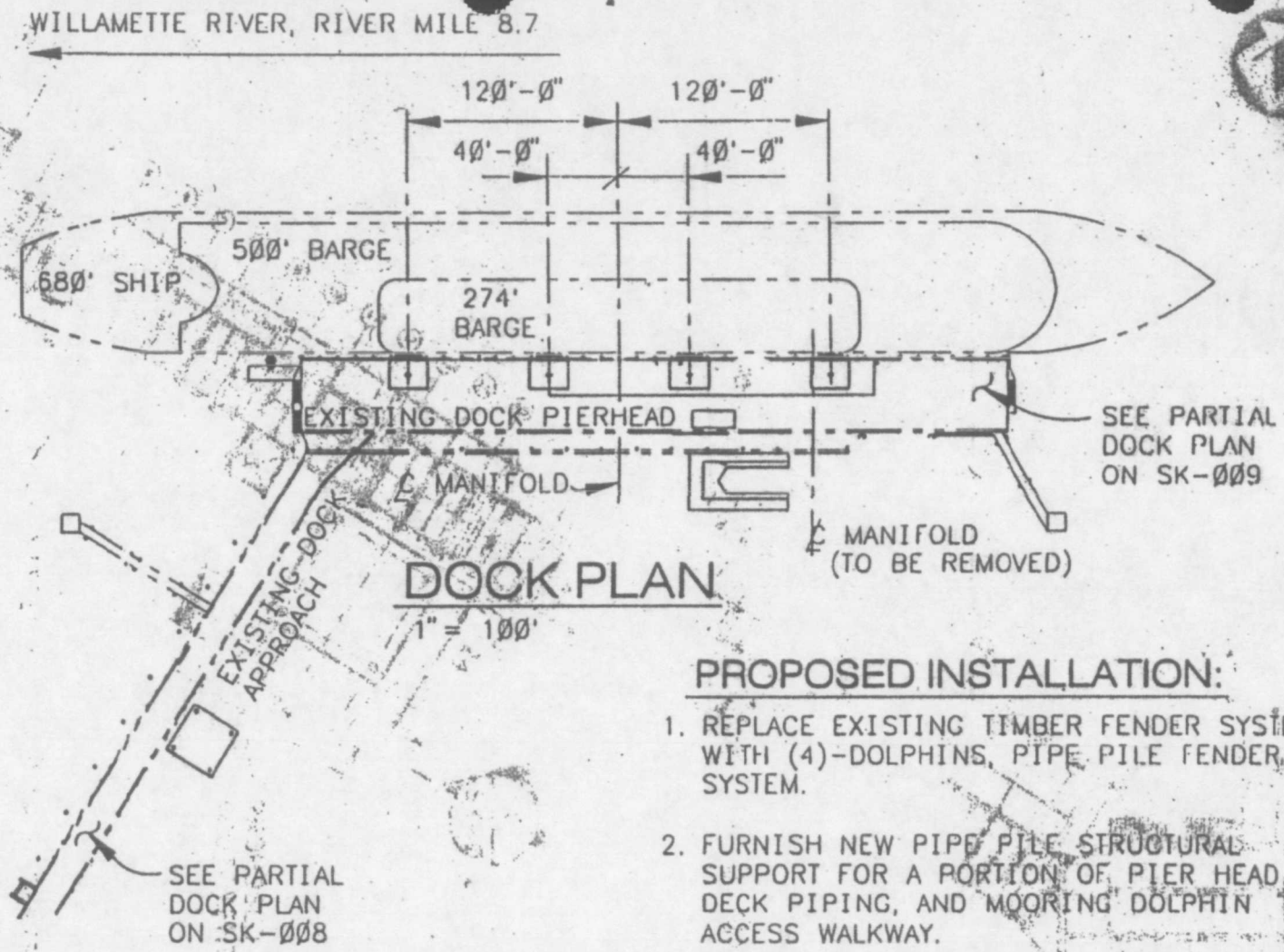
SHELL PIPELINE AND MONITORING WELL LOCATION MAP (MAY 15, 2002)
SHELL BULK TERMINAL SAP NO. 357083
3800 NW ST. HELENS ROAD
PORTLAND, OREGON

FIGURE: 3

JOB#: 150T.09308.02.0003 APPR: DWN: KPM DATE: 06/05/02

N:/SHELL OIL

DWG: 150T-9308-2-3(MW).dwg



DOCK PLAN

1" = 100'

PROPOSED INSTALLATION:

1. REPLACE EXISTING TIMBER FENDER SYSTEM WITH (4)-DOLPHINS, PIPE PILE FENDER SYSTEM.
2. FURNISH NEW PIPE PILE STRUCTURAL SUPPORT FOR A PORTION OF PIER HEAD DECK PIPING, AND MOORING DOLPHIN ACCESS WALKWAY.
3. FURNISH NEW STRUCTURAL FRAMING FOR APPROACH DECK & PIPING.
4. INSTALL NEW EQUIPMENT PLATFORM.

APPLICANT:
SHELL OIL PRODUCTS US

MARINE UNLOADING FACILITY
DOCK UPGRADE
APPLICATION FOR PERMIT

DRAWN BY GMH DATE 4-FEB-02	CHK'D BY DATE	APP'D BY DATE
PROJECT 0111774.01	SCALE NONE	DRAWING NUMBER 0111774-SK-007
SHT 2	OF 7	REV 0

Mar 12, 2002 2:05p.m. - SK-007.dwg - GMH = 1 = 1200.00 - AutoCAD14.01

SUPPLEMENTAL TABLES

Table 3. Soil Sample Snalytical Result Summary (SECOR 2001)
Table 4. Summary of Groundwater Chemical Analytical Data VOCs in Water
GeoEngineers 2003b)

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This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Table 3. Soil Sample Analytical Result Summary
Boiler and Pump House, and Parking Lot Area
Texaco District Terminal, Portland, Oregon, September 1991

Sample ID	Collection Date	Sample Collection Depth (feet BGS)	Field PID[a] Measurement (ppm)	Soil Sample Analytical Results (ppm)			
				HCID[b]	TPH-G[c]	TPH-D[d]	TRPH[e]
B-22	9/24/91	5	0	ND	<20	<50	–
		10	0	ND	<20	<50	–
B-23	9/24/91	5	9.5	ND	<20	<50	–
		10	9	ND	<20	<50	–
B-24	9/24/91	8	11.5	D/O[f]	<20	150	400
		11.5	65	D/O[f]	<20	3,800	15,500
B-25	9/23/91	5.5	590	G/D[f]	1,200	1,300[f]	–
		9	550	G/D[f]	1,800	5,500[f]	–
B-26	9/23/91	5	10	ND	<20	<50	–
		9	8.5	ND	<20	<50	–
B-27	9/24/91	4.5	12.5	ND	<20	<50	–
		8.5	90	D[f]	<20	220	–
B-28	9/23/91	5	30	D[f]	<20	1,900	–
B-29	9/23/91	5	4.5	ND	<20	<50	–
		9	4.5	ND	<20	<50	–
B-30	9/23/91	5	3	ND	<20	<50	–

a Peak headspace measurement of soil collected from an adjacent brass liner from same sampler. Measurement taken using HNu® photoionization detector (PID) in parts per million (ppm).
b HCID analysis performed by NET Pacific Laboratory by using OAR/DEQ TPH-HCID Method.
c TPH-G analysis performed by NET Pacific Laboratory by using OAR/DEQ Method TPH-Gas (EPA 8015m). Results in ppm.
d TPH-D analysis performed by NET Pacific Laboratory by using OAR/DEQ Method TPH-Diesel (EPA 8015m). Results in ppm.
e Total recoverable petroleum hydrocarbon (TRPH) analysis performed by NET Pacific Laboratory by using US EPA Method 418.1. Results in ppm.
f "G" denotes gasoline, "K" denotes kerosene, "D" denotes diesel, and "O" denotes oil ranged hydrocarbons.
g TPH-D analysis identified hydrocarbons similar to kerosene.
ND Denotes analyte not detected per laboratory reportable limit presented under TPH-G and TPH-D columns.
NT Denotes sample measurement not taken.

SUMMARY OF GROUNDWATER CHEMICAL ANALYTICAL DATA[1]
VOLATILE ORGANIC COMPOUNDS IN WATER
SHELL OIL PRODUCTS US BULK TERMINAL PIPELINE CORRIDOR
4350 NW FRONT AVENUE
PORTLAND, OREGON

Volatile Organic Compounds[2]
(EPA Method 8260B)
(µg/l)

Sample Location	Date Sampled	Carbon disulfide	Carbon tetrachloride	Chlorobenzene	Chloroethane	Chloroform	Chloromethane	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene[4]	Dibromochloromethane	Dibromomethane	Dichlorodifluoromethane	Ethylbenzene	Hexachlorobutadiene	Isopropylbenzene	m,p-Xylene	Methyl tert-butyl ether	Methylene chloride	n-Butylbenzene	n-Propylbenzene	Naphthalene	o-Xylene	sec-Butylbenzene	Styrene	tert-Butylbenzene	Tetrachloroethene	Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene[4]	Trichloroethene	Trichlorofluoromethane	Vinyl acetate	Vinyl chloride	Xylenes (total)
SMW-3	12/26/02	–	–	–	–	–	–	–	–	–	–	–	10	–	–	53	<1	–	–	–	15	45	–	–	<100	–	1	–	–	–	–	–	–	98
SMW-9	12/27/02	–	–	–	–	–	–	–	–	–	–	–	<1	–	–	<1	<1	–	–	–	<1	<1	–	–	<100	–	<1	–	–	–	–	–	–	<1
SMW-11	12/27/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	3	<5	43	3	<1	<5	<5	30	<1	<1	6	<5	–	<5	1	<5	<5	<5	<5	<10	<10	3
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	22	<1	<1	<5	<5	14	<1	<1	6	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-12	12/26/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	2	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	2	<5	<5	<5	<1	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-13	12/26/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	1	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	2	<5	<5	<5	<1	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-14	12/27/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	14	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-15	12/27/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-16	12/26/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-17	12/26/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
SMW-18	12/27/02	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	–	<5	<1	<5	<5	<5	<5	<10	<10	<1
	03/27/03	<5	<5	<5	<10	<5	<10	<5	<5	<5	<5	<10	<1	<5	<5	<1	<1	<5	<5	<5	<1	<1	<5	<5	<5	<5	<1	<5	<5	<5	<5	<10	<10	<1
Oregon DEQ Level II Screening Level Values (SLVs) for Aquatic Exposure to Surface Water (µg/L)[3]																																		
		0.92	74.0	50	NE	1,240	NE	590	244	NE	NE	NE	7.3	9.3	NE	NE	NE	2,200	NE	NE	620	NE	NE	NE	NE	840	9.8	590	244	21,900	NE	16	NE	13

TABLE 4

SUMMARY OF GROUNDWATER CHEMICAL ANALYTICAL DATA[1]
VOLATILE ORGANIC COMPOUNDS IN WATER

SHELL OIL PRODUCTS US BULK TERMINAL PIPELINE CORRIDOR
4350 NW FRONT AVENUE
PORTLAND, OREGON

		Volatile Organic Compounds[2] (EPA Method 8260B) (µg/l)																																			
Sample Location	Date Sampled	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloroethene (total)	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	1,3-Dichloropropene	1,4-Dichlorobenzene	2,2-Dichloropropane	2-Butanone	2-Chloroethyl vinyl ether	2-Chlorotoluene	2-Hexanone	4-Chlorotoluene	4-Isopropyltoluene	4-Methyl-2-pentanone	Acetone	Acrylonitrile	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane
SMW-3	12/26/02	-	-	-	-	-	-	-	-	-	-	-	<2	-	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SMW-9	12/27/02	-	-	-	-	-	-	-	-	-	-	-	<2	-	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	-	-	-	-	-	-	-	-
SMW-11	12/27/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	2	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-12	12/26/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-13	12/26/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-14	12/27/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-15	12/27/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-16	12/26/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-17	12/26/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
SMW-18	12/27/02	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
	03/27/03	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<20	<10	<5	<10	<5	<5	<10	<100	<50	<1	<5	<5	<5	<5	<10
Oregon DEQ Level II Screening Level Values (SLVs) for Aquatic Exposure to Surface Water (µg/L)[3]																																					

Georgia-Pacific – Linnton Fiber Terminal

GEORGIA-PACIFIC – LINNTON FIBER TERMINAL
CSM Site Summary

GEORGIA-PACIFIC – LINNTON FIBER TERMINAL

Oregon DEQ ECSI #: 2370

12222 NW Marina Road
DEQ Site Mgr: Tom Gainer
Latitude: 45.6229°
Longitude: -122.7949°
Township/Range/Section: 2N/1W/34

River Mile: 3.5 West bank LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Georgia Pacific – Linnton (Morse Bros.) site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

A total of five drainage areas have been identified at the Georgia-Pacific site, as shown in Supplemental Figure 4 from ESA (2000). Approximately 92% of the 21-acre site is covered by impervious surfaces, and the vast majority of stormwater drains through the site's underground stormwater system to four outfalls. Overland transport of sheet runoff from the uplands to the river is expected to be minimal (see Sections 10.1 and 10.3).

1.2. Riverbank Erosion

The extent of riprap along the shoreline was determined from bathymetric survey information and from a river bottom sounding investigation by CH2M HILL (2000b) on May 27, 2000. As shown in Supplemental Figure 2-1 from CH2M HILL (2000a), riprap is estimated to extend across much of the shoreline. This shoreline armoring reportedly acts to reduce bank erosion. Evidence of riverbank erosion was not reported in the files reviewed.

1.3. Groundwater

Four shallow monitoring wells have been installed at the site to characterize groundwater. Monitoring wells were installed downgradient from the historic wood treating area, adjacent to the ACF Industries site, and the former Linnton Oil Fire Training Ground (LOFTG) site. Constituents were largely undetected in groundwater samples. "VOCs were detected at concentrations above the method detection limit [downgradient from the wood treating area], which ranged from 1 μg/L to 50 μg/L" (CH2M HILL 2000a). It is not clear whether this range applies to the concentrations of detected constituents or the detection limits. Specific VOC constituents were not identified. A groundwater sample collected from wells adjacent to the former LOFTG site contained detectable concentrations of petroleum; however, VOCs and SVOCs were not detected in the sample. Although groundwater impacts to the site have not been completely characterized, the DEQ has indicated that the site does not appear to be a current source of Willamette River sediment contamination (DEQ 2002a) (see Section 10.2).

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1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

There are four stormwater outfalls draining five areas of the site (described further in Section 10.3). In addition, Outfall 1/WR-153 currently serves as a discharge point for stormwater from a portion of Forest Park and the former ACF Industries site located to the west. Historically, excess wastewater from washing railcars at the former ACF Industries site drained into a swampy area located on the Georgia-Pacific site. Stormwater discharge appears to be a potential current and historical pathway for upland releases (see Section 10.3).

The dock was constructed in 1971 to load wood chips on deep-water vessels for export. The dock had no maintenance or ship-refueling capabilities. Overwater releases between 1971 and 1996 were considered minor (CH2M HILL 2000a,c) (see Sections 8.2 and 8.3).

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Georgia-Pacific site is located on the west bank at RM 3.5, just upstream of the Multnomah Channel. This portion of the river was characterized in the Portland Harbor Work Plan (Integral et al. 2004) as transitional between the upstream transport zone (RM 5-7) and the downstream depositional zone (RM 1-3). The Sediment Trend Analysis® results indicate that the channel environment off of this site is a mixture episodic net accretion and erosion in the nearshore and dynamic equilibrium offshore in the center and eastern portion of the channel. Time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) indicate that the nearshore area from the 0 to the –20 foot contour NAVD88 shows either no change or sediment erosion to about 1 foot across site's river frontage upstream of the center of the T-dock. From the center of T-dock downstream, net sediment accretion is evident (up to 1+ foot in extent) both inside and along the dock face out to about the –30 foot NAVD88 contour. The main channel offshore from the site is dominated by areas of no measurable riverbed elevation change.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☒	PA – November 1999 (CH2M Hill 1999) Supplemental PA – January 2000 (CH2M HILL 2000a) XPA – August 2000 (CH2M HILL 2000b)
RI	☐	
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☒	1991-NFA by DEQ for UST (#26-89-0133) cleanup 1995-NFA by DEQ for UST (#26-95-0052) cleanup

A Phase II Environmental Site Assessment was performed by CH2M Hill in 1999.

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Tier 1

4. SITE OWNER HISTORY

Sources: DEQ 1999c, 2004

Owner/Occupant	Type of Operation	Years
Morse Brothers, Inc. – **owner/operator**	Gravel storage terminal	1999-present
Georgia-Pacific West, Inc. – **owner/operator**	Wood chip transfer from truck and rail to ship	1995-1997
Georgia-Pacific, Inc. Linnton Fiber Terminal – **owner/operator**	Wood chip transfer from truck and rail to ship	1971- 1995
Kingsley Lumber - **owner/operator**	Sawmill, creosote plant, and lumber storage facilities in southern end of property	Active through late 1950s, Inactive until sale in 1971

5. PROPERTY DESCRIPTION

The Georgia-Pacific site is located along the western bank of Willamette River on a 21.5-acre tract (Figure 1). The site is fully fenced and mostly paved. The site lies in an area of mixed industrial, residential, and recreational use. The site is bounded on the southwest by the former ACF Industries railcar cleaning, repair, and repainting facility, to the northwest by a Bonneville Power Administration (BPA) transmission line right-of-way and wetland area that separates the facility from the Portland General Electric (PGE) Harborton electrical substation, and to the southeast by the Owens Corning/Trumbull Asphalt asphalt storage and roofing shingle manufacturing facility. A Burlington Northern-Santa Fe (BNSF) Railroad right-of-way and tracks separate the former Georgia-Pacific facility from the former ACF Industries' facility. The former Linnton Oil Fire Training Grounds (LOFTG) is located at the northwestern corner of the Georgia-Pacific facility on the BPA right-of-way.

A maintenance shop, railcar rollover building, truck scale, railcar rollover and truck tilt-up unloading systems, truck scales, and lab/office building are situated in the northeast corner of the site. An L-shaped wood chip conveyor extends from the central portion of the site to the 1200-ft long ship loading dock. A 15,000-gallon AST and four smaller ASTs for storing and dispensing petroleum products are located in the northwest corner of the site. Three of the ASTs, used to store hydraulic oil, transmission oil, and motor oil, are situated inside a containment berm (CH2M Hill 2000a). It is not known if secondary containment is available for either the 15,000-gallon AST or the truck unloading system. A hazardous material storage shed was located adjacent to the maintenance shop and was used to store oakite (used in late 1970s/early 1980s) and grease primarily. It is not known if the shed had a floor but may have sat directly on the pavement. The remainder of the site is not developed (CH2M Hill 2000a).

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Department of State Lands files.

6. CURRENT SITE USE

The site is currently owned and used by Morse Brothers for rock storage and distribution via rail or barge (www.morsebros.com\materi.html). No other information on the current use of this site is available.

7. SITE USE HISTORY

The site was owned by Kingsley Lumber Company, which operated a sawmill, creosote plant, and lumber storage facility in the southeastern half of the site up until the late 1950s. It is not known when Kingsley acquired the property, though it is believed to have been undeveloped land before that time.

Georgia-Pacific purchased the site from Kingsley Lumber Company in 1971. At that time, most of the property was in an undeveloped state. Construction of the facility began in 1971, at which time the nearshore area was dredged for the construction of a dock, followed by a maintenance dredging event in 1985. The facility operated as a wood chip transfer facility from 1971 to 1996. The facility was transferred from Georgia-Pacific, Inc. to Georgia-Pacific West, Inc., a wholly owned subsidiary of Georgia-Pacific, Inc., in January 1995.

Chips were virgin fiber and contained no wood preservatives, resins, or other constituents. Originally, over half of the chips were delivered by railcar. At its peak, the vast majority of chips were loaded and unloaded via ship (44 ship loads in mid-1980s), but by the mid-1990s, most chips arrived by truck. In 1971, a pneumatic conveyor system was used to convey chips from unloading areas to the asphalt-covered chip storage area in the central portion of the site. The pneumatic system was replaced by a conveyer belt system in 1976 to reduce particulate emissions. Chips were segregated by type in the central portion of the site until adequate quantities were available for export by cargo ship. Bulldozers were used to push chips to reclaim areas. Conveyors then moved the chips from the reclaim areas to a pneumatic conveyor feeder that blew the chips into the ship holds. As the amount of timber harvested in the Pacific Northwest declined in the 1990s, use of the site rapidly decreased. The site was largely inactive by mid-1996, and operations altogether were mothballed in early 1997.

A 10,000-gallon gasoline underground tank was installed in the northeast corner of the site in 1972. It was later decommissioned in 1989. In 1995, Georgia-Pacific replaced a 10,000-gallon diesel fuel UST after 20 years of service with a 15,000-gallon diesel AST in the northwest corner of the site. Four other 500-gallon ASTs were installed in the northwest corner as well (date unknown). A 5,000-gallon diesel fuel UST was installed in the southwest corner of the site in 1975. It was later decommissioned in 1988.

In the early 1970s, a fuel unloading facility was constructed at the dock to transfer fuel from the barges to storage tanks at the PGE Harborton substation. A pipeline was placed underground from the dock to the PGE site although the files reviewed for this report did not show its location. CH2M Hill (2000a) indicated that the pipeline was only used two or three times.

The site was inactive between August 1996 and 1999. Morse Brothers, Inc., a commercial sand and gravel supplier and aggregate mining company, purchased the site from Georgia-Pacific in 1999 and currently owns the site (CH2M HILL 2000a, DEQ 1999a, 2004).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

The following is a summary of the sources that were determined to be potential sources of releases to sediment as evaluated in the *Supplemental Preliminary Assessment Report for the Linnton Site* (CH2M HILL 2000a). The locations of these sources are shown on Supplemental Figure 3-3 from CH2M HILL (2000a):

Potential Onsite Sources

- **Gasoline UST Soil Remediation Pile:** Soil from a gasoline UST excavation was stockpiled in order to aerate and naturally degrade. There are no records of stormwater contamination from the pile.
- **Bulk Petroleum Storage Area:** The bulk petroleum storage area consists of four ASTs located in the northwestern portion of the site. Three 500-gallon tanks contain hydraulic oil, transmission oil, and motor oil within a bermed storage area. A 500-gallon waste oil tank is located outside the bermed area. In addition, a 15,000-gallon diesel AST was installed in this area to replace the 10,000-gallon diesel UST that was removed. There are no documented releases from the ASTs.
- **Historic Kingsley Lumber Creosote Wood Treating Plant:** Kingsley Lumber operated a sawmill and creosote plant in the southeastern corner of the site. It is not known what specific operations were conducted; however, CH2M HILL (2000a) indicated that Sanborn maps available for the site showed a creosote pole treating plant.
- **Georgia-Pacific Dock:** The dock was historically used to load chips for export. There were no maintenance or ship-refueling capabilities at the dock. In the mid-1970s, a small number of diesel fuel transfers were performed at the dock. Fuel was transferred from barges to storage tanks at the PGE Harborton substation via underground pipeline.

Potential Offsite Sources

- **ACF Industries:** Prior to development of the Georgia-Pacific site, wastewater from the ACF site collected in the swampy area in the northwest portion of the Georgia-Pacific site and was allowed to evaporate or infiltrate into the ground. After development of the Georgia-Pacific site, a 30-inch stormwater drain line carried runoff from the Georgia-Pacific and ACF sites, as well as from the Portland hills, to the river via Outfall 1. DEQ (1999c) noted that sediment contamination in the river (sample SD005) is similar in character to contaminants that were known to be, or suspected of being, present on the ACF property.

COPCs for the potential source areas include oil and grease, PAHs, BTEX compounds, waste motor oil, diesel, ablative paint compounds (lead and TBT), and wood-treating compounds (PCP and arsenic).

8.2. Overwater Activities ☒ Yes ☐ No

Georgia-Pacific Dock: The dock was constructed in 1971 to load deep-water vessels with wood chips for export. The Georgia-Pacific site dock was dredged in 1988 for maintenance purposes, and thus sediments impacted from any incidental releases would have been removed (CH2M HILL 2000a). There were no reported releases aside from a spill of approximately 4 ounces of diesel fuel from a transfer hose in 1976 (see Section 8.3). There is no information available concerning current rock loading and unloading activities.

Information about the owner having and exercising a statutory right to an overwater facility was not found in Oregon Department of State Lands files.

8.3. Spills

Known or documented spills at the Georgia-Pacific site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports (CH2M HILL 2000a), or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
4/76	Diesel fuel	~0.06 gallons (4 ounces)	From fuel transfer hose at dock	Not reported

9. PHYSICAL SITE SETTING

In 1999, a Phase II environmental site assessment (ESA) was conducted at the site, which included the completion of seven probe borings and four monitoring wells; however, a copy of this report was not available in the DEQ file for review (Not seen, as cited in CH2M Hill 2000a). The Supplemental Preliminary Assessment Report for the Georgia-Pacific Site (CH2M HILL 2000a) refers to the Phase II ESA, but does not include geologic/hydrogeologic data collected during that investigation.

9.1. Geology

No site-specific geologic information was available in the DEQ file for the site.

9.2. Hydrogeology

No site-specific hydrogeologic information was available in the DEQ file for this site.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

Soil samples were collected during the removal of the following gasoline and diesel USTs located at the site (CH2M HILL 2000a):

- **Southern Diesel Fuel UST:** A 5,000-gallon diesel fuel UST was removed in 1988. No soil contamination was detected during decommissioning sampling. A monitoring well was installed downgradient of the former UST location and a soil sample was collected at the soil/groundwater interface. Neither diesel nor lube oil was detected in the sample.
- **Gasoline UST:** A 10,000-gallon gasoline UST was removed from the northeastern corner of the facility in 1989. A sample collected from the soil excavated during the UST removal contained 900 ppm TPH, but no detectable gasoline or BTEX. TPH was not detected in two samples collected from the bottom of the tank excavation at 10 and 12 feet bgs. A Geoprobe™ boring was installed downgradient of the former UST location during the Phase II ESA. A soil sample was collected from this boring at the soil/groundwater interface, 11.9 bgs, and analyzed for diesel and lube oil. Both analytes were not detected.
- **Northern Diesel Fuel UST:** In 1995, Georgia-Pacific replaced a 20-year old, 10,000-gallon diesel fuel UST with a diesel fuel AST. A sample of the excavated soils contained 3,160 ppm TPH, but no detectable gasoline or heavier oils. Two confirmation soil samples collected at 12 feet bgs contained 21 ppm and less than 20 ppm TPH, respectively. Two soil borings, E-5-Lin and E-9-Lin, were advanced near the location of this former UST during the 1999 Phase II ESA. Soil samples were collected at the soil/groundwater interface. Diesel was detected

at the detection limit of 19 ppm in the sample nearest the former tank location, and lube oil was not detected in either sample.

10.1.2. Riverbank Samples ☐ Yes ☒ No

Available records indicate that no riverbank investigations have been conducted at the site.

10.1.3. Summary

Soil samples were collected in the excavation area of the three USTs that were removed. Soil borings were advanced at all three locations, and soil samples were collected at the soil/groundwater interface. Diesel was detected at the detection limit in the sample nearest the northern diesel fuel UST. Soil samples from the gasoline and northern diesel fuel UST contained TPH but no detectable BTEX. Surface soil samples were not collected; however, because most of the site is covered with impervious surfaces, overland transport is expected to be minimal.

10.2. Groundwater

10.2.1. Groundwater Investigations ☒ Yes ☐ No

In 1999, a Phase II ESA was conducted at the site and included groundwater investigation activities; however, a copy of this report was not available in the DEQ file for review. The Supplemental Preliminary Assessment for the Linnton Site (CH2M HILL 2000a) includes minimal information from the Phase II ESA report with respect to water quality results and the locations of the borings and wells. An RI report completed at the ACF site (RETEC 2002), located west-southwest of the Georgia Pacific site, includes a brief summary of the water quality data collected during the 1999 Phase II ESA. The following assessment of the nature and extent of impacted groundwater was based on information in these available reports and DEQ correspondence.

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

Available records indicate no evidence of NAPL at the site.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

According to the Supplemental Preliminary Assessment (CH2M HILL 2000a), a groundwater sample was collected from monitoring well MW-2 located downgradient from the historic wood treating area. The sample was analyzed for TPH-Dx, VOCs, and SVOCs. No diesel or lube oil was detected in the sample. SVOCs were not detected in the sample above the method detection limit, which ranged from 10 to 25 µg/L. The report states that "VOCs were detected at concentrations above the method detection limit, which ranged from 1 µg/L to 50 µg/L." It is not clear whether this range applies to the concentrations of detected constituents or the detection limits. Specific VOC constituents were not identified.

According to the ACF RI report (RETEC 2002), two monitoring wells (MW-1 and MW-3) were installed on the former Georgia Pacific property immediately downgradient from the ACF site. No petroleum, VOCs, or SVOCs were detected in the groundwater samples. Monitoring well MW-4 was installed on former Georgia Pacific property adjacent to the LOFTG site to assess potential groundwater contamination in that area. Petroleum was detected in the groundwater sample collected from MW-4; however, VOCs and SVOCs were not detected in the sample.

Plume Characterization Status ☐ Complete ☒ Incomplete

In a letter to Georgia Pacific, the DEQ (2002b) requested an evaluation of groundwater

near the historic wood treatment facility. The DEQ file indicates that no additional investigation of groundwater was performed in this area.

Plume Extent

Insufficient information is available in the DEQ files to assess the extent of the plumes, if any, at the site.

Min/Max Detections (Current situation)

Specific concentration levels from groundwater investigation activities were not available in the DEQ file.

Current Plume Data

Insufficient information is available in the DEQ files concerning possible plumes at the site.

Preferential Pathways

Based on available information, no preferential pathways were identified at the site.

Downgradient Plume Monitoring Points (min/max detections)

Plume monitoring data have not been collected.

Visual Seep Sample Data ☐ Yes ☒ No

No seeps have been identified at the site (GSI 2003).

Nearshore Porewater Data

No porewater data have been collected at the site.

Groundwater Plume Temporal Trend

Insufficient data are available to assess plume distributions, if any, over time.

10.2.4. Summary

Four shallow monitoring wells have been installed at the site to characterize groundwater. Available DEQ records include minimal information regarding groundwater quality at the site. However, the DEQ (2002a) has indicated that the site does not appear to be a current source of Willamette River sediment contamination.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit [Current or Past] ☒ Yes ☐ No

Permit Type	File Number	Start Date	Outfalls	Volumes	Parameters/Frequency
GEN12Z	32876-17443	4/3/01	Outfall 3 (CH2M HILL 2000a)	?	Standard[17] twice yearly
GEN12Z	32876-10301	10/22/97	Inactive (terminated)	?	Standard[17] twice yearly
GEN12W	32876-10302	10/23/92	Inactive	?	pH, TSS, BOD, COD, TOC, O&G

GEN01	32876-10303	12/27/82	Outfall 3 (inactive-terminated)	?	Flow rate, temperature, and pH

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

The locations of these outfalls are shown on Supplemental Figure 3-3 from CH2M HILL (2000a), and drainage areas are shown on Supplemental Figure 4 from ESA (2001). It should be noted that the outfall numbering used by ESA (2001) is the reverse of those used by CH2M HILL (2000a). The following description of outfalls follows the CH2M HILL (2000a, 2000c) nomenclature, although information was compiled from both ESA (2001) and CH2M HILL (2000c):

- **Outfall 1/WR-153** is a 30-inch outfall located at the northern end of the site. The outfall conveys surface runoff from the west hills (Forest Park), the adjacent former ACF Industries site, and onsite drainage from areas 2 (2 acres, 30% impervious), 3 (1.5 acres, 100% impervious), and 4 (0.75 acres, 100% impervious). A 15,000-gallon AST occurs in area 2, the truck scale occurs in area 3, and a maintenance shop occurs in area 4.
- **Outfall 2/WR-239** is a 12-inch outfall that collects stormwater from area 5 (0.75 acres; 100% impervious) near the site laboratory building. This outfall discharges to the riprap bank just below the existing grade of the terminal.
- **Outfall 3/WR-238** is a 12-inch outfall that receives stormwater runoff from the former chip storage area and drainage from the subsurface conveyor pit locations of area 1(16 acres; 98% impervious). Stormwater is collected in a trench that runs north and south. This outfall discharges to the riprap bank just below the existing grade of the terminal.
- **Outfall 4/WR-237** is a 12-inch outfall that also receives stormwater runoff from the former chip storage area, the former Kingsley Lumber Wood Treating Plant, and drainage from the subsurface conveyor pit locations of area 1 (16 acres; 98% impervious). Stormwater is collected in a trench that runs north and south. This outfall discharges to the riprap bank just below the existing grade of the terminal in the southeast corner.

Do other non-stormwater wastes discharge to the system? ☒ Yes ☐ No

When the former ACF Industries facility was in operation (operations ceased in 1980), wastewater from pressure-washing activities was discharged to an unlined surface impoundment in the northeast corner of the site. As the impoundment filled, the pond would extend to the southeast to a culvert located beneath the railroad tracks and wastewater would discharge to a swampy area on the Georgia-Pacific site. After development of the Georgia-Pacific site, a 30-inch stormwater drainline was installed, and now the ponded water passes through the culvert under the tracks and enters the Georgia-Pacific storm sewer (CH2M HILL 2000a).

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

Permit Type	Permit No.	Start Date	Outfalls	Volumes	Parameters/Frequency
GEN01	32876-10303 (inactive-terminated)	12/27/82	Outfall 3	?	Flow rate, temperature, and pH

10.3.6. Wastewater Data

☐ Yes ☒ No

10.3.7. Summary

Stormwater is currently discharged from four outfall points; samples are collected from Outfall 3/WR-238 (nomenclature from CH2M HILL 2000a) in compliance with the facility's NPDES 12Z permit. There is no wastewater currently generated at the site; however, a permit for the discharge of cooling water was in place beginning in 1982. The wastewater permit has since been terminated. In addition, excess wastewater generated at ACF Industries historically drained into a swampy area located on the Georgia-Pacific site. Now, ponded water at the ACF Industries site enters the Georgia-Pacific stormwater system site via culvert and discharges to the river through Outfall 1/WR-153.

10.4. Sediment

10.4.1. River Sediment Data

☒ Yes ☐ No

River Character and Dredging History

Steep slopes extend from the site shoreline to just east of the Georgia-Pacific dock adjacent to the site. The bottom then tapers off just east of the dock, and the slope is gentle until reaching the main river channel approximately 500 feet from the shoreline. The area downstream of the site is a shoal in which water depths were too shallow for a prop boat to navigate during low water.

CH2M HILL (2000c) observed that during higher volume flows, a large back-eddy exists downstream of the site. The back-eddy flows countercurrent to the main downstream flow, and re-enters the main flow in the general vicinity of the downstream end of the dock and Outfall 1.

In 1971, the Willamette River sediment was dredged in the area adjacent to the Linnton site for the purpose of constructing a dock, as shown in Supplemental Figure 2-1 from CH2M HILL (2000c). Approximately 474,000 cubic yards of material were removed, and river bottom levels were lowered by over 30 feet in some areas. A portion of the area was re-dredged in 1985 as part of the maintenance dredging performed near the dock. Bathymetric surveys were conducted in 1970 and 2000. The historical data were compared to the current data to determine the sediment depositional characteristics adjacent to the site. As shown in Supplemental Figures 3-1 through 3-4 from CH2M HILL (2000c), a significant amount of sediment deposition has occurred in the area adjacent to the Linnton site. Approximately 10 to 15 feet of sediment has been redeposited in areas near the Linnton dock since the 1971 dredging.

Sediment Sampling Data

One surface sediment and 11 subsurface sediment samples have been collected off the Georgia-Pacific property in association two surveys (Figure 1). Roy F. Weston (EPA contractor) collected one surface sediment sample in 1997 (Weston 1998), and CH2M

HILL collected core samples for Georgia-Pacific on May 16-17, 2000 as part of the Expanded Preliminary Assessment (XPA) for the Linnton Site (CH2M HILL 2000c). Sediment chemistry data are summarized in Table 2.

Weston's (1998) surface sediment sample was collected on the downstream end of the Georgia-Pacific dock. DEQ (2004) noted "elevated concentrations of thallium, PAHs, arsenic and iron in river sediments at [this location], and elevated concentrations of thallium, PAHs, mercury, and pentachlorophenol in sediments collected about 340 feet farther downstream" of the site.

As part of CH2M HILL's (2000c) study, two cores were collected from each location shown in Supplemental Figure 2-1 of CH2M HILL (2000c) and composited. Sediment characteristics between locations were very similar, with the exception of two or three samples downstream of Outfall 1/WR-153. In general, sediment was a silty material with various colorations of gray, brown, and green, with a layer approximately 1 to 2 centimeters (cm) thick of a lighter brown silt on top. The general area downstream of Outfall 1/WR-153 appeared to differ from other areas due to different depositional/scouring characteristics. Both samples upstream of the site and the sample at the downstream end of the dock had slight petroleum-like organic odors.

Based on the results from the XPA (CH2M HILL 2000c), DEQ (2004) concluded that while petroleum-contaminated sediment was observed adjacent to the subject site in the Willamette River, the subject site does not appear to be a current source of such contamination and that source-control measures are not necessary at this time.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

In 1988, a 5,0000-gallon diesel fuel UST was removed. No soil contamination was discovered during decommissioning.

A 10,000-gallon gasoline UST, formerly used to store diesel, was removed in 1989 and approximately 10 cy of soil was removed during tank removal. The excavated soil contained 900 ppm TPH, but gasoline and BTEX were non-detect. TPH was not detected in the bottom of the excavation, and the soil/groundwater interface sample collected downgradient was non-detect for diesel and lube oil compounds.

In 1995, a 10,000-gallon diesel fuel UST was replaced with an AST and approximately 69 cy of soil was removed during the UST removal. The excavated soil contained 3,160 ppm TPH, but no detectable gasoline or heavier oils. Confirmation samples collected at the bottom of the tank excavation contained 21 ppm and 20 ppm TPH. No groundwater was encountered. Two soil borings were advanced near the location of the UST, and soil samples were collected at the soil/groundwater interface. Lube oil was not detected and diesel was only detected at the detection limit in the boring nearest the tank removal area (CH2M HILL 2000c).

11.2. Groundwater Cleanup/Source Control

No groundwater source control measures have been conducted at the site.

11.3. Other

Sediments have been dredged at various times since at least 1971. Details are provided in Section 10.4.

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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Other relevant references/information sources:

Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assesment
Table 2. Queried Sediment Chemistry Data.

Supplemental Figures:

Figure 2-1. Linnton Site Bathymetry, Sediment sample Locations and Historical Dredging (CH2M HILL 2000c)
Figure 3-3. Source/Pathway Locations (CH2M HILL 2000a)
Figure 4. Site Storm Water Drainage/Outfall Map (ESA 2001)
Figure 3-1. Plan View Cross Sections A-A', B-B', and C-C' (CH2M HILL 2000c)
Figure 3-2. Cross Section View A-A' (CH2M HILL 2000c)
Figure 3-3. Cross Section View B-B' (CH2M HILL 2000c)
Figure 3-4. Cross Section View C-C' (CH2M HILL 2000c)

FIGURES

Figure 1. Site Features

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This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls (Abandoned)
Non-City Outfalls
City Outfalls
Seep Photo Location (Not location of actual Seep)

Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
Navigation Channel
Docks & In-water Structures

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Georgia Pacific -
Linnton Fiber Terminal
ECSI 2370

TABLES

Table 1. Potential Sources and Transport Pathways Assesment
Table 2. Queried Sediment Chemistry Data.

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Georgia-Pacific - Linnton (Morse Bros) #2370

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs																			Potential Complete Pathway				
						TPH			VOCs																				
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	*Oakite*	*Grease*	*Oils*	*Creosote, Wood Treating Chemicals*	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																													
Gasoline Fuel UST & Soil Remediation Pile	✓	✓				✓	✓		✓				✓												✓			✓	
Bulk Petroleum Storage Area - ASTs	?						✓	✓														✓	✓					✓	
Former ACF Site	✓	✓											✓									✓	✓		✓			✓	
Former Kingsley Lumber Wood Treating Plant	✓	✓	✓		✓					✓		?	✓			?								✓	✓	✓	✓		
Former Linnton Oil Fire Training Ground (LOFTG)		✓	✓																				✓			✓			
Overwater Areas																													
Georgia-Pacific Dock (docked ships, former fuel unloading)					✓		✓									✓				✓		✓	✓				✓		
Other Areas/Other Issues																													

Notes:

[1] All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source. COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source. COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychlorinated biphenols

Table 2. Georgia-Pacific Linnton Site Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	1	0	0						3.9 U	3.9 U	3.9	3.9 U	3.9 U
surface	Aroclor 1242 (ug/kg)	1	0	0						3.9 U	3.9 U	3.9	3.9 U	3.9 U
surface	Aroclor 1248 (ug/kg)	1	0	0						6.4 U	6.4 U	6.4	6.4 U	6.4 U
surface	Aroclor 1254 (ug/kg)	1	0	0						17 U	17 U	17	17 U	17 U
surface	Aroclor 1260 (ug/kg)	1	0	0						26 U	26 U	26	26 U	26 U
surface	Aroclor 1221 (ug/kg)	1	0	0						7.8 U	7.8 U	7.8	7.8 U	7.8 U
surface	Aroclor 1232 (ug/kg)	1	0	0						3.9 U	3.9 U	3.9	3.9 U	3.9 U
surface	Polychlorinated biphenyls (ug/kg)	1	0	0						26 U	26 U	26	26 U	26 U
surface	Total solids (percent)	1	1	100	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8
surface	Total organic carbon (percent)	13	13	100	1	3.02	1.95	1.89	2.82	1	3.02	1.95	1.89	2.82
surface	< 0.075 mm (percent)	11	11	100	64.2	95.6	84.3	86.9	92	64.2	95.6	84.3	86.9	92
surface	0.075 to 0.85 mm (percent)	11	11	100	4.3	34.4	15.2	12.9	30.5	4.3	34.4	15.2	12.9	30.5
surface	Gravel (percent)	2	2	100	0.5	2.87	1.69	0.5	0.5	0.5	2.87	1.69	0.5	0.5
surface	Sand (percent)	1	1	100	45.71	45.71	45.7	45.71	45.71	45.71	45.71	45.7	45.71	45.71
surface	Very coarse sand (percent)	1	1	100	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
surface	Coarse sand (percent)	1	1	100	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
surface	Medium sand (percent)	1	1	100	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81
surface	Fine sand (percent)	1	1	100	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.15
surface	Very fine sand (percent)	1	1	100	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
surface	Fines (percent)	1	1	100	51.42	51.42	51.4	51.42	51.42	51.42	51.42	51.4	51.42	51.42
surface	Silt (percent)	1	1	100	42.71	42.71	42.7	42.71	42.71	42.71	42.71	42.7	42.71	42.71
surface	Coarse silt (percent)	1	1	100	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
surface	Medium silt (percent)	1	1	100	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4
surface	Fine silt (percent)	1	1	100	9.26	9.26	9.26	9.26	9.26	9.26	9.26	9.26	9.26	9.26
surface	Very fine silt (percent)	1	1	100	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97
surface	Clay (percent)	1	1	100	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71
surface	8-9 Phi clay (percent)	1	1	100	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
surface	9-10 Phi clay (percent)	1	1	100	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61
surface	>10 Phi clay (percent)	1	1	100	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09
surface	Dalapon (ug/kg)	1	0	0						16 U	16 U	16	16 U	16 U
surface	Dicamba (ug/kg)	1	0	0						3.3 U	3.3 U	3.3	3.3 U	3.3 U
surface	MCPA (ug/kg)	1	0	0						12000 U	12000 U	12000	12000 U	12000 U
surface	Dichloroprop (ug/kg)	1	0	0						6.5 U	6.5 U	6.5	6.5 U	6.5 U
surface	2,4-D (ug/kg)	1	0	0						6.5 U	6.5 U	6.5	6.5 U	6.5 U
surface	Silvex (ug/kg)	1	0	0						1.6 U	1.6 U	1.6	1.6 U	1.6 U
surface	2,4,5-T (ug/kg)	1	0	0						1.6 U	1.6 U	1.6	1.6 U	1.6 U
surface	2,4-DB (ug/kg)	1	0	0						33 U	33 U	33	33 U	33 U
surface	Dinoseb (ug/kg)	1	0	0						3.3 U	3.3 U	3.3	3.3 U	3.3 U
surface	MCPP (ug/kg)	1	0	0						4500 U	4500 U	4500	4500 U	4500 U

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aluminum (mg/kg)	13	13	100	27400	41900	32700	32200	36600	27400	41900	32700	32200	36600
surface	Antimony (mg/kg)	12	0	0						0.72 U	5 UJ	1.18	0.83 U	0.98 U
surface	Arsenic (mg/kg)	13	13	100	4	21.6	10.6	9.8	15.8	4	21.6	10.6	9.8	15.8
surface	Cadmium (mg/kg)	13	4	30.8	0.21	1.3	0.688	0.4	0.84	0.21	1.3	0.797	0.84	0.98 U
surface	Chromium (mg/kg)	13	13	100	30.1	44.7	35.7	35.8	39.5	30.1	44.7	35.7	35.8	39.5
surface	Copper (mg/kg)	13	13	100	32.3	47.4	39.2	39.3	43.7	32.3	47.4	39.2	39.3	43.7
surface	Lead (mg/kg)	13	13	100	7.7	28.7	14.7	14	16.8	7.7	28.7	14.7	14	16.8
surface	Manganese (mg/kg)	12	12	100	503	725	601	592	665	503	725	601	592	665
surface	Mercury (mg/kg)	13	12	92.3	0.07 J	0.36	0.117	0.09	0.18	0.07 J	0.36	0.115	0.09	0.18
surface	Nickel (mg/kg)	13	13	100	26	34.5	28.8	28.8	31.8	26	34.5	28.8	28.8	31.8
surface	Selenium (mg/kg)	13	3	23.1	0.9	11	4.29	0.98	0.98	0.4 UJ	11	1.54	0.76 U	0.98
surface	Silver (mg/kg)	13	2	15.4	0.05 J	0.7	0.375	0.05 J	0.05 J	0.05 J	2 U	1.48	1.6 U	1.9 U
surface	Thallium (mg/kg)	1	1	100	23	23	23	23	23	23	23	23	23	23
surface	Zinc (mg/kg)	13	13	100	88.1	151	112	104	140	88.1	151	112	104	140
surface	Barium (mg/kg)	12	12	100	150	196	171	172	194	150	196	171	172	194
surface	Beryllium (mg/kg)	12	12	100	0.54	1.1	0.828	0.82	0.96	0.54	1.1	0.828	0.82	0.96
surface	Calcium (mg/kg)	1	1	100	7600	7600	7600	7600	7600	7600	7600	7600	7600	7600
surface	Cobalt (mg/kg)	12	12	100	15	26.2	18.7	17.9	20.7	15	26.2	18.7	17.9	20.7
surface	Iron (mg/kg)	12	12	100	27600	47600	34300	33000	41600	27600	47600	34300	33000	41600
surface	Magnesium (mg/kg)	12	12	100	5830	7010	6380	6370	6910	5830	7010	6380	6370	6910
surface	Potassium (mg/kg)	1	1	100	1140	1140	1140	1140	1140	1140	1140	1140	1140	1140
surface	Sodium (mg/kg)	1	1	100	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040
surface	Tin (mg/kg)	11	0	0						3.6 U	4.9 U	4.16	4.1 U	4.7 U
surface	Titanium (mg/kg)	11	11	100	608	1880	1060	1030	1160	608	1880	1060	1030	1160
surface	Vanadium (mg/kg)	12	12	100	78.2	109	88.9	86	98.5	78.2	109	88.9	86	98.5
surface	2-Methylnaphthalene (ug/kg)	2	2	100	74	200	137	74	74	74	200	137	74	74
surface	Acenaphthene (ug/kg)	13	10	76.9	2.9	411	90	16	194	2.9	411	76.9	22 U	194
surface	Acenaphthylene (ug/kg)	13	10	76.9	6.1	153	38.9	18	63	1.7 U	153	36.2	21	63
surface	Anthracene (ug/kg)	13	12	92.3	2.4	613	88.4	25	134	2.4	613	86	33	134
surface	Fluorene (ug/kg)	13	11	84.6	2.5	265	55.2	17	124	2.5	265	52.7	20 U	124
surface	Naphthalene (ug/kg)	13	12	92.3	5.4	358	98.4	17	303	5.4	358	92.5	22 U	303
surface	Phenanthrene (ug/kg)	13	13	100	12	3040	458	120	1120	12	3040	458	120	1120
surface	Low Molecular Weight PAH (ug/kg)	13	13	100	25.2 A	4785 A	776	207 A	1992 A	25.2 A	4785 A	776	207 A	1992 A
surface	Dibenz(a,h)anthracene (ug/kg)	13	10	76.9	5.4	100	28.5	12	60 J	1.7 U	141 U	34.4	18	100
surface	Benz(a)anthracene (ug/kg)	13	13	100	9.2	1680	287	124	480	9.2	1680	287	124	480
surface	Benzo(a)pyrene (ug/kg)	13	13	100	10	1890	346	165	780	10	1890	346	165	780
surface	Benzo(b)fluoranthene (ug/kg)	13	13	100	13	1960	373	215 E	500	13	1960	373	215 E	500
surface	Benzo(g,h,i)perylene (ug/kg)	13	13	100	7.1	1610	281	133	460	7.1	1610	281	133	460
surface	Benzo(k)fluoranthene (ug/kg)	13	13	100	3.3	520	130	52	459	3.3	520	130	52	459
surface	Chrysene (ug/kg)	13	13	100	8.5	1360	264	95	620	8.5	1360	264	95	620
surface	Fluoranthene (ug/kg)	13	13	100	23	3850	634	226 E	1100	23	3850	634	226 E	1100

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	13	13	100	5.3	1080	201	100	400	5.3	1080	201	100	400
surface	Pyrene (ug/kg)	13	13	100	20	4600	713	236 E	1300	20	4600	713	236 E	1300
surface	Benzo(b+k)fluoranthene (ug/kg)	12	12	100	16.3 A	2419 A	502	257 A	1020 A	16.3 A	2419 A	502	257 A	1020 A
surface	High Molecular Weight PAH (ug/kg)	13	13	100	99.4 A	18489 A	3250	1346 A	6260 A	99.4 A	18489 A	3250	1346 A	6260 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	12	12	100	124.6 A	23274 A	4100	1471 A	7473 A	124.6 A	23274 A	4100	1471 A	7473 A
surface	C1-Dibenzothiophene (ug/kg)	11	8	72.7	2.1	247	60.9	5.8	126	1.7 U	247	48.3	5.8	126
surface	C1-Chrysene (ug/kg)	11	11	100	3.9	779	129	56	174	3.9	779	129	56	174
surface	C1-Fluorene (ug/kg)	11	8	72.7	3.3	287	56.9	9.2	90	1.7 U	287	45.3	9.4	90
surface	C1-Naphthalene (ug/kg)	11	8	72.7	3.5	327	58.9	6.4	94	1.7 U	327	46.8	7.7	94
surface	C1-Fluoranthene/pyrene (ug/kg)	11	11	100	7.9	1850	287	95	442	7.9	1850	287	95	442
surface	C1-Phenanthrene/anthracene (ug/kg)	11	11	100	6.7	1820	270	55	516	6.7	1820	270	55	516
surface	C2-Dibenzothiophene (ug/kg)	11	9	81.8	5.5	515	128	14	409	1.7 U	515	106	14	409
surface	C2-Chrysene (ug/kg)	11	11	100	2	393	71.8	31	128	2	393	71.8	31	128
surface	C2-Fluorene (ug/kg)	11	8	72.7	3.8	366	75.7	8.8	101	1.7 U	366	59	12	101
surface	C2-Naphthalene (ug/kg)	11	9	81.8	2.4	1080	165	15	242	2.4	1080	139	16	242
surface	C2-Phenanthrene/anthracene (ug/kg)	11	11	100	5.3	1530	252	50	467	5.3	1530	252	50	467
surface	C3-Dibenzothiophene (ug/kg)	11	9	81.8	5.6	404	97.1	11	311	1.7 U	404	81.4	11	311
surface	C3-Chrysene (ug/kg)	11	9	81.8	5.5	176	41	13	84	1.7 U	176	35.5	13	84
surface	C3-Fluorene (ug/kg)	11	9	81.8	5.6	370	73.7	16	123	1.7 U	370	62.2	16	123
surface	C3-Naphthalene (ug/kg)	11	8	72.7	4.9	1240	219	12	285	1.7 U	1240	163	14	285
surface	C3-Phenanthrene/anthracene (ug/kg)	11	11	100	3.2	631	147	43	448	3.2	631	147	43	448
surface	C4-Dibenzothiophene (ug/kg)	11	6	54.5	4.9	232	45.8	5.6	20	1.7 U	232	42	6.8	141 U
surface	C4-Chrysene (ug/kg)	11	3	27.3	2	3.5	2.67	2.5	2.5	1.7 U	141 U	21	3.5	22 U
surface	C4-Fluorene (ug/kg)	11	4	36.4	4.3	38	22.6	13	35	1.7 U	141 U	25.5	13	38
surface	C4-Naphthalene (ug/kg)	11	8	72.7	4.3	835	149	9.7	162	1.7 U	835	112	11	162
surface	C4-Phenanthrene/anthracene (ug/kg)	11	8	72.7	2.7	201	45.3	7.9	106	1.7 U	201	47.7	11	141 U
surface	2,4'-DDD (ug/kg)	1	0	0						2.2 UJ	2.2 UJ	2.2	2.2 UJ	2.2 UJ
surface	2,4'-DDE (ug/kg)	1	0	0						3.6 U	3.6 U	3.6	3.6 U	3.6 U
surface	2,4'-DDT (ug/kg)	1	1	100	22	22	22	22	22	22	22	22	22	22
surface	4,4'-DDD (ug/kg)	1	1	100	10 J	10 J	10	10 J	10 J	10 J	10 J	10	10 J	10 J
surface	4,4'-DDE (ug/kg)	1	1	100	4.8 J	4.8 J	4.8	4.8 J	4.8 J	4.8 J	4.8 J	4.8	4.8 J	4.8 J
surface	4,4'-DDT (ug/kg)	1	1	100	210	210	210	210	210	210	210	210	210	210
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	1	1	100	225 J	225 J	225	225 J	225 J	225 J	225 J	225	225 J	225 J
surface	Aldrin (ug/kg)	1	0	0						0.49 U	0.49 U	0.49	0.49 U	0.49 U
surface	alpha-Hexachlorocyclohexane (ug/kg)	1	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	beta-Hexachlorocyclohexane (ug/kg)	1	0	0						0.89 U	0.89 U	0.89	0.89 U	0.89 U
surface	delta-Hexachlorocyclohexane (ug/kg)	1	0	0						0.2 UJ	0.2 UJ	0.2	0.2 UJ	0.2 UJ
surface	gamma-Hexachlorocyclohexane (ug/kg)	1	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	cis-Chlordane (ug/kg)	1	0	0						0.4 U	0.4 U	0.4	0.4 U	0.4 U
surface	trans-Chlordane (ug/kg)	1	0	0						1.8 U	1.8 U	1.8	1.8 U	1.8 U
surface	Oxychlordane (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	cis-Nonachlor (ug/kg)	1	0	0						1 U	1 U	1	1 U	1 U
surface	trans-Nonachlor (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Dieldrin (ug/kg)	1	0	0						0.35 U	0.35 U	0.35	0.35 U	0.35 U
surface	alpha-Endosulfan (ug/kg)	1	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	beta-Endosulfan (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Endosulfan sulfate (ug/kg)	1	0	0						0.39 UJ	0.39 UJ	0.39	0.39 UJ	0.39 UJ
surface	Endrin (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Endrin aldehyde (ug/kg)	1	0	0						0.62 U	0.62 U	0.62	0.62 U	0.62 U
surface	Endrin ketone (ug/kg)	1	0	0						0.73 UJ	0.73 UJ	0.73	0.73 UJ	0.73 UJ
surface	Heptachlor (ug/kg)	1	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	Heptachlor epoxide (ug/kg)	1	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	Methoxychlor (ug/kg)	1	0	0						2 U	2 U	2	2 U	2 U
surface	Mirex (ug/kg)	1	0	0						2.2 U	2.2 U	2.2	2.2 U	2.2 U
surface	Toxaphene (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	Diesel fuels (mg/kg)	11	11	100	21	262	86.5	69	113	21	262	86.5	69	113
surface	2,3,4,6-Tetrachlorophenol (ug/kg)	1	0	0						290 U	290 U	290	290 U	290 U
surface	2,4,5-Trichlorophenol (ug/kg)	13	0	0						14 U	290 U	45.4	20 U	96 U
surface	2,4,6-Trichlorophenol (ug/kg)	13	0	0						1.4 U	290 U	31.3	2 U	96 U
surface	2,4-Dichlorophenol (ug/kg)	2	0	0						58 U	170 U	114	58 U	58 U
surface	2,4-Dimethylphenol (ug/kg)	13	0	0						1.4 U	170 U	16.1	2 U	19 U
surface	2,4-Dinitrophenol (ug/kg)	2	0	0						190 UJ	580 U	385	190 UJ	190 UJ
surface	2-Chlorophenol (ug/kg)	13	0	0						14 U	58 U	21.6	19 U	22 U
surface	2-Methylphenol (ug/kg)	13	0	0						1.4 U	58 U	7.49	2 U	19 U
surface	2-Nitrophenol (ug/kg)	2	0	0						96 U	290 U	193	96 U	96 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	2	0	0						190 UJ	580 U	385	190 UJ	190 UJ
surface	4-Chloro-3-methylphenol (ug/kg)	13	0	0						14 U	120 U	27.8	20 U	38 U
surface	4-Methylphenol (ug/kg)	13	3	23.1	32	76	48.3	37	37	16 U	76	28.8	21 U	58 U
surface	4-Nitrophenol (ug/kg)	2	0	0						96 U	290 U	193	96 U	96 U
surface	Pentachlorophenol (ug/kg)	13	0	0						14 U	96 UJ	25.3	20 U	29 U
surface	Phenol (ug/kg)	13	7	53.8	28	152	91.7	102	108	17 U	152	66.2	68	120 U
surface	2,3,4,5-Tetrachlorophenol (ug/kg)	1	0	0						290 U	290 U	290	290 U	290 U
surface	2,3,5,6-Tetrachlorophenol (ug/kg)	1	0	0						290 U	290 U	290	290 U	290 U
surface	Dimethyl phthalate (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Diethyl phthalate (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Dibutyl phthalate (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Butylbenzyl phthalate (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Di-n-octyl phthalate (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	2	0	0						120 UJ	130 U	125	120 UJ	120 UJ
surface	Azobenzene (ug/kg)	1	0	0						58 U	58 U	58	58 U	58 U
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	2	0	0						19 UJ	58 U	38.5	19 UJ	19 UJ
surface	2,4-Dinitrotoluene (ug/kg)	2	0	0						96 U	290 U	193	96 U	96 U

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	2,6-Dinitrotoluene (ug/kg)	2	0	0						96 U	290 U	193	96 U	96 U
surface	2-Chloronaphthalene (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	2-Nitroaniline (ug/kg)	2	0	0						96 U	290 U	193	96 U	96 U
surface	3,3'-Dichlorobenzidine (ug/kg)	2	0	0						96 U	290 U	193	96 U	96 U
surface	3-Nitroaniline (ug/kg)	2	0	0						120 UJ	350 U	235	120 UJ	120 UJ
surface	4-Bromophenyl phenyl ether (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	4-Chloroaniline (ug/kg)	2	0	0						58 U	170 U	114	58 U	58 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	4-Nitroaniline (ug/kg)	2	0	0						96 UJ	290 U	193	96 UJ	96 UJ
surface	Aniline (ug/kg)	1	0	0						58 U	58 U	58	58 U	58 U
surface	Benzoic acid (ug/kg)	2	0	0						190 U	580 U	385	190 U	190 U
surface	Benzyl alcohol (ug/kg)	2	0	0						19 UJ	290 U	155	19 UJ	19 UJ
surface	Bis(2-chloroethoxy) methane (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Bis(2-chloroethyl) ether (ug/kg)	2	0	0						38 U	120 U	79	38 U	38 U
surface	Carbazole (ug/kg)	2	2	100	16	37 J	26.5	16	16	16	37 J	26.5	16	16
surface	Dibenzofuran (ug/kg)	2	2	100	27	50	38.5	27	27	27	50	38.5	27	27
surface	Hexachlorobenzene (ug/kg)	2	0	0						0.2 U	19 U	9.6	0.2 U	0.2 U
surface	Hexachlorobutadiene (ug/kg)	2	0	0						0.25 U	19 U	9.63	0.25 U	0.25 U
surface	Hexachlorocyclopentadiene (ug/kg)	2	0	0						96 UJ	290 U	193	96 UJ	96 UJ
surface	Hexachloroethane (ug/kg)	2	0	0						5.8 U	19 U	12.4	5.8 U	5.8 U
surface	Isophorone (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Nitrobenzene (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	N-Nitrosodimethylamine (ug/kg)	1	0	0						290 UJ	290 UJ	290	290 UJ	290 UJ
surface	N-Nitrosodipropylamine (ug/kg)	2	0	0						38 U	120 U	79	38 U	38 U
surface	N-Nitrosodiphenylamine (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	Dibenzothiophene (ug/kg)	11	8	72.7	3.6	340	69	8.3	142	1.7 U	340	54.2	9.4	142
surface	1,2-Dichlorobenzene (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	1,3-Dichlorobenzene (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	1,4-Dichlorobenzene (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U
surface	1,2,4-Trichlorobenzene (ug/kg)	2	0	0						19 U	58 U	38.5	19 U	19 U

SUPPLEMENTAL FIGURES

Figure 2-1. Linnton Site Bathymetry, Sediment sample Locations and Historical Dredging (CH2M HILL 2000c)
Figure 3-3. Source/Pathway Locations (CH2M HILL 2000a)
Figure 4. Site Storm Water Drainage/Outfall Map (ESA 2001)
Figure 3-1. Plan View Cross Sections A-A', B-B', and C-C' (CH2M HILL 2000c)
Figure 3-2. Cross Section View A-A' (CH2M HILL 2000c)
Figure 3-3. Cross Section View B-B' (CH2M HILL 2000c)
Figure 3-4. Cross Section View C-C' (CH2M HILL 2000c)

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This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

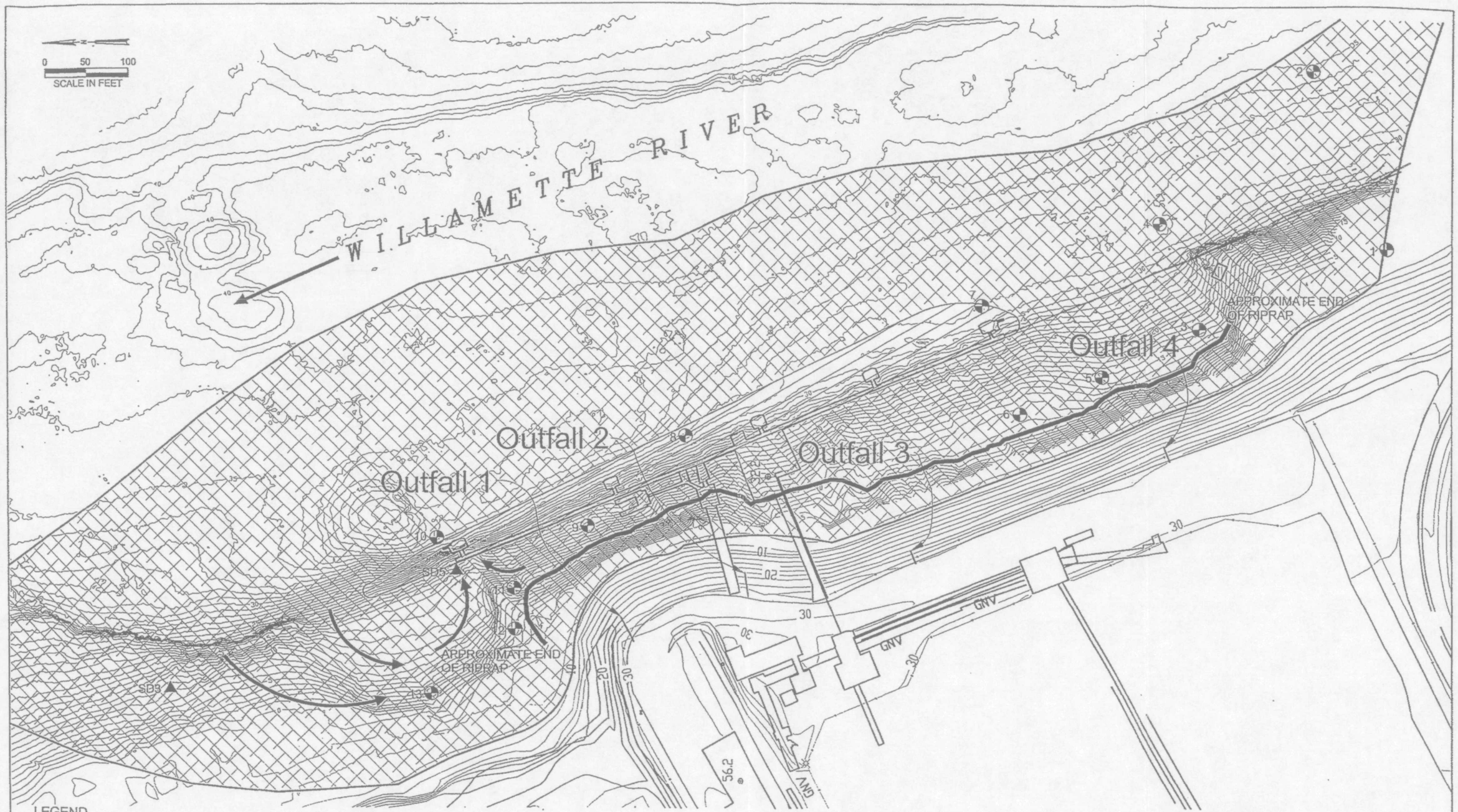


Figure 2-1
LINNTON SITE BATHYMETRY, SEDIMENT SAMPLE LOCATIONS, AND HISTORICAL DREDGING
Expanded Preliminary Assessment for the Linnton Site

CH2MHILL

5640g0110D.dwg

02-Feb-2000

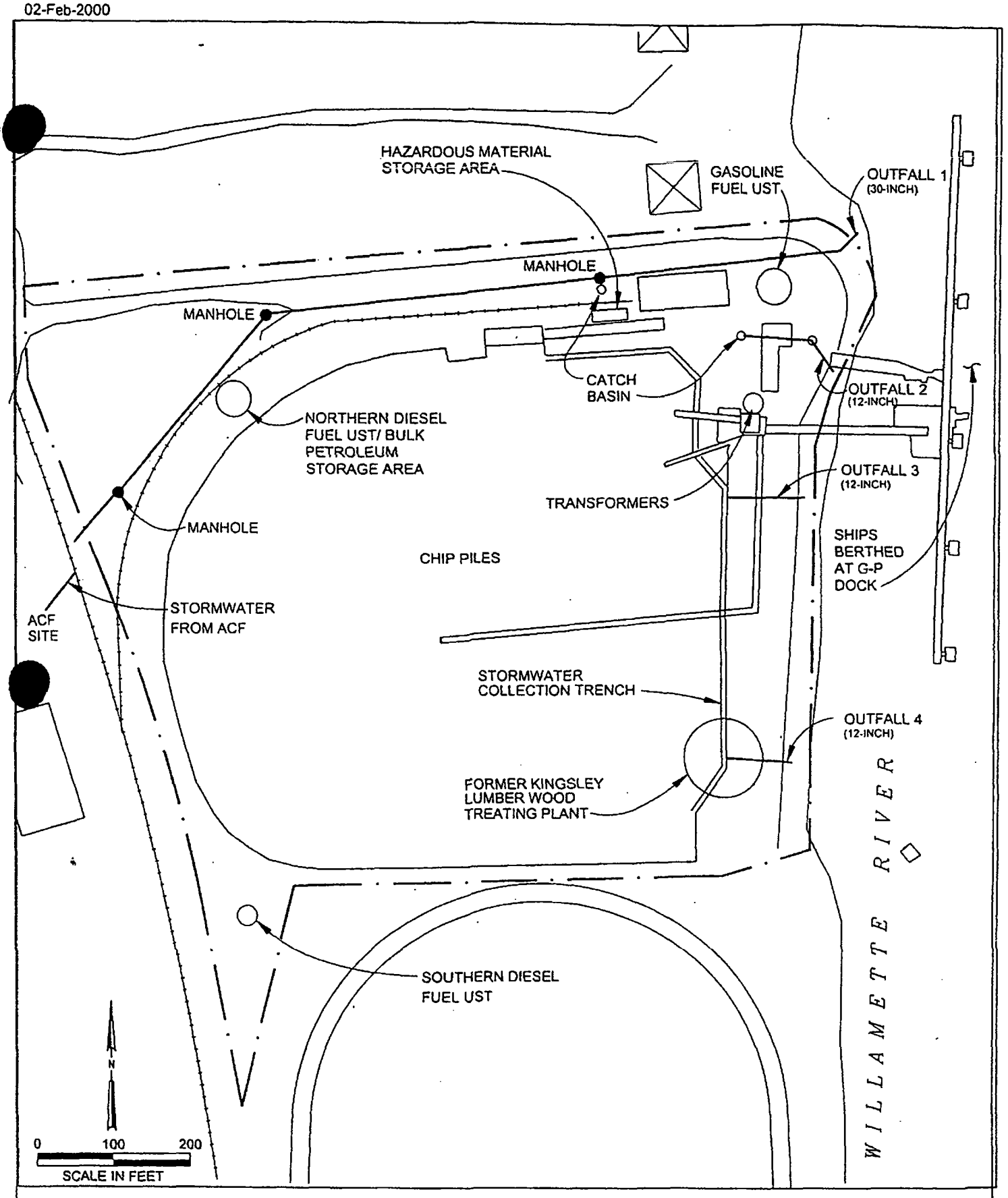
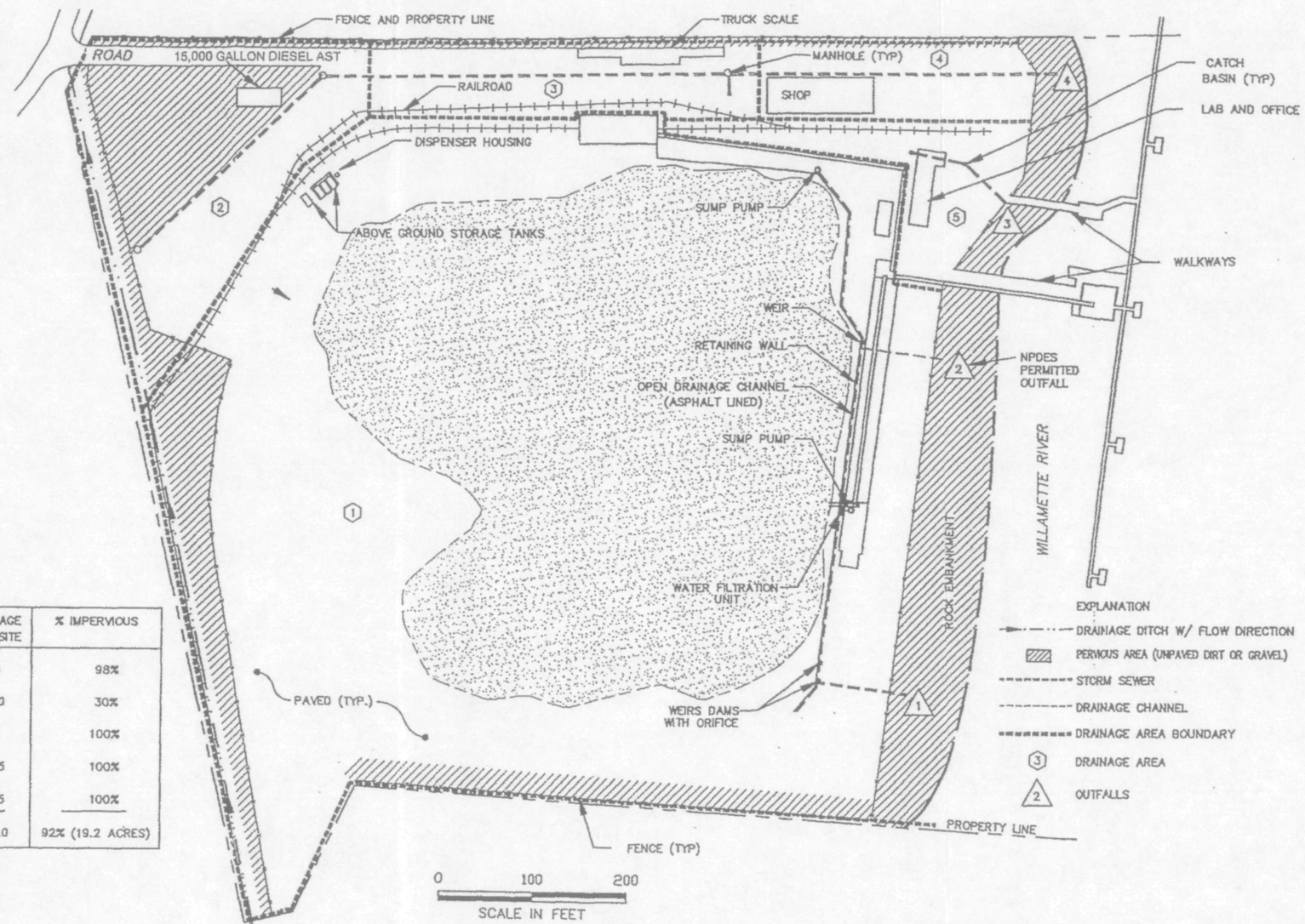


Figure 3-3
SOURCE / PATHWAY LOCATIONS
Supplemental Preliminary Assessment Report for the Linnton Site

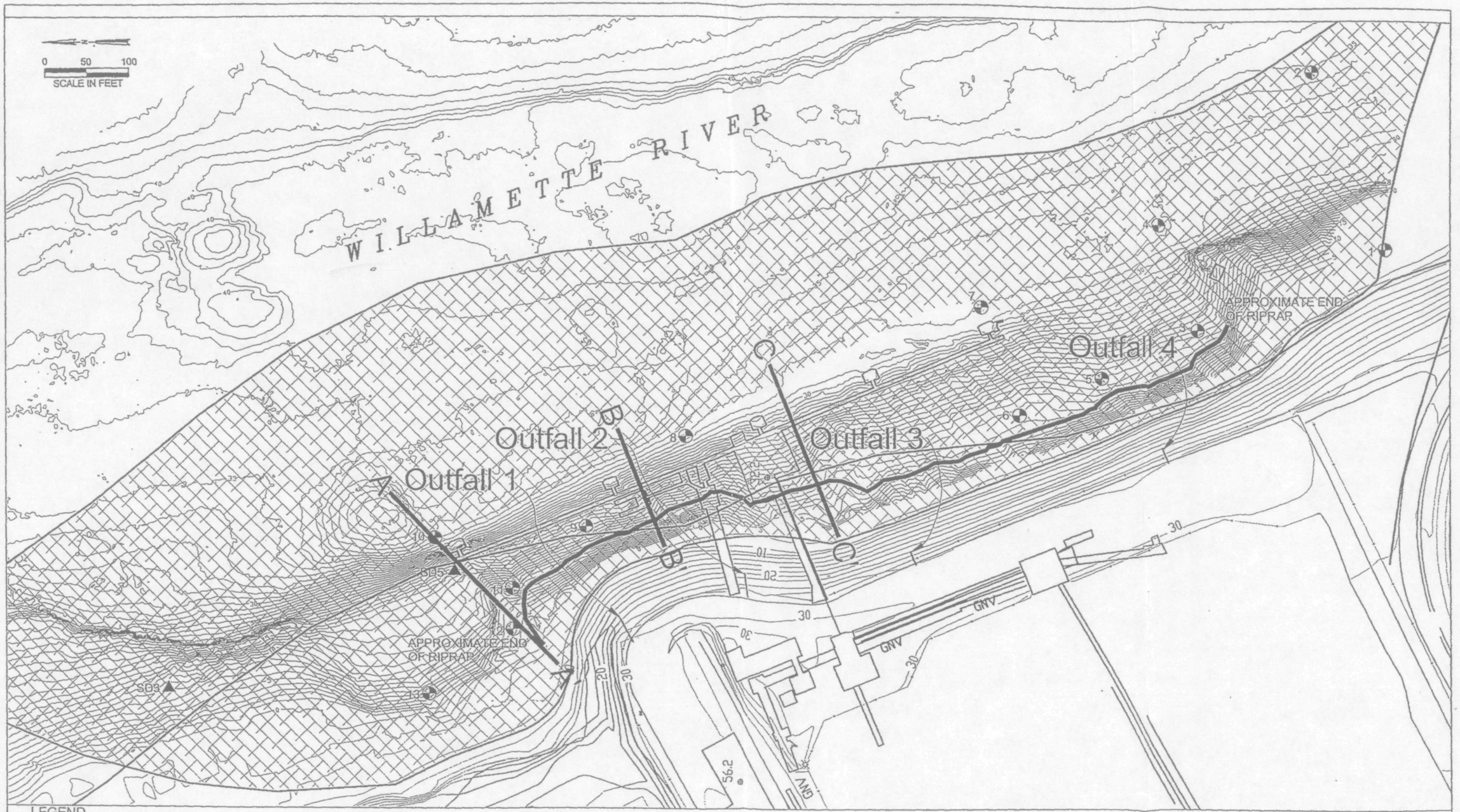
CH2MHILL

5640g010.dwg



DRAINAGE AREA	ACREAGE ON-SITE	% IMPERVIOUS
1	16	98%
2	2.0	30%
3	1.5	100%
4	0.75	100%
5	0.75	100%
TOTAL	21.0	92% (19.2 ACRES)

Morse Brothers Linnton Facility 12222 NW Marina Way Portland, Oregon 97231	Environmental Science Associates, Inc. 6/10/01	SITE STORM WATER DRAINAGE/OUTFALL MAP	FIGURE 4



LEGEND

- SURFACE SEDIMENT SAMPLE LOCATION - MAY 2000
- 5-FOOT CONTOURS
- APPROXIMATE END OF RIPRAP
- EPA SEDIMENT SAMPLE LOCATION
- 1971 DOCK DEVELOPMENT DREDGING
- A——A' CROSS SECTION

Figure 3-1
PLAN VIEW CROSS SECTIONS
A-A', B-B', AND C-C'
Expanded Preliminary Assessment
for the Linnton Site

CH2MHILL

5640g0110E.dwg

CROSS SECTION A-A'

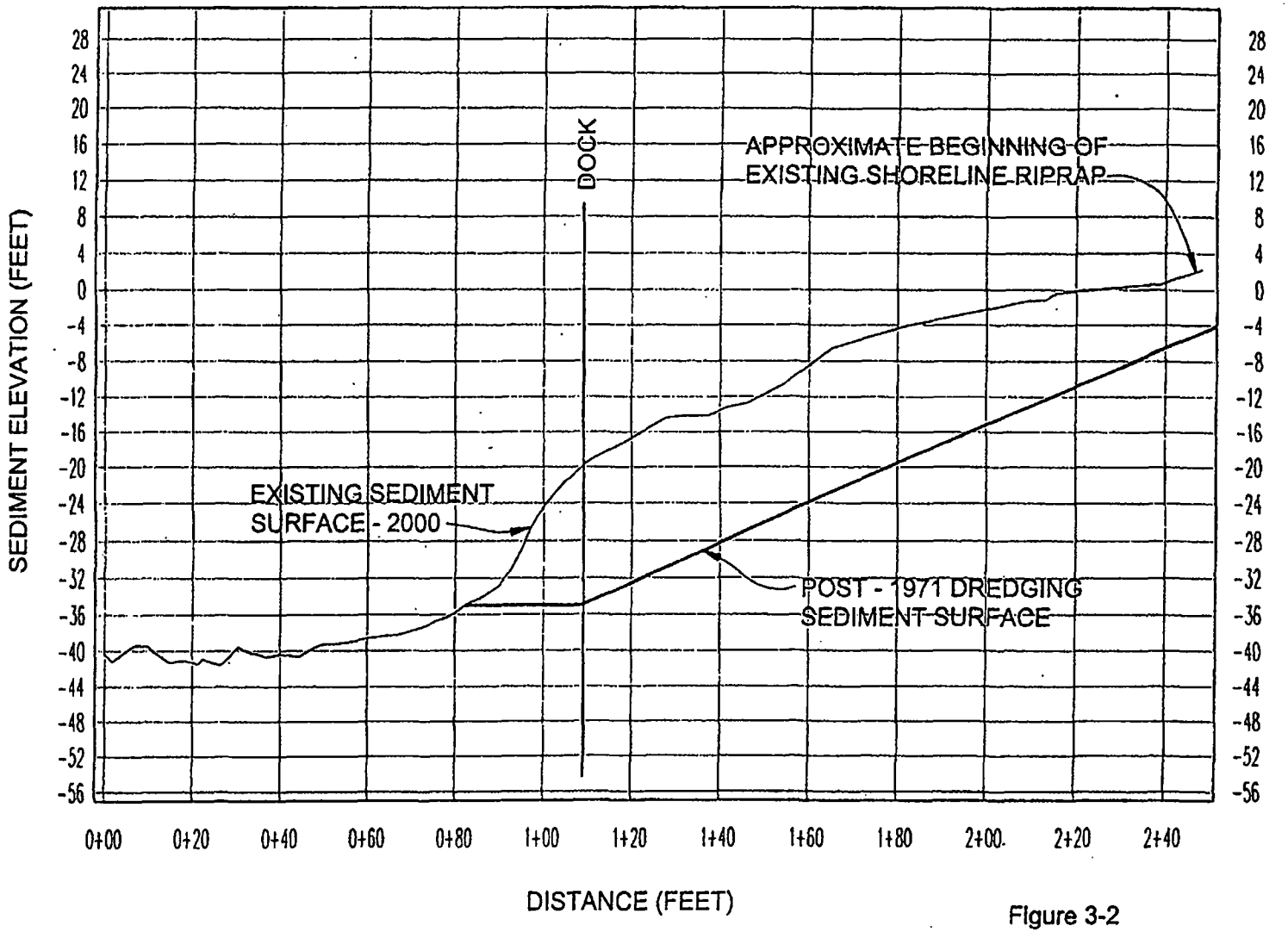


Figure 3-2
CROSS SECTION VIEW, A-A'
Expanded Preliminary Assessment
for the Linnton Site

CH2MHILL

5640CS01.DWG

CROSS SECTION B-B'

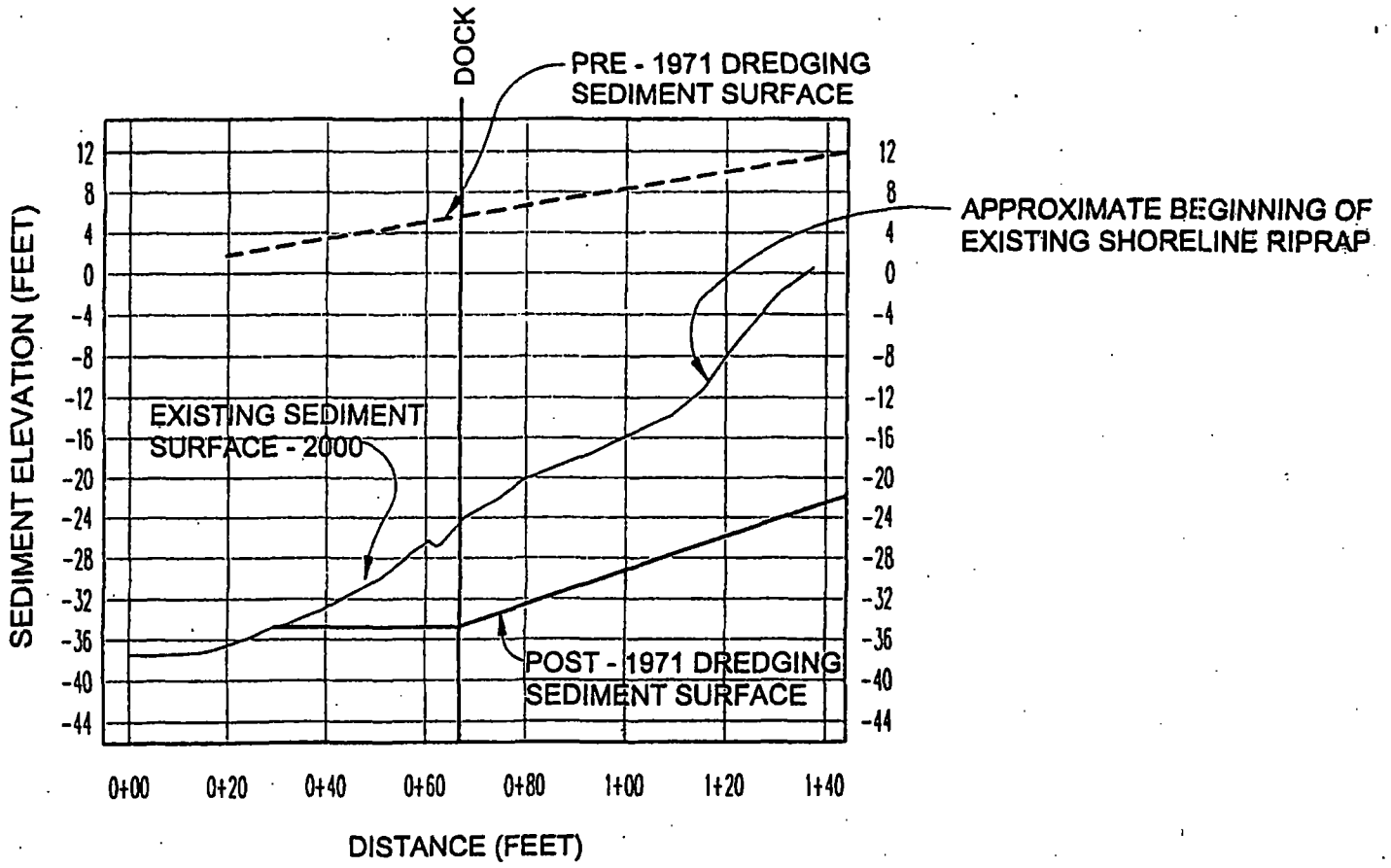


Figure 3-3
CROSS SECTION VIEW, B-B'
Expanded Preliminary Assessment
for the Linnton Site

CH2MHILL

5640CS02.DWG

CROSS SECTION C-C'

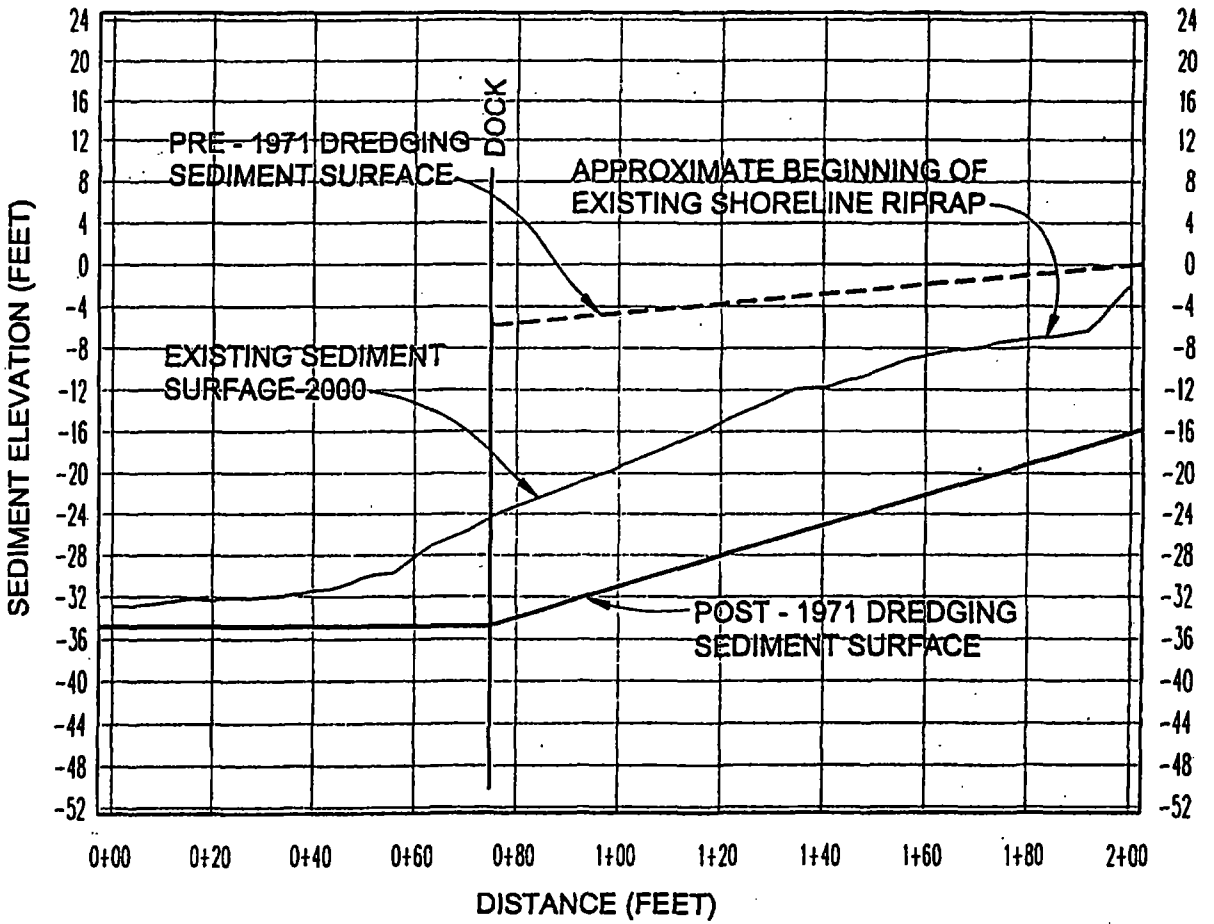


Figure 3-4
CROSS SECTION VIEW, C-C'
Expanded Preliminary Assessment
for the Linnton Site

CH2MHILL

5640CS03.DWG

Jefferson Smurfit Corporation

JEFFERSON SMURFIT CORPORATION
CSM Site Summary

JEFFERSON SMURFIT CORPORATION

Oregon DEQ ECSI #2371

9930 N. Burgard Way
DEQ Site Mgr: Alicia Voss
Latitude: 45.6144°
Longitude: -122.7694°
Township/Range/Section: 2N/1W/35

River Mile: 4 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Jefferson Smurfit site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

Most of the Jefferson Smurfit site is covered by impervious surfaces, which drain to an onsite storm sewer system and then to the river. Therefore, the potential for overland sheet transport of contaminated materials from the site to reach the river is minimal.

1.2. Riverbank Erosion

As shown in Figure 2-3 of Appendix B (Ecological Risk Assessment Approach) of the Portland Harbor Work Plan (Integral et al. 2004), the bank in the vicinity of Jefferson Smurfit is described "natural." Evidence of bank erosion is unknown.

1.3. Groundwater

With the exception of limited sampling of water in an excavation during removal of soil impacted by a 1996 fuel oil release, no groundwater investigations have been conducted at the site. No preferential groundwater transport pathways were identified in the documents reviewed.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Stormwater from roof drains and paved surfaces on the site is routed to a stormwater system that discharges through three NPDES-permitted outfalls on the north side of the International Terminals Slip. These outfalls also receive stormwater from multiple offsite sources in addition to the Jefferson Smurfit facility.

There are no overwater activities associated with this site.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

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1.6. Sediment Transport

The Jefferson Smurfit property is located along the inner two-thirds and approximately 60 feet north of the International Terminal Slip. The northern half of the slip is relatively shallow and is part of the heterogeneous, nearshore zone based on the site physical information compiled in the Programmatic Work Plan (Integral et al. 2004). The Sediment Trend Analysis® results indicate that sediment movements in the slip alternate between net erosion and net accretion, and this likely reflects a mix of anthropogenic (e.g., ship traffic) and natural forces. The measured bathymetric changes over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) are consistent with the Sediment Trend Analysis® results and show a mosaic of no-change, small-scale scour, and small-scale depositional subareas along the northern, nearshore portion of the slip.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☒	PA completed by MFA in 2001
RI	☐	
FS	☐	
Interim Action/Source Control	☒	Source control decision issued by DEQ on 6/22/04.
ROD	☐	
RD/RA	☐	
NFA	☐	DEQ (2003, pers. comm.) believes there are no current source areas of concern on this site and recommends no further upland investigation. DEQ plans to issue NFA after EPA accepts the Source Control Decision.

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 3

4. SITE OWNER HISTORY

Sources: Multnomah County Assessment & Taxation; USACE Port Series reports; NARA historic records; DEQ 2004, MFA 2001

Owner/Occupant	Type of Operation	Years
Jefferson Smurfit Corp. – **owner/operator**	Corrugated cardboard manufacturing	1986 to present
National Life Insurance Company - **owner**		1950s - unknown
Container Corporation of America - **lessee**	Corrugated cardboard manufacturing	1944 - 1986
Sefton Can & Plastics (Div. of Container Corp) - **lessee**	Box manufacturer	1960 - unknown
Oregon Shipbuilding Corporation – **owner/operator**	Warehouse storage for shipbuilding parts	1943 - unknown
U.S Government – **owner/operator**	Warehouse	1941 - unknown

5. PROPERTY DESCRIPTION

The 9.53-acre Jefferson Smurfit property is located on the east side of the Willamette at approximately RM 4. It is bounded on the west and east by the Schnitzer Investment Corporation; to the north by railroad tracks, Morgan CFS, Bell Oil Company, and Time Oil Company; and to the south by the International Terminals Slip, which is approximately 60 feet away from the property boundary. The property lies about 800 feet east of the Willamette River. Land use in this area is zoned for heavy industry (MFA 2001).

The site is occupied by a 200,000-square-foot, sheet-metal warehouse on a concrete slab. Asphalt and/or gravel cover the areas surrounding the warehouse. Two railroad spurs cross the north part of the property. A 60,000-gallon, fire-suppression water tower is located on the east property line. Diesel fuel is stored in a 6,000-gallon, double-walled, aboveground storage tank for use as backup fuel for the boiler.

The Jefferson Smurfit property is located on dredged spoils from the Willamette River. The asphalt parking area adjacent to the slip slopes slightly to the north and away from the slip, so nearly all stormwater is directed to catch basins. Otherwise, the site is basically flat (MFA 2001). Six concrete-lined sumps and various trench drains are located throughout the property. The site consists of four drainage areas and is served by three stormwater outfalls that discharge to the slip [see Supplemental Figure 2 from Parsons (1998)].

Prior to 1969, wastewater generated inside the facility was discharged to the slip (MFA 2001). Since that time the drains were plumbed to discharge to the sanitary sewer when the municipal waste treatment facilities became available in this area.

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Division of State Lands (DSL) files.

6. CURRENT SITE USE

Jefferson Smurfit operates a corrugated container manufacturing facility on this property. Equipment within the facility includes one corrugator, three printer/folder/gluers, two rotary die cutters, a "window machine" (i.e., glues polyfilm to corrugated box), a bailer/hogger (for waste paper shredding and bailing), a slitter (cuts paper to size), and various conveyors to produce paper products. Raw materials include paper, cornstarch and starch additives, glue, and inks. The Jefferson Smurfit facility is a conditionally exempt generator of hazardous waste (MFA 2001). Jefferson Smurfit discharges its wastewater to the City's sanitary sewer system under a wastewater discharge permit (MFA 2001).

7. SITE USE HISTORY

This property has been used for the manufacture of corrugated boxes since the 1950s. Aerial photographs show that the Jefferson Smurfit property and surrounding area were undeveloped and included a wetland in 1940. Sometime between 1940 and 1943, dredge spoils from the Willamette were used as fill to bring the area up to its current grade. The existing structure was built in 1943 and used as a warehouse for the thriving shipbuilding industry from 1943 to 1945. The Jefferson Smurfit property was occupied by the Container Corporation of America during the 1950s. It was referred to as part of the Burgard Industrial Park through at least 1980 (MFA 2001).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

Stormwater runoff from roof drains and the parking area is routed to a series of catch basins connected to a communal storm drain system servicing the site and adjacent properties before discharging to the slip under an NPDES permit. The runoff could contain trace quantities of petroleum and oil and grease from parking areas.

Prior to 1969, all wastewater generated during facility operations was conveyed to a separator system and then directly to the slip (MFA 2001). Solids from the separator were disposed of as a solid waste. According to research by MFA (2001), wastewater prior to 1969 consisted of boiler blowdown, food-grade starch and additives, and corrugator wash water. The boiler blowdown contained sodium sulfite and phosphate. Starch additives included caustic soda, borax, and formaldehyde. Currently, approximately 15,700 gallons of wastewater are discharged to the sanitary sewer daily. Wastewater from the site may contain residual amounts of cornstarch, water-based inks, cleaners, and petroleum products from machinery drips.

Releases from underground piping associated with a former Bunker C and diesel fuel AST impacted subsurface soil. Water present in the remedial excavation associated with the cleanup of the release reported in 1996 also was impacted by petroleum. A total of approximately 750 tons of impacted soil were removed during the initial spill response in 1996, and subsequently during the decommissioning of the ASR and associated piping in 1997. A small amount of impacted soil was left in place under nearby railroad tracks with the concurrence of DEQ (MFA 2001).

According to MFA (2001), site drawings dating from 1970 show the presence of two 2,000-gallon USTs located on the north side of the property structure. The USTs were decommissioned by removal prior to 1983, prior to implementation of current UST decommissioning and sampling requirements.

8.2. Overwater Activities

☐ Yes ☒ No

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Department of State Lands (DSL) files.

8.3. Spills

Known or documented spills at the Jefferson Smurfit site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
12/16/96	Fuel Oil	100	Soil	Yes
4/97	Diesel	10	Soil	Yes
7/16/02	"MVA"	Unknown	Unknown	Yes

9. PHYSICAL SITE SETTING

Available records indicate that no subsurface investigations have been conducted at the site. The property borders a 60-foot setback from the north bank of the International Terminals Slip. The west site of the site is approximately 800 feet from the bank of the Willamette River and extends approximately 1,700 feet to the east. The average width of the site, parallel to the river, is approximately 400 feet. The surface of the property is approximately 25-30 feet above msl.

9.1. Geology

The area received dredge spoils prior to property development (early 1900s). Dredge fill located on adjacent properties consists primarily of fine to medium sand and silty fine sand (GSI 2003). The spoils were placed on recent alluvium and/or fine-grained Pleistocene flood deposits.

9.2. Hydrogeology

A review of logs for wells in the vicinity of the site on file with the Oregon Department of Water Resources was provided in the preliminary assessment (MFA 2001). Based on this review, it appears that shallow groundwater is present at depths between 7 and 18 feet. MFA (2001) concluded that regional groundwater flow is likely toward the northeast toward the confluence of the Willamette and Columbia rivers, and that shallow on-site groundwater may flow west toward the Willamette River or south toward the slip. Groundwater seepage was observed at several locations on the north side of the International Terminals Slip near the Jefferson Smurfit site (GSI 2003).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☐ Yes ☒ No

The only soil sampling that has taken place on this property occurred after the removal of petroleum-impacted soil during a 1996 cleanup of a fuel release from underground piping associated with a 14,200 gallon AST, and during the decommissioning of the AST and related underground piping in 1997. After the piping and a total of 750 tons of impacted soil were removed from the site in 1996 and 1997, confirmation soil sampling indicated that a small pocket of about 1 cubic yard of soil with up to 2,500 mg/kg of heavy oil was left in place beneath the railroad tracks, with concurrence from DEQ (MFA 2001).

10.1.2. Riverbank Samples ☐ Yes ☒ No

Investigations at the site have not indicated the need for sampling of riverbank soils.

10.1.3. Summary

Only limited soil sampling associated with the removal of soil impacted by a release from piping from a fuel AST has occurred on this site. Confirmation soil sampling indicated that a small pocket of about 1 cubic yard of soil with up to 2,500 mg/kg of heavy oil was left in place beneath the railroad tracks, with concurrence from DEQ (MFA 2001).

10.2. Groundwater

10.2.1. Groundwater Investigations ☐ Yes ☒ No

Based on DEQ records, groundwater investigations at the site are limited to sampling of water in a remedial excavation associated with the 1996 fuel oil release from underground piping related to the former fuel AST. Analytical results for water samples collected from the 1996 remedial excavation indicated that concentrations of BTEX were below DEQ UST action levels and TPH concentrations ranged from 44 to 1,500 mg/L. The extent of TPH-impacted groundwater was not evaluated further.

10.2.2. NAPL (Historic & Current) ☐ Yes ☐ No

Unknown.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

TPH was detected in groundwater samples in the vicinity of the AST pipe release. See Section 10.2.1

Plume Characterization Status ☐ Complete ☒ Incomplete

Plume Extent

Not applicable (N/A). No groundwater quality data are available to assess the presence or absence of a groundwater plume.

Min/Max Detections (Current situation)

N/A. No groundwater quality data are available to assess the presence or absence of a groundwater plume.

Current Plume Data

N/A. No groundwater quality data are available to assess the presence or absence of a groundwater plume.

Preferential Pathways

Subsurface data obtained at the site are insufficient to assess the presence of preferential groundwater transport pathways at the site.

Downgradient Plume Monitoring Points (min/max detections)

N/A

Visual Seep Sample Data ☐ Yes ☒ *No*

Nearshore Porewater Data

No nearshore porewater data have been collected at this site.

Groundwater Plume Temporal Trend

N/A. No groundwater quality data are available to assess the presence or absence of a groundwater plume.

10.2.4. Summary

Available records indicate limited groundwater investigation associated with the fuel release has been conducted at the site. Limited sampling of water present in the remedial investigation associated with an underground fuel oil release indicated the presence of TPH. DEQ did not require further remedial activities associated with this release (MFA 2001).

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

The stormwater drainage system is shown on Supplemental Figure 2 from Parsons (1998). Stormwater discharges through three NPDES-permitted outfalls.

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN12Z	109845	Unknown	Outfall 1 (WR-84) Outfall 2 (WR-83) Outfall 3 (WR-82)	Oil & grease/twice yearly

Do other non-stormwater wastes discharge to the system? ☐ Yes ☐ No

Unknown

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☒ Yes ☐ No

Permit Type	Permit No.	Start Date	Outfalls	Volumes	Parameters/Frequency
Wastewater Discharge	400.069	1969	Sewer	15,700 gal/day	?

10.3.6. Wastewater Data ☐ Yes ☒ No

Portland Bureau of Environmental Services (BES) lists seven violations related to sanitary discharges since 1994. There were three exceedances of copper and two of pH, one failure to sample at the appropriate time, one failure to report noncompliance, and one violation for missing a reporting deadline (MFA 2001).

10.3.7. Summary

Stormwater runoff from paved areas onsite could contain trace quantities of petroleum and oil and grease. Prior to 1969, wastewater discharged directly to the slip and could have contributed contaminants to in-water media. The City of Portland BES has recorded exceedances for copper and pH in Jefferson Smurfit's wastewater.

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

Three sediment samples have been collected in the vicinity of the Jefferson Smurfit site (Figure 1). Schnitzer Steel collected two surface (0-15 cm) sediment samples in 1998 within the International Terminals Slip: SD11, opposite the west end of the property, and SD12, opposite the center of the site. A single sediment sample (03R034) was collected just off the western edge of the property during the Round 1 sediment investigation (Integral 2004). These data are summarized in Table 2.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

The following soil cleanup and source control measures have been implemented on the Jefferson Smurfit site:

- Routing of process wastewater to the municipal sanitary sewer system beginning in 1969
- Removal of soil contaminated by oil fuel spill in 1996
- Removal of soil contaminated by diesel spill in 1997
- Institution of good housekeeping practices when handling and storing petroleum products and potentially hazardous materials.

11.2. Groundwater Cleanup/Source Control

No groundwater cleanups or source control has been conducted at the property.

11.3. Other

Jefferson Smurfit uses BMPs from their Stormwater Pollution Control Plan to routinely clean catch basins and trench drains and dispose of sludge offsite (Parsons 1998).

11.4. Potential for Recontamination from Upland Sources

DEQ agreed with MFA (2001) conclusions that there did not appear to be any significant current sources of contamination to the river. DEQ submitted a recommendation memo to EPA in 2002 for no further uplands investigation. EPA agreed with DEQ's recommendation for no further upland investigation and a low environmental priority ranking based on existing information.[1]

12. BIBLIOGRAPHY / INFORMATION SOURCES

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[1] http://www.deq.state.or.us/wmc/ecsi/ecsidetail.asp?seqnbr=2371

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Other relevant references/information sources:

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GSI. 2003. Portland Harbor RI/FS: Upland Groundwater Data Review Report, River Mile 2-11, Lower Willamette River. Prepared for the Lower Willamette Group, Portland, OR. Groundwater Solutions, Inc., Portland, OR.

Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Scanned Figures:

Figure 2. Storm Drainage Plot Plan (Parsons 1998)

FIGURES

Figure 1. Site Features

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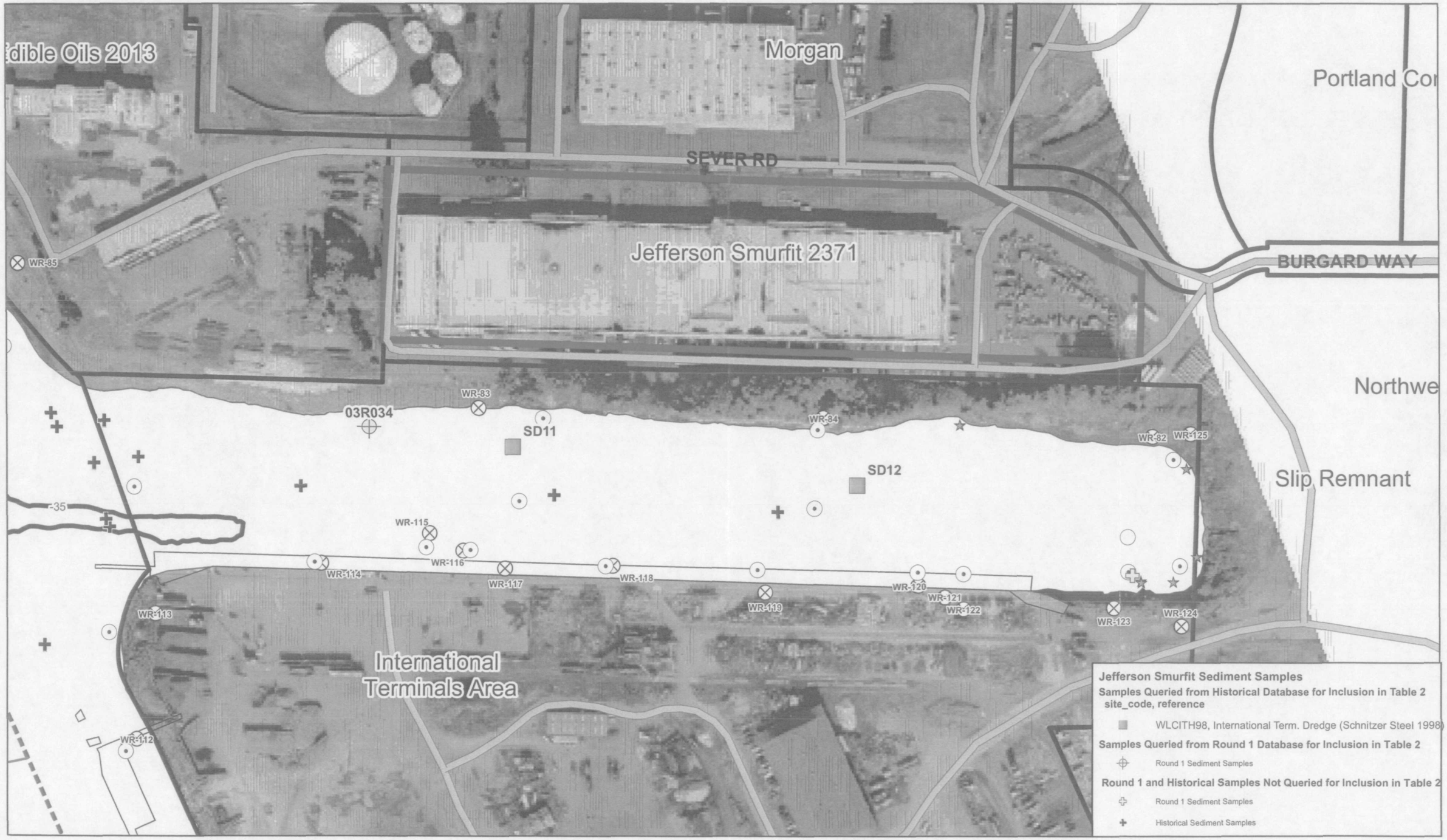

integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Jefferson Smurfit
ECSI 2371

TABLES

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

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Jefferson Smurfit #2371
Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
Stormwater oufalls (3 on north side of slip)				✓	✓			✓								✓								✓	
Area of leaks from former AST subsurface piping		✓	✓				?	?								?						?			
Overwater Areas																									
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

Table 2. Queried Sediment Chemistry Data.

Surface or				N	%	Detected Concentrations					Detected and Nondetected Concentrations				
Subsurface	Analyte	Units	N	Detected	Detected	Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016	(ug/kg)	1	0	0						3.8 U	3.8 U	3.8	3.8 U	3.8 U
surface	Aroclor 1242	(ug/kg)	1	0	0						3.8 U	3.8 U	3.8	3.8 U	3.8 U
surface	Aroclor 1248	(ug/kg)	1	0	0						3.8 U	3.8 U	3.8	3.8 U	3.8 U
surface	Aroclor 1254	(ug/kg)	1	1	100	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
surface	Aroclor 1260	(ug/kg)	1	1	100	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
surface	Aroclor 1221	(ug/kg)	1	0	0						7.7 U	7.7 U	7.7	7.7 U	7.7 U
surface	Aroclor 1232	(ug/kg)	1	0	0						3.8 U	3.8 U	3.8	3.8 U	3.8 U
surface	Polychlorinated biphenyl	(ug/kg)	1	1	100	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
surface	Butyltin ion	(ug/kg)	2	2	100	6	9	7.5	6	6	6	9	7.5	6	6
surface	Dibutyltin ion	(ug/kg)	2	2	100	5	7	6	5	5	5	7	6	5	5
surface	Tributyltin ion	(ug/kg)	2	2	100	110	170	140	110	110	110	170	140	110	110
surface	Tetrabutyltin	(ug/kg)	2	0	0						5 U	5 U	5	5 U	5 U
surface	Total solids	(%)	3	3	100	54.1	73.3	61.4	56.7	56.7	54.1	73.3	61.4	56.7	56.7
surface	Total organic carbon	(%)	3	3	100	0.59	1.39	1.08	1.26	1.26	0.59	1.39	1.08	1.26	1.26
surface	Gravel	(%)	3	3	100		1.74	0.703	0.37	0.37	0	1.74	0.703	0.37	0.37
surface	Very coarse sand	(%)	3	3	100	0.14	1.43	0.61	0.26	0.26	0.14	1.43	0.61	0.26	0.26
surface	Coarse sand	(%)	3	3	100	2.89	24.1	10	3.05	3.05	2.89	24.1	10	3.05	3.05
surface	Medium sand	(%)	3	3	100	28.3	64.1	40.5	29.2	29.2	28.3	64.1	40.5	29.2	29.2
surface	Fine sand	(%)	3	3	100	5.51	21	13.6	14.2	14.2	5.51	21	13.6	14.2	14.2
surface	Very fine sand	(%)	3	3	100	0.67	11.1	6.03	6.31	6.31	0.67	11.1	6.03	6.31	6.31
surface	Silt	(%)	2	2	100	27.2	39.5	33.4	27.2	27.2	27.2	39.5	33.4	27.2	27.2
surface	Coarse silt	(%)	1	1	100	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
surface	Medium silt	(%)	1	1	100	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
surface	Fine silt	(%)	1	1	100	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
surface	Very fine silt	(%)	1	1	100	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
surface	Clay	(%)	2	2	100	9	11.8	10.4	9	9	9	11.8	10.4	9	9
surface	8-9 Phi clay	(%)	1	1	100	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
surface	9-10 Phi clay	(%)	1	1	100	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
surface	>10 Phi clay	(%)	1	1	100	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
surface	Dalapon	(ug/kg)	1	0	0						220 U	220 U	220	220 U	220 U
surface	Dicamba	(ug/kg)	1	0	0						3.2 UJ	3.2 UJ	3.2	3.2 UJ	3.2 UJ
surface	MCPA	(ug/kg)	1	0	0						3200 U	3200 U	3200	3200 U	3200 U
surface	Dichloroprop	(ug/kg)	1	0	0						6.4 UJ	6.4 UJ	6.4	6.4 UJ	6.4 UJ
surface	2,4-D	(ug/kg)	1	0	0						6.4 UJ	6.4 UJ	6.4	6.4 UJ	6.4 UJ
surface	Silvex	(ug/kg)	1	0	0						1.6 UJ	1.6 UJ	1.6	1.6 UJ	1.6 UJ
surface	2,4,5-T	(ug/kg)	1	0	0						4.7 UJ	4.7 UJ	4.7	4.7 UJ	4.7 UJ
surface	2,4-DB	(ug/kg)	1	0	0						32 U	32 U	32	32 U	32 U
surface	Dinoseb	(ug/kg)	1	0	0						3.2 UJ	3.2 UJ	3.2	3.2 UJ	3.2 UJ
surface	MCPP	(ug/kg)	1	0	0						10000 U	10000 U	10000	10000 U	10000 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Units	N	N Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aluminum	(mg/kg)	3	3	100	14100	20500	16900	16200	16200	14100	20500	16900	16200	16200
surface	Antimony	(mg/kg)	2	0	0						5 U	5 U	5	5 U	5 U
surface	Arsenic	(mg/kg)	3	3	100	2.1	4	3.03	3	3	2.1	4	3.03	3	3
surface	Cadmium	(mg/kg)	3	2	66.7	0.06	0.3	0.18	0.06	0.06	0.06	0.3	0.187	0.2 U	0.2 U
surface	Chromium	(mg/kg)	3	3	100	15.9	23	19.6	20	20	15.9	23	19.6	20	20
surface	Copper	(mg/kg)	3	3	100	16.3	36	27.4	30	30	16.3	36	27.4	30	30
surface	Lead	(mg/kg)	3	2	66.7	12	24	18	12	12	5.3 UJ	24	13.8	12	12
surface	Manganese	(mg/kg)	2	2	100	528	593	561	528	528	528	593	561	528	528
surface	Mercury	(mg/kg)	3	2	66.7	0.06	0.07	0.065	0.06	0.06	0.05 UJ	0.07	0.06	0.06	0.06
surface	Nickel	(mg/kg)	3	3	100	17	20	18.3	18	18	17	20	18.3	18	18
surface	Selenium	(mg/kg)	3	0	0						0.3 U	1 U	0.767	1 U	1 U
surface	Silver	(mg/kg)	3	0	0						0.03 U	1 U	0.677	1 U	1 U
surface	Thallium	(mg/kg)	2	0	0						1 U	1 U	1	1 U	1 U
surface	Zinc	(mg/kg)	3	3	100	57.5	101	73.5	62	62	57.5	101	73.5	62	62
surface	Barium	(mg/kg)	2	2	100	121	142	132	121	121	121	142	132	121	121
surface	Beryllium	(mg/kg)	2	0	0						1 U	1 U	1	1 U	1 U
surface	Calcium	(mg/kg)	2	2	100	4450	4600	4530	4450	4450	4450	4600	4530	4450	4450
surface	Cobalt	(mg/kg)	2	2	100	13	14	13.5	13	13	13	14	13.5	13	13
surface	Iron	(mg/kg)	2	2	100	25800	28200	27000	25800	25800	25800	28200	27000	25800	25800
surface	Magnesium	(mg/kg)	2	2	100	4540	4640	4590	4540	4540	4540	4640	4590	4540	4540
surface	Potassium	(mg/kg)	2	2	100	540	570	555	540	540	540	570	555	540	540
surface	Sodium	(mg/kg)	2	2	100	352	472	412	352	352	352	472	412	352	352
surface	Titanium	(mg/kg)	2	2	100	940	973	957	940	940	940	973	957	940	940
surface	Vanadium	(mg/kg)	2	2	100	63	66	64.5	63	63	63	66	64.5	63	63
surface	2-Methylnaphthalene	(ug/kg)	3	0	0						5 U	20 U	10	5 U	5 U
surface	Acenaphthene	(ug/kg)	3	0	0						10 U	20 UJ	13.3	10 U	10 U
surface	Acenaphthylene	(ug/kg)	3	1	33.3	38	38	38	38	38	10 U	38	22.7	20 U	20 U
surface	Anthracene	(ug/kg)	3	2	66.7	19	21	20	19	19	19	21	20	20 U	20 U
surface	Fluorene	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Naphthalene	(ug/kg)	3	0	0						5 U	20 U	10	5 U	5 U
surface	Phenanthrene	(ug/kg)	3	2	66.7	54	79	66.5	54	54	20 U	79	51	54	54
surface	Low Molecular Weight PAH	(ug/kg)	3	2	66.7	100 A	111 A	106	100 A	100 A	20 UJ	111 A	77	100 A	100 A
surface	Dibenz(a,h)anthracene	(ug/kg)	3	3	100	2.3	61	30.4	28	28	2.3	61	30.4	28	28
surface	Benz(a)anthracene	(ug/kg)	3	3	100	7.4	340	159	130	130	7.4	340	159	130	130
surface	Benzo(a)pyrene	(ug/kg)	3	3	100	8.6	520	230	160	160	8.6	520	230	160	160
surface	Benzo(b)fluoranthene	(ug/kg)	3	3	100	8.4	330	166	160	160	8.4	330	166	160	160
surface	Benzo(g,h,i)perylene	(ug/kg)	3	3	100	10	300	143	120	120	10	300	143	120	120
surface	Benzo(k)fluoranthene	(ug/kg)	3	3	100	11 J	280	134	110	110	11 J	280	134	110	110
surface	Chrysene	(ug/kg)	3	3	100	10 J	420	193	150	150	10 J	420	193	150	150

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Units	N	N Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Fluoranthene	(ug/kg)	3	2	66.7	200	250	225	200	200	20 U	250	157	200	200
surface	Indeno(1,2,3-cd)pyrene	(ug/kg)	3	3	100	10	490	230	190	190	10	490	230	190	190
surface	Pyrene	(ug/kg)	3	2	66.7	210	350	280	210	210	20 UJ	350	193	210	210
surface	High Molecular Weight PAH	(ug/kg)	3	3	100	67.7	3341 A	1620	1458 A	1458 A	67.7	3341 A	1620	1458 A	1458 A
surface	Polycyclic Aromatic Hydrocarbons	(ug/kg)	2	2	100	1558 A	3452 A	2510	1558 A	1558 A	1558 A	3452 A	2510	1558 A	1558 A
surface	2,4'-DDD	(ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	2,4'-DDE	(ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	2,4'-DDT	(ug/kg)	1	0	0						0.38 UJ	0.38 UJ	0.38	0.38 UJ	0.38 UJ
surface	4,4'-DDD	(ug/kg)	3	1	33.3	5 J	5 J	5	5 J	5 J	0.38 UJ	5 J	2.46	2 U	2 U
surface	4,4'-DDE	(ug/kg)	3	1	33.3	4 J	4 J	4	4 J	4 J	0.38 U	4 J	2.13	2 U	2 U
surface	4,4'-DDT	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE	(ug/kg)	3	1	33.3	9 A	9 A	9	9 A	9 A	0.38 UJ	9 A	3.79	2 UA	2 UA
surface	Aldrin	(ug/kg)	3	0	0						0.19 U	2 U	1.4	2 U	2 U
surface	alpha-Hexachlorocyclohexane	(ug/kg)	3	0	0						0.19 U	2 U	1.4	2 U	2 U
surface	beta-Hexachlorocyclohexane	(ug/kg)	3	0	0						0.19 U	2 U	1.4	2 U	2 U
surface	delta-Hexachlorocyclohexane	(ug/kg)	3	0	0						0.19 U	3 U	2.06	3 U	3 U
surface	gamma-Hexachlorocyclohexane	(ug/kg)	3	0	0						0.19 U	3 U	2.06	3 U	3 U
surface	cis-Chlordane	(ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	trans-Chlordane	(ug/kg)	1	0	0						0.19 U	0.19 U	0.19	0.19 U	0.19 U
surface	Oxychlordane	(ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	cis-Nonachlor	(ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	trans-Nonachlor	(ug/kg)	1	0	0						0.38 U	0.38 U	0.38	0.38 U	0.38 U
surface	Dieldrin	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	alpha-Endosulfan	(ug/kg)	3	0	0						0.19 U	2 U	1.4	2 U	2 U
surface	beta-Endosulfan	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	Endosulfan sulfate	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	Endrin	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	Endrin aldehyde	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	Endrin ketone	(ug/kg)	3	0	0						0.38 U	2 U	1.46	2 U	2 U
surface	Heptachlor	(ug/kg)	3	0	0						0.19 U	3 U	2.06	3 U	3 U
surface	Heptachlor epoxide	(ug/kg)	3	0	0						0.19 U	2 U	1.4	2 U	2 U
surface	Methoxychlor	(ug/kg)	3	0	0						1.9 U	4 U	3.3	4 U	4 U
surface	Mirex	(ug/kg)	3	0	0						0.38 U	3 U	2.13	3 U	3 U
surface	Toxaphene	(ug/kg)	3	0	0						19 U	50 U	39.7	50 U	50 U
surface	gamma-Chlordane	(ug/kg)	2	0	0						2 U	2 U	2	2 U	2 U
surface	2,3,4,6-Tetrachlorophenol	(ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
surface	2,4,5-Trichlorophenol	(ug/kg)	3	0	0						40 U	98 U	59.3	40 U	40 U
surface	2,4,6-Trichlorophenol	(ug/kg)	3	0	0						30 U	98 U	52.7	30 U	30 U
surface	2,4-Dichlorophenol	(ug/kg)	3	0	0						59 U	80 U	73	80 U	80 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Units	N	N Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	2,4-Dimethylphenol	(ug/kg)	3	0	0						50 U	59 U	53	50 U	50 U
surface	2,4-Dinitrophenol	(ug/kg)	3	0	0						70 U	200 U	113	70 U	70 U
surface	2-Chlorophenol	(ug/kg)	3	0	0						20 UJ	50 U	40	50 U	50 U
surface	2-Methylphenol	(ug/kg)	3	0	0						20 U	80 U	60	80 U	80 U
surface	2-Nitrophenol	(ug/kg)	3	0	0						40 U	98 U	59.3	40 U	40 U
surface	4,6-Dinitro-2-methylphenol	(ug/kg)	3	0	0						30 U	200 U	86.7	30 U	30 U
surface	4-Chloro-3-methylphenol	(ug/kg)	3	0	0						39 UJ	50 U	46.3	50 U	50 U
surface	4-Methylphenol	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	4-Nitrophenol	(ug/kg)	3	0	0						80 U	98 UJ	86	80 U	80 U
surface	Pentachlorophenol	(ug/kg)	3	1	33.3	2.9 J	2.9 J	2.9	2.9 J	2.9 J	2.9 J	50 U	34.3	50 U	50 U
surface	Phenol	(ug/kg)	3	0	0						39 UJ	50 U	46.3	50 U	50 U
surface	2,3,4,5-Tetrachlorophenol	(ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
surface	2,3,5,6-Tetrachlorophenol	(ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
surface	3- and 4-Methylphenol Coelution	(ug/kg)	2	0	0						90 U	90 U	90	90 U	90 U
surface	Dimethyl phthalate	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Diethyl phthalate	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Dibutyl phthalate	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Butylbenzyl phthalate	(ug/kg)	3	2	66.7	19	24	21.5	19	19	19	24	21	20 U	20 U
surface	Di-n-octyl phthalate	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Bis(2-ethylhexyl) phthalate	(ug/kg)	3	3	100	26	400	209	200	200	26	400	209	200	200
surface	Azobenzene	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	Bis(2-chloro-1-methylethyl) ether	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	2,4-Dinitrotoluene	(ug/kg)	3	0	0						20 U	98 UJ	46	20 U	20 U
surface	2,6-Dinitrotoluene	(ug/kg)	3	0	0						10 U	98 U	39.3	10 U	10 U
surface	2-Chloronaphthalene	(ug/kg)	3	0	0						5 U	20 U	10	5 U	5 U
surface	2-Nitroaniline	(ug/kg)	3	0	0						10 U	98 U	39.3	10 U	10 U
surface	3,3'-Dichlorobenzidine	(ug/kg)	3	0	0						40 U	98 U	59.3	40 U	40 U
surface	3-Nitroaniline	(ug/kg)	3	0	0						70 U	120 U	86.7	70 U	70 U
surface	4-Bromophenyl phenyl ether	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	4-Chloroaniline	(ug/kg)	3	0	0						50 U	59 U	53	50 U	50 U
surface	4-Chlorophenyl phenyl ether	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	4-Nitroaniline	(ug/kg)	3	0	0						10 U	98 U	39.3	10 U	10 U
surface	Aniline	(ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	Benzoic acid	(ug/kg)	3	0	0						200 U	300 U	267	300 U	300 U
surface	Benzyl alcohol	(ug/kg)	3	0	0						98 U	100 U	99.3	100 U	100 U
surface	Bis(2-chloroethoxy) methane	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Bis(2-chloroethyl) ether	(ug/kg)	3	0	0						10 U	39 U	19.7	10 U	10 U
surface	Carbazole	(ug/kg)	3	0	0						2 U	10 U	7.33	10 U	10 U
surface	Dibenzofuran	(ug/kg)	3	0	0						2 U	5 U	4	5 U	5 U

Table 2. Queried Sediment Chemistry Data.

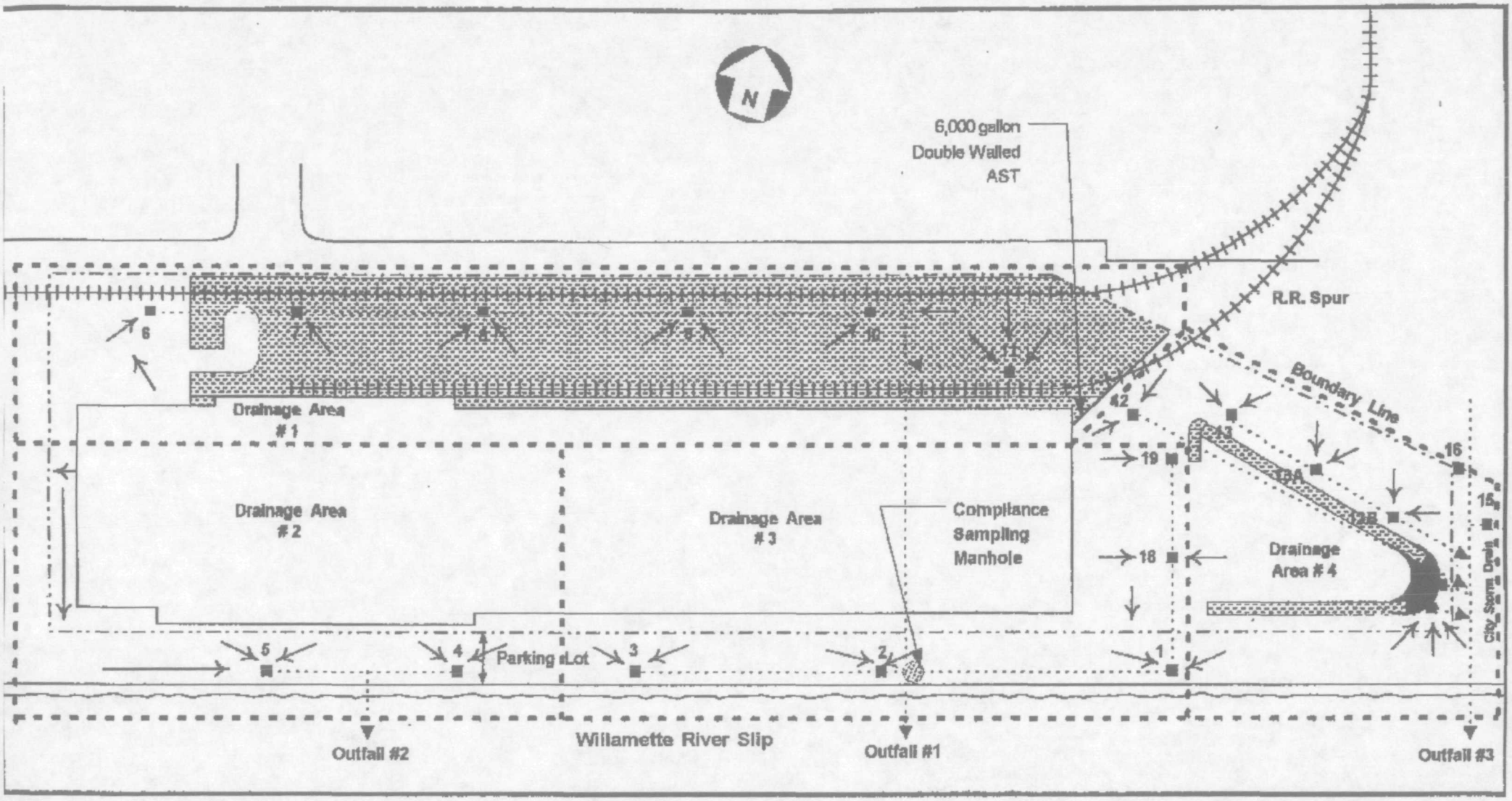
Surface or Subsurface	Analyte	Units	N	N Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Hexachlorobenzene	(ug/kg)	3	0	0						0.19 U	10 U	6.73	10 U	10 U
surface	Hexachlorobutadiene	(ug/kg)	3	0	0						0.34 U	10 U	6.78	10 U	10 U
surface	Hexachlorocyclopentadiene	(ug/kg)	3	0	0						70 U	98 U	79.3	70 U	70 U
surface	Hexachloroethane	(ug/kg)	3	0	0						2 U	40 U	27.3	40 U	40 U
surface	Isophorone	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Nitrobenzene	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	N-Nitrosodimethylamine	(ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
surface	N-Nitrosodipropylamine	(ug/kg)	3	0	0						10 U	39 UJ	19.7	10 U	10 U
surface	N-Nitrosodiphenylamine	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	Bis(2-chloroisopropyl) ether	(ug/kg)	2	0	0						10 U	10 U	10	10 U	10 U
surface	1,2-Dichlorobenzene	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	1,3-Dichlorobenzene	(ug/kg)	3	0	0						10 U	20 U	13.3	10 U	10 U
surface	1,4-Dichlorobenzene	(ug/kg)	3	0	0						10 U	20 UJ	13.3	10 U	10 U
surface	1,2,4-Trichlorobenzene	(ug/kg)	3	0	0						10 U	20 UJ	13.3	10 U	10 U

SUPPLEMENTAL FIGURES

Figure 2. Storm Drainage Plot Plan (Parsons 1998)

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

Figure 2: Storm Drainage Plot Plan
Jefferson Smurfit Corporation
9930 N Bugard Wy, Portland, Oregon



1. Catch Basins 15 and 16 are believed to be outside JSC's property boundary, but are included for completeness
2. The actual configuration and location of the Portland City Storm Sewer is not known. It has been confirmed that it discharges into the slip.

0 90 150 300

Approximate Scale in Feet

Legend:

- Underground Piping
- Catch Basin
- Unpaved

PARSONS

jscstorm21696.vsd

Linnton Plywood Association
(Columbia River Sand and Gravel)

LINNTON PLYWOOD ASSOCIATION (Columbia River Sand & Gravel) CSM Site Summary

LINNTON PLYWOOD ASSOCIATION

Oregon DEQ ECSI #2373 (Linnton Plywood), #2351 (Columbia River Sand & Gravel). Although CRSG has its own ECSI number, this facility is discussed as part of the Linnton Plywood site, except where noted below.

10504 NW St. Helens Road
DEQ Site Mgr: Don Pettit
Latitude: 45.5989°
Longitude: -122.7829°
Township/Range/Section: 1N/1W/2

River Mile: 4.7 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Linnton Plywood site to the river is summarized in this section and Table 1, and supported in the following sections.

1.1. Overland Transport

Except for bank areas, the entire Linnton Plywood site is covered with impervious surfaces. There is evidence of bank erosion near the former maintenance shop and Outfall 5 (City Designation WR-106) area. Minimal overland transport of contaminants via soil erosion is expected from other areas of the site. Overland transport of contaminants during historical operations is unknown.

1.2. Riverbank Erosion

The shoreline is a mixture of riprap and vegetation. There is evidence of bank erosion in the vicinity of the former maintenance shop and Outfall 5 (WR-106) area. CH2M HILL (2002b) found concentrations of gasoline- and/or diesel-range hydrocarbons ranging from 900 to 2,000 mg/kg in soil samples from these areas. Approximately 10.5 cubic yards of soil/sediment was removed from the base of Outfall 5 (WR-106) in May and July 2003 (Anderson 2003, pers. comm.).

1.3. Groundwater

Based on the results from Pre-RI investigations (CH2M HILL 2002a,b) and the DEQ's Source Control Decision letter to the EPA (DEQ 2004b), the site does not appear to be a current or ongoing source to groundwater. The DEQ recommends no further investigation of upland sources of contamination to the Willamette River.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

There are seven NPDES-permitted outfalls associated with this property: six are located on the Linnton Plywood portion and one on the Columbia River Sand & Gravel (CRSG) site. Concentrations of several contaminants in "soil/sediment" from two of these outfalls (5 and 6, also designated WR-106 and WR-126) have exceeded applicable DEQ Level II sediment

screening values. Soil/sediment from the base of Outfall 5 (WR-106) was removed during a source area removal action in May 2003, followed by additional soil removal in July 2003. Outfall 6 (WR-126) also receives stormwater runoff from several unknown, upgradient locations. CH2M HILL's (2002b) sampling results suggested that hazardous substances from the facility's pale oil application and overflow from the scrubber migrated via the stormwater drainage system to sediments in the discharge location of Outfall 6 (WR-126). With the cessation of operations in 2001, follow-up results showed lower concentrations of all analytes. Linnton Plywood has instituted ongoing source control measures (e.g., catch basin cleaning and filter replacement).

Sand is delivered to the CRSG site by tug and barge. DEQ does not believe that CRSG's operations are a source of contaminants to the Willamette River (Pettit 2003, per. comm.). Raw logs were delivered to the Linnton Plywood facility and prepared for the manufacture of plywood while over water up until 1992, which could have contributed machinery and transformer oils, metals, fuels, rubber, and organic debris from log handling to river sediments. (Pettit 2003, pers.comm.)

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Linnton Plywood site is adjacent to a channel area characterized as predominantly depositional in the Portland Harbor Work Plan based on the sediment-profile and time-series bathymetry surveys (Integral et al. 2004). The Sediment Trend Analysis® results suggest that this reach periodically experiences both net accretion and net erosion. The time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) show a large region of sediment accretion (with deposits up to 30 to 60 cm in extent) along the edge of the channel just offshore of this property. Inshore of this channel edge, there is an area at the downstream end of the property that shows net erosion while the upstream portion shows no change. The very shallow areas immediately offshore of the site (i.e., within about 75 ft of the shoreline) have not been surveyed so there is no information on riverbed elevation changes or sediment transport patterns immediately adjacent to the property.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☒	Pre-RI Assessment completed by CH2M HILL in February 2002 (2002b), followed by additional enhancement sampling (CH2M HILL 2002a). A public notice to approve the Pre-RI and the cleanup of soils contaminated by petroleum and metals at the Linnton Plywood site was published on October 1, 2003.
FS	☐	
Interim Action/Source Control	☒	Source control decision published May 2004 (Pettit 2004, pers. comm.)
ROD	☐	
RD/RA	☐	
NFA	☐	Additional evaluations needed before DEQ determines NFA for non-river issues (Pettit 2004, pers comm.)

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Tier 2

4. SITE OWNER HISTORY

Sources: DEQ 1999, 2004

Owner/Occupant	Type of Operation	Years
Linnton Plywood Association – **owner/operator**	Warehousing in plywood building	2001 - present
Linnton Plywood Association - **owner/operator**	Plywood manufacturing	1971 - 2001
Columbia River Sand & Gravel – **operator (occupied site starting in 1997)**	Sand barging and redistribution	1994 - present
Spokane, Portland & Seattle Railway Company and Burlington Northern, Inc. - **owner /** Linnton Plywood Association - **operator (early 1950s – present)**	Plywood manufacturing	1962 - ?
Columbia River Stevedoring Company - **operator**	Unknown	1935? - ?
Clark & Wilson Lumber Company – **operator; owner/operator starting in 1944**	Saw mill and lumber company	Operator: 1905 – 1933? Owner/Operator: 1944? - ?

5. PROPERTY DESCRIPTION

The Willamette River borders the Linnton Plywood site on its western boundary, at approximately RM 4.7. The facility is located east of Hwy 30 in the Linnton community of Portland (Figure 1), a mixed industrial, commercial, and residential use area. About 35 residences are located 0.25 mile away from the facility. The properties north and south of the Linnton Plywood site along the river are owned by Babcock Land Company and ARCO, respectively. The 26.5-acre Linnton Plywood site is divided into two operational areas: 16 acres to the north is Linnton's manufacturing facility, and the remaining portion is leased to CRSG. A separate office area is located west of the main plant across the Burlington Northern railroad tracks (CH2M HILL 2002b; DEQ 1999, 2004).

The entire Linnton Plywood site is covered with impervious surfaces, including railroad tracks, roads, offices, and production buildings, with the exception of bank areas. The site slopes steeply toward the Willamette shoreline, which is covered with a mixture of riprap and vegetation, mostly Oregon ash and black cottonwood. There are four drainage areas and six outfalls associated with the site [see Supplemental Figure 2 of CH2M HILL (2000)]. Outfall 6 (WR-126) also receives stormwater from upgradient and offsite sources (CH2M HILL 2002b; Burnet 2003, pers. comm.). The six outfalls are combined under an NPDES permit.

Stormwater runoff on the CRSG site is routed to two discharge areas, as shown on the Glacier Northwest Linnton Stormwater Handling Site Plan (see attached supplemental figure). SW-1 drains the majority of the site and discharges through an outfall to the Willamette after the stormwater is routed through a sediment fence, straw bales, and a settling pond. SW-2 drains the western portion and stormwater infiltrates the ground. These discharges are also NPDES-permitted.

As shown on Figure 1, the entire shoreline encompassing Linnton Plywood and CRSG is designated as a

recreational beach (Integral et al. 2004). Linnton Plywood applied for a lease for a log raft storage area, approximately 25,500 square feet, from the Oregon Department of State Lands (DSL) in 1998.

6. CURRENT SITE USE

Linnton Plywood. Linnton's plywood manufacturing operation has ceased at the site, and equipment is being liquidated for a possible sale of the property. The former plywood manufacturing building is being used for a warehouse, details of which were not contained in DEQ files. According to the ECSI database (DEQ 2004), Linnton Plywood is still registered as a conditionally exempt generator of hazardous waste.

CRSG. CRSG barges clean sand from dredging projects in the Columbia River to their leased property for redistribution onto trucks. Willamette River water used to slurry the sand is collected in several ponds at the site, filtered, and discharged to the Willamette River. Approximately 575 gallons of diesel, plus small amounts of motor, hydraulic, and used oils, are stored in a building with secondary containment (DEQ 1999).

7. SITE USE HISTORY

Linnton Plywood operated on the site since the 1950s until the plant shut down in December 2001 due to poor market conditions and financial problems. Their plywood manufacturing facility occupied the northern portion of the site, while the southern half has been leased to CRSG since 1994.

Linnton Plywood used phenol-formaldehyde resin, sodium hydroxide, and petroleum hydrocarbons, such as oil, diesel, and kerosene, in the manufacture of plywood. The principal raw material was veneer. Most historical operations occurred in four connected buildings: the gas dryer, steam dryer, green veneer, and pressing and finishing buildings. Raw logs were stored along the waterfront pilings until processing operations began at the dock. Over-water activities included cutting off ends of logs, cutting to approximate lengths for peeling, and loading the prepared lengths onto a conveyer (known as the "Green End" of the operations) (DEQ 2004; Pettit 2003, pers. comm.). At one time, the waste bark material was routed to wood waste storage areas via overhead conveyers, where it was used to fuel boilers at the site (DEQ 1999).

Although Linnton Plywood brokered the lease with CRSG in 1994, CRSG did not occupy the property until 1997. This portion of the property was formerly the site of the Clark and Wilson Lumber Company, which was destroyed by fire in 1948 (DEQ 1999).

DEQ (1999) noted that a 1985 dredging permit renewal for the nearby GATX terminal referred to plans to place dredged material on the Linnton Plywood property. However, the DEQ permit file does not indicate if the renewal permit was issued, if dredging occurred, and if dredged material was ever placed on the Linnton property.

8. CURRENT AND HISTORIC SOURCES AND COPCS

Current understanding of the historic and current potential upland and overwater sources at the site are summarized in Table 1. The following sections provide a brief discussion of the potential sources at the site requiring additional discussion.

8.1. Uplands

Linnton Plywood: CH2M HILL's Pre-Remedial Investigation Work Plan identified the following potential sources on the Linnton Plywood property [see Supplemental Figure 2 from CH2M HILL (2000)], including the area leased to CRSG:

- **Historic Clark and Wilson Lumber Mill Operations (Main Plant) Dredge Spoil Disposal Area.** The area leased to CRSG was once used for dredge spoil disposal from dredging the historic log processing area. CRSG has since placed 10 feet of clean fill in this area.
- **Historic Clark and Wilson Lumber Mill Operations (Wigwam Burner).** This burner was also located on the CRSG site in the area used for dredge spoil disposal. CRSG has since placed 10 feet of clean fill in this area.
- **Sander Dust Ash Disposal.** The air treatment system on the CRSG site captured solids from the sander dust burner, which were spread on the ground to dry and used as fill on this parcel. CRSG has since placed 10 feet of clean fill in this area. Currently, CRSG mixes the dust with the sand.
- **Green End Operations.** This process took place over water (raw log barking) and in the mill (log peeling). Oils and solvents were used to maintain the equipment.
- **Auto Repair and Steam Cleaning Area Soils.** Auto repair and steam cleaning activities could have released hazardous substances to surrounding soils (Pettit 2003, pers. comm.).
- **Maintenance Shop.** This covered area was used for mill maintenance activities, including use of chemicals for tool and part cleaning, and metal grinding. PCB-containing transformers are located in this area. At one time, a methylene chloride-containing adhesive was stored here. Occasionally the shop was spray-washed, with washwater conveyed into the stormwater collection system that discharged through Outfall 5.
- **Pale Oil Application, Edge Sealer Application, Sander Dust Burner Scrubber Overflow.** These activities were conducted on paved areas. Stormwater drainage was directed to Outfall 6 (WR-126). Transformer storage is also located within this drainage area.

Of these seven source areas, only the maintenance shop and the area encompassing the pale oil application, edge sealer application, and sander dust burner scrubber overflow activities [see Supplemental Figure 2 from CH2M HILL (2000)], were identified as potentially complete pathways for contaminants to reach the river sediment (discussed in Section 1). The COIs were identified as TPH, PCBs, heavy metals, SVOCs in catch basin sediments or soil entrained in stormwater runoff, and TPH, SVOCs, heavy metals, and VOCs in riverbank groundwater and soils (CH2M HILL 2002b)

CRSG: DEQ does not believe that CRSG's operations are a source of contaminants to the Willamette River (Pettit 2003, per. comm.).

8.2. Overwater Activities ☒ Yes ☐ No

Linnton Plywood: Raw logs were prepared for the manufacture of plywood while over water, which could have contributed machinery and transformer oils, metals, fuels, rubber, and organic debris from log handling to river sediments. This over-water work ceased in 1992, when Linnton Plywood began importing veneer sheets via truck and rail (CH2M HILL 2000; Pettit 2003, pers. comm.).

Linnton Plywood applied for a lease for a log raft storage area, approximately 25,500 square feet, from the Oregon DSL in 1998. It is unknown if this overwater use actually occurred based on a review of DEQ files.

CRSG: Sand is delivered to the CRSG site by tug and barge. Accidental releases of fuels and oils from tug operations would be a direct pathway for contaminants to reach in-water media.

8.3. Spills

Known or documented spills at Linnton Plywood and CRSG facilities were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
9/94	"Milky substance" from broken separator	Not reported	Asphalt	Not reported
2/17/95	Pale oil	20-55	Onsite storm drain, created sheen on river	No, a Notice of Noncompliance issued and civil penalty levied by DEQ

9. PHYSICAL SITE SETTING

Although 13 direct push borings have been completed at the site, the Pre-RI Assessment reports do not include information regarding the geology and hydrogeology of the site. Field and boring logs associated with the assessment, available in the DEQ file, were reviewed for site-specific geologic and hydrogeologic information. The maximum depth investigated at the site was 40 feet below ground surface (bgs).

9.1. Geology

Of the 13 direct push borings, only three were logged for soil information in the following areas: steam cleaner, wigwam burner, and Clarke and Wilson center. The boring logs indicate fill material at least 24 feet thick consisting primarily of silt and fine-to-medium-grained sand. The fill also includes burner ash, angular gravel, wood chips, and brick. Pleistocene/Recent Alluvium underlying the fill includes silt and fine-grained sand with minor clay.

9.2. Hydrogeology

Groundwater was encountered at depths ranging from 23 to 33 feet bgs in the borings. Shallow groundwater in the region generally flows toward the Willamette River. No seeps were identified at the site.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. If no data exist for a specific medium, it is noted and evaluated to determine if this may represent a data gap.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

Linnton Plywood. CH2M HILL (2002b) collected surface soil samples in the auto repair, steam cleaning, and maintenance shop areas of the site [see Supplemental Figure 2 from CH2M HILL (2002b)]. Results are provided below:

Analyte	Minimum Concentration µg/kg	Maximum Concentration µg/kg
Total Petroleum Hydrocarbons (TPH)		
TPH-Gasoline	120	15,900
TPH-Diesel	48,200	1,820,000
Metals		
Copper	111,000	618,000
Chromium	12,600	105,000
Lead	13,900	402,000
Zinc	12,100	739,000
Bis(2-ethylhexyl)phthalate	ND*	6,330
Benzl butyl phthalate	ND	7,070

ND = not detected

Additional soil sampling was performed by CH2M HILL in the historic ash disposal area in October 2002 [see Supplemental Figure 5-1 from CH2M Hill (2002a)]. The exact location of this disposal area was difficult to determine given varying institutional memories. Boiler ash and scrubber ash from operational areas were also collected and analyzed to corroborate results from the historical disposal area. None of the disposal area samples contained the elevated chromium observed in the sources sample or the high TPH in the scrubber ash. Lead was detected in a single sample above the EPA PRG in an area covered with pavement (CH2M HILL 2002a). Boiler and scrubber ash has since been removed from the property (Burnet 2003, pers. comm.; Pettit 2003, pers. comm.).

A knife-grinding debris pile adjacent to the river was found to contain chromium, iron, and low concentrations of residual oil; this pile was removed from the property in May and July 2003 (DEQ 2003; Pettit 2003, pers. comm.).

CRSG. No soil investigations have occurred on the CRSG property.

10.1.2. Riverbank Samples

☒ Yes ☐ No

Bank erosion from the maintenance shop and Outfall 5 (WR-106) area could potentially contribute hydrocarbon-impacted soils to the river. Concentrations of gasoline- and/or diesel-range hydrocarbons ranged from 900 to 2,000 mg/kg in soil samples from the bank area (CH2M HILL 2002b).

10.1.3. Summary

According to James Anderson (2003, pers. comm.), DEQ Portland Harbor Cleanup Manager, the characterization and cleanup of soils on the Linnton Plywood site is complete, and the site is not considered to be "a current threat to the river."

10.2. Groundwater

10.2.1. Groundwater Investigations

☒ Yes ☐ No

In October 2001, groundwater samples were collected from nine temporary well points at the site as part of the Pre-RI Assessment (CH2M HILL 2002b) [see Supplemental Figures 2 and 3 from CH2M Hill (2002b)]. Because of the presence of low-yield silt in the formation, sample volumes during sample collection were limited, and non-turbid samples could not be collected from temporary well screens. In October 2002, groundwater samples were collected from four temporary wells as part of the Enhancement Sampling for Pre-RI (CH2M HILL 2002a).

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

Available records indicate no evidence of nonaqueous-phase liquids (NAPL) at the site.

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☒ No

Some samples collected during the October 2001 sampling event, without field filtering, contained metals and phthalates at concentrations slightly above the chronic freshwater ambient freshwater criteria. Groundwater samples collected during the October 2002 event were filtered in the field to determine whether the high turbidity may have biased the analytical results. Based on a comparison between the two sampling events, the DEQ concurred with CH2M HILL that elevated concentrations of some metals and phthalates were biased upward (by 1 to 2 orders of magnitude) in the samples collected during the first event because of the turbid samples. Therefore, the groundwater data collected during the October 2002 event were given a higher priority when assessing groundwater quality data for this site summary.

A diesel plume was identified between the maintenance shop and the Willamette River. Relatively low concentrations of petroleum hydrocarbons, metals, and phthalates were identified at other areas of the site (auto repair area, steam-cleaning area, green end area, boiler house area, wigwam burner area, sander dust ash area, and former Clarke and Wilson property). Figure 2 shows the estimated distribution of contaminants in groundwater based on Pre-RI Assessment data.

According to the DEQ's Source Control Decision letter (DEQ 2004b), the site does not appear to be a current or ongoing source of Willamette River water or sediment contamination. The DEQ recommends no further investigation of upland sources of contamination to the Willamette River.

Plume Characterization Status ☒ Complete ☐ Incomplete

According to the DEQ, the plumes have been characterized with regards to potential impacts to the Willamette River.

Min/Max Detections (Current situation)

The following table summarizes minimum and maximum concentrations of constituents detected at the site.

Analytes	Minimum Concentration µg/L	Maximum Concentration µg/L
Total Petroleum Hydrocarbons (TPH)		
TPH-Gasoline	ND*	96*
TPH-Diesel	ND*	4,340*
Metals		
Copper	ND	15.3
Chromium	ND*	66.1*
Lead	3.2	4.12
Bis(2-ethylhexyl)phthalate	ND*	103*

µg/L = micrograms per liter
ND = not detected
* = *unfiltered groundwater sample*

Preferential Pathways

No preferential pathways were identified during the Pre-RI Assessment.

Downgradient Plume Monitoring Points (min/max detections)

Most of the groundwater samples collected at the site were located near the Willamette River. Refer to the Min/Max Detections section above.

Visual Seep Sample Data ☐ Yes ☒ No

No seeps have been identified at the site (GSI 2003).

Nearshore Porewater Data

No porewater data have been collected at the site.

Groundwater Plume Temporal Trend

Insufficient data are available to assess plume distributions over time.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit [Current or Past] ☒ Yes ☐ No

Currently, both Linnton and CRSG have general stormwater permits. (Note that Outfalls 3A, 4,5, and 6 are designated by the City as Outfalls WR-103, WR-364, WR-106, WR-126, respectively)

Permit Holder	Permit Type	File Number	Start Date	Outfalls	Parameters/ Frequency
Linnton Plywood Association	GEN12Z (Will expire 6/30/07)	10434	10/28/97	3A, 4, 5, 6	Standard[1]/ twice yearly
Linnton Plywood Association	GEN12Z Expired 9/30/96	10435	8/24/92	3A, 4, 5, 6	Standard[1]/ twice yearly
CRSG	GEN12Z	14458	8/7/01	SW-1, SW-2	Standard[1]/ twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required. Linnton is required to do visual monitoring of Outfall 3 for floating solids and oil & grease sheen once a month when discharging.

Do other non-stormwater wastes discharge to the system? ☒ Yes ☐ No

Stormwater that discharges through Linnton's Outfall 6 (WR-126) originates from a 36-inch pipe that also drains unknown upgradient and offsite areas along Highway 30 (Burnet 2002, pers. comm.). CH2M HILL (2002b) indicated that Linnton Plywood connected to Outfall 6 in the 1960s.

10.3.3. Stormwater Data ☐ Yes ☒ No

Only permit-required monitoring data are collected.

10.3.4. Catch Basin Solids Data

☒ Yes ☐ No

Catch basin solids data were collected by CH2M HILL (2002b) in October 2001 from site catch basins (associated with Outfalls 2 (WR-105), 3 (WR-104), and 3A (WR-103) and from "soil/sediment" beneath Outfalls 5 (WR-106) and 6 (WR-126). Catch basin samples were found to contain detectable concentrations of chromium, copper, lead, zinc, petroleum hydrocarbons, halogenated hydrocarbons, phthalates, PAHs, and PCBs.

Copper was detected in the catch basins for Outfall 2 (WR-105) (111 mg/kg), Outfall 3 (WR-104(175 mg/kg), and Outfall 3A (WR-103) (177 mg/kg). PCB concentrations ranged from 9.9 to 19.2 µg/kg in these catch basins. Benzyl butyl phthalate was detected at 7,070 µg/kg in a duplicate sample from catch basin 3. Two surface and two subsurface samples were collected in the vicinity of Outfall 5 (WR-106). Outfall 5 (WR-106) surface samples contained primarily diesel-range hydrocarbons at 1,430 to 1,820 mg/kg (1,270 to 1620 mg/kg subsurface sample), low levels of chlorinated hydrocarbons, and elevated metals. A surface sample collected from Outfall 5 (WR-106) contained concentrations as high as 618 mg/kg copper, 182 mg/kg lead (241 mg/kg lead in subsurface sample), and 739 mg/kg zinc in a subsurface sample. Bis(2-ethylhexyl) phthalate was found at 6,330 and 2,220 µg/kg in the two samples collected from Outfall 5 (WR-106) (CH2M HILL 2002b).

Samples from Outfall 6 (WR-126) contained elevated PAHs, cadmium, copper, and lead. The LPAH concentration in the Outfall 6 sediment sample was 39,500 µg/kg, compared with 1,627 µg/kg detected in the closest Weston (1998) sediment sample (SD-030). The HPAH concentration in the same sample was 23,640 µg/kg, compared with 4,226 µg/kg from the closest Weston sample (CH2M HILL 2002b).

CH2M HILL (2002a) collected an additional round of sediment/soil samples from the base of Outfall 6 (WR-126) in October 2002, following the operational shutdown in 2001. Concentrations of all analytes were significantly less than the October 2001 sampling event. Follow-up sampling efforts at the catch basins in 2002 were unsuccessful, as no sediment had accumulated due to the regular maintenance of catch basins and the cessation of site operations.

10.3.5. Wastewater Permit

☐ Yes ☐ No

Permit Type	Permit No.	Start Date	Outfalls	Volumes	Parameters/Frequency
Individual NPDES-IW-N	102452	3/22/0 (will expire 12/31/04)	1	Not provided	Suspended solids, turbidity[1] temperature/daily when outfall is operating
Individual NPDES-IW-N	100097 (Expired 6/30/90)	7/19/85		Not provided	
Individual NPDES-IW-N	100969 (Expired 8/31/97)	9/16/92		Not provided	
Individual NPDES-IW-N	3174 (Expired 2/28/85)	1/1/1901		Not provided	

[1] DEQ lowered the effluent limits for turbidity and total suspended solids, as documented in Modification #1 to the NPDES permit.

10.3.6. Wastewater Data ☒ Yes ☐ No

Conventional parameters are monitored according to permit requirements (see above); however, no chemical data are collected.

10.3.7. Summary

The potential for contaminated stormwater runoff from the Linnton Plywood facility to impact in-water media is significantly less now that operations have ceased. Routine catch basin maintenance and other operational BMPs have been successful in reducing the potential transport of contamination from the site to the river.

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

Sediment sampling in the vicinity of Linnton Plywood and CRSG has been performed during three surveys: Weston (1998), Battelle (2002), and Integral (2004.). Summary results from these investigations are found in Table 2. Weston sampled sediment at three stations (SD035, SD030, SD028; Figure 1) and found concentrations of PAHs and other petroleum constituents, including heavy metals, in three shallow sediment samples and one deeper sample collected adjacent to the Linnton Plywood and CRSG site. As part of their 1997 study of PAH concentrations in Willamette River surface sediment, Battelle (2002) sampled one station (S-029; Figure 1) at Linnton Plywood's downstream property boundary. In October 2002, Round 1 sediment data were collected in the lower Willamette River, including two stations along the shoreline of Linnton Plywood. Station 04B023 was located at the upstream end of the property, and Station 04R004 was situated at the downstream boundary of CRSG, about 200 feet downstream of Outfall 2 (WR-105) (see Figure 1).

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Cleanup and source control actions to date include the following:

- Decommissioning of a 5,000-gallon oil UST and removal of 200 cubic yards of contaminated soil from the excavation in 1989.
- Decommissioning of three underground gasoline storage tanks east of boiler house and removal of 80 cubic yards of impacted soil from the excavation in 1994.
- Implementation of a Stormwater Pollution Control Plan for both operations, including installation of sorbent filters and routine removal of sediment from catch basins (CH2M HILL 2001; CRSG 2003).
- Removal of 8 cubic yards of knife-grinding debris near riverbank in May 2003.
- Removal of 10 cubic yards of soil/sediment at base of Outfall 5 (WR-106) in May 2003.
- Removal of an additional 0.5 cubic yard of material beneath Outfall 5 (WR-106) in July 2003.

11.2. Groundwater Cleanup/Source Control

No groundwater source controls have been conducted at the site.

11.3. Other

Unused products and wastes were disposed of offsite after operations ceased in December 2001.

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Figure 2. Drainage Basin and Outfall Map (CH2M HILL 2000)
Glacier Northwest Linnton Storm Water Handling Site Plan (no figure #)
Figure 2. Sampling Locations (CH2M HILL 2002b)
Figure 3. Sampling Locations (CH2M HILL 2002b)
Figure 5-1. Sampling Locations (CH2M HILL 2002a)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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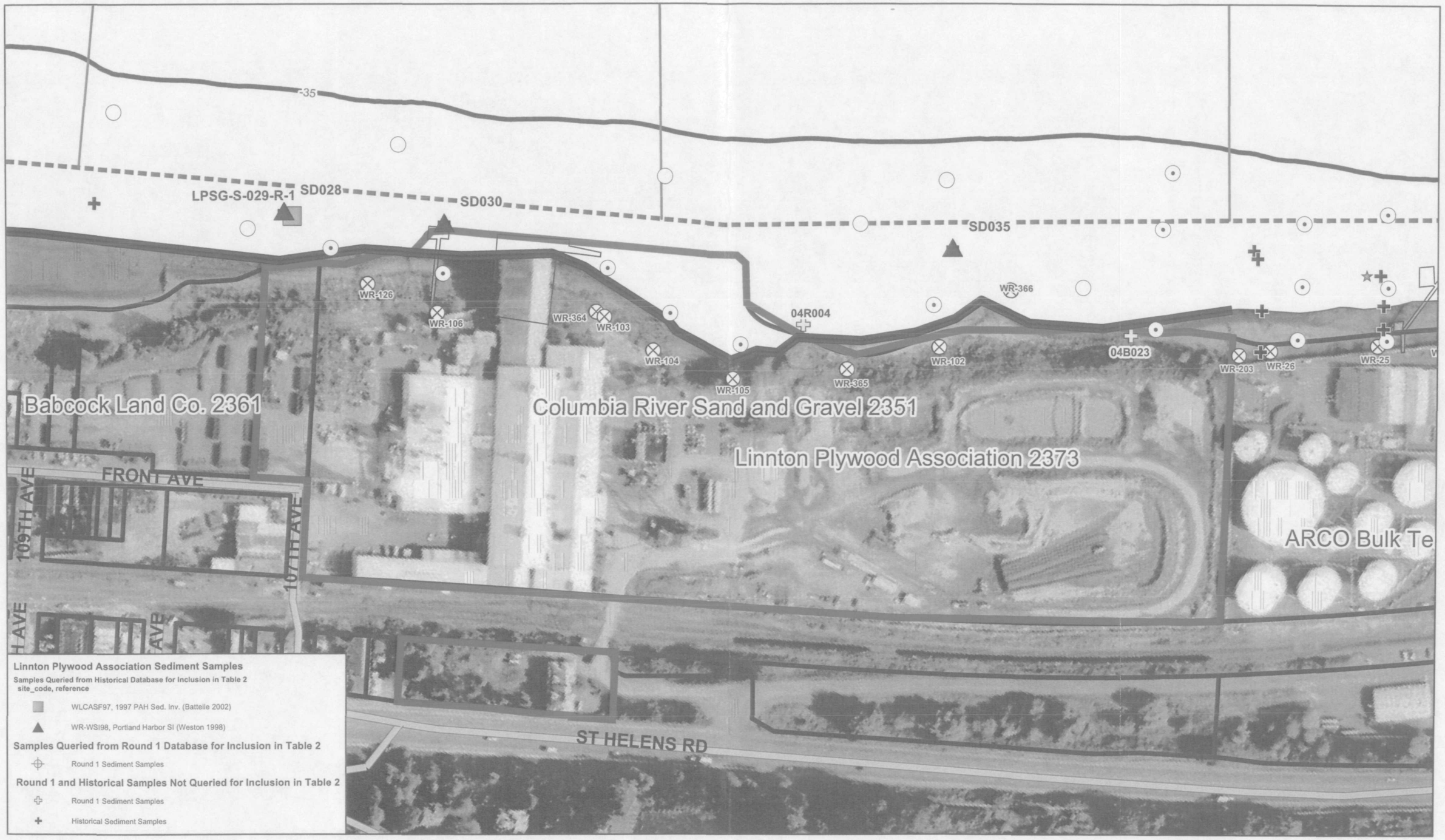

integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Linnton Plywood Association
ECSI 2373

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 150 300 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_LinntonPly_SummryMap.mxd

LEGEND

Site boundary

Maximum Detection Location

Contaminant Type

Petroleum related

SVOC (bis(2-ethylhexyl)phthalate)

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Linnton Plywood (Columbia River Sand and Gravel) Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

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Linnton Plywood #2373

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
Eroded bank at maintenance shop area	✓	✓	✓	✓	✓	✓	✓									✓									✓
Private stormwater outfalls				✓	✓	✓					✓	✓	✓			✓								✓	
Overwater Areas																									
Tug and barge operations at CRSG and historic log operations					✓		✓	✓								✓	✓						✓		
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	Aroclor 1242 (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	Aroclor 1248 (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	Aroclor 1254 (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	Aroclor 1260 (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	Aroclor 1221 (ug/kg)	1	0	0						38 U	38 U	38	38 U	38 U
surface	Aroclor 1232 (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	Polychlorinated biphenyl (ug/kg)	1	0	0						38 UA	38 UA	38	38 UA	38 UA
surface	Butyltin ion (ug/kg)	1	0	0						5.7 U	5.7 U	5.7	5.7 U	5.7 U
surface	Butyltin ion (ug/l)	1	0	0						0.06 U	0.06 U	0.06	0.06 U	0.06 U
surface	Dibutyltin ion (ug/kg)	1	0	0						5.7 U	5.7 U	5.7	5.7 U	5.7 U
surface	Dibutyltin ion (ug/l)	1	0	0						0.06 U	0.06 U	0.06	0.06 U	0.06 U
surface	Tributyltin ion (ug/kg)	1	1	100	14	14	14	14	14	14	14	14	14	14
surface	Tributyltin ion (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
surface	Tetrabutyltin (ug/kg)	1	0	0						5.7 U	5.7 U	5.7	5.7 U	5.7 U
surface	Tetrabutyltin (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
surface	Total organic carbon (%)	4	4	100	1.2	2	1.43	1.2	1.3	1.2	2	1.43	1.2	1.3
surface	Gravel (%)	4	4	100		1.27	0.398	0.14	0.18	0	1.27	0.398	0.14	0.18
surface	Sand (%)	3	3	100	24.82	27.77	26.4	26.51	26.51	24.82	27.77	26.4	26.51	26.51
surface	Very coarse sand (%)	1	1	100	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
surface	Coarse sand (%)	1	1	100	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
surface	Medium sand (%)	1	1	100	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
surface	Fine sand (%)	1	1	100	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
surface	Very fine sand (%)	1	1	100	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
surface	Fines (%)	3	3	100	70.96	75.04	73.1	73.31	73.31	70.96	75.04	73.1	73.31	73.31
surface	Silt (%)	3	3	100	59.92	67.46	63.9	64.21	64.21	59.92	67.46	63.9	64.21	64.21
surface	Coarse silt (%)	1	1	100	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8
surface	Medium silt (%)	1	1	100	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
surface	Fine silt (%)	1	1	100	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
surface	Very fine silt (%)	1	1	100	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
surface	Clay (%)	3	3	100	7.58	11.04	9.24	9.1	9.1	7.58	11.04	9.24	9.1	9.1
surface	8-9 Phi clay (%)	1	1	100	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
surface	9-10 Phi clay (%)	1	1	100	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
surface	>10 Phi clay (%)	1	1	100	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
surface	Aluminum (mg/kg)	3	3	100	36900	41000	39100	39400	39400	36900	41000	39100	39400	39400
surface	Aluminum (mg/l)	1	1	100	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
surface	Antimony (mg/kg)	3	2	66.7	5 J	6 J	5.5	5 J	5 J	5 J	6 J	5.33	5 UJ	5 UJ
surface	Antimony (mg/l)	1	0	0						0.05 U	0.05 U	0.05	0.05 U	0.05 U
surface	Arsenic (mg/kg)	3	1	33.3	5	5	5	5	5	5 U	5 U	5	5	5
surface	Arsenic (mg/l)	1	1	100	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
surface	Cadmium (mg/kg)	3	3	100	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
surface	Cadmium (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Chromium (mg/kg)	3	3	100	35.9	38	36.6	36	36	35.9	38	36.6	36	36
surface	Chromium (mg/l)	1	0	0						0.005 U	0.005 U	0.005	0.005 U	0.005 U
surface	Copper (mg/kg)	3	3	100	40.9	43.8	41.9	41	41	40.9	43.8	41.9	41	41
surface	Copper (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U
surface	Lead (mg/kg)	3	3	100	9	9	9	9	9	9	9	9	9	9
surface	Lead (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Manganese (mg/kg)	3	3	100	662	763	716	723	723	662	763	716	723	723
surface	Manganese (mg/l)	1	1	100	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
surface	Mercury (mg/kg)	3	3	100	0.05	0.06	0.0567	0.06	0.06	0.05	0.06	0.0567	0.06	0.06
surface	Mercury (mg/l)	1	0	0						0.0001 U	0.0001 U	0.0001	0.0001 U	0.0001 U
surface	Nickel (mg/kg)	3	3	100	26.9	29	27.9	27.9	27.9	26.9	29	27.9	27.9	27.9
surface	Nickel (mg/l)	1	0	0						0.01 U	0.01 U	0.01	0.01 U	0.01 U
surface	Selenium (mg/kg)	3	0	0						5 U	5 U	5	5 U	5 U
surface	Selenium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Silver (mg/kg)	3	3	100	0.4	1	0.633	0.5	0.5	0.4	1	0.633	0.5	0.5
surface	Silver (mg/l)	1	0	0						0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U
surface	Thallium (mg/kg)	3	3	100	9	11	10	10	10	9	11	10	10	10
surface	Thallium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Zinc (mg/kg)	3	3	100	88.2	91	90	90.9	90.9	88.2	91	90	90.9	90.9
surface	Zinc (mg/l)	1	0	0						0.004 U	0.004 U	0.004	0.004 U	0.004 U
surface	Barium (mg/kg)	3	3	100	174	183	180	182	182	174	183	180	182	182
surface	Barium (mg/l)	1	1	100	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124
surface	Beryllium (mg/kg)	3	3	100	0.62	0.7	0.667	0.68	0.68	0.62	0.7	0.667	0.68	0.68
surface	Beryllium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Calcium (mg/kg)	3	3	100	8210	8590	8390	8370	8370	8210	8590	8390	8370	8370
surface	Calcium (mg/l)	1	1	100	76.9	76.9	76.9	76.9	76.9	76.9	76.9	76.9	76.9	76.9
surface	Cobalt (mg/kg)	3	3	100	17.4	18.7	18	17.9	17.9	17.4	18.7	18	17.9	17.9
surface	Cobalt (mg/l)	1	1	100	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
surface	Iron (mg/kg)	3	3	100	38900	42100	40300	39900	39900	38900	42100	40300	39900	39900
surface	Iron (mg/l)	1	1	100	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9
surface	Magnesium (mg/kg)	3	3	100	6700	7220	6960	6960	6960	6700	7220	6960	6960	6960
surface	Magnesium (mg/l)	1	1	100	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3
surface	Potassium (mg/kg)	3	3	100	1230	1320	1280	1290	1290	1230	1320	1280	1290	1290
surface	Potassium (mg/l)	1	1	100	4	4	4	4	4	4	4	4	4	4
surface	Sodium (mg/kg)	3	3	100	1070	1150	1120	1130	1130	1070	1150	1120	1130	1130
surface	Sodium (mg/l)	1	1	100	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1
surface	Titanium (mg/kg)	1	1	100	2040	2040	2040	2040	2040	2040	2040	2040	2040	2040
surface	Vanadium (mg/kg)	3	3	100	99.1	110	103	101	101	99.1	110	103	101	101
surface	Vanadium (mg/l)	1	1	100	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
surface	2-Methylnaphthalene (ug/kg)	3	1	33.3	46	46	46	46	46	19 U	46	28.3	20 U	20 U
surface	Acenaphthene (ug/kg)	4	4	100	13	170	65.5	29 N	50	13	170	65.5	29 N	50
surface	Acenaphthylene (ug/kg)	4	1	25	10	10	10	10	10	10	20 U	17	19 U	19 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Anthracene (ug/kg)	4	4	100	25	130	53.8	25	35	25	130	53.8	25	35
surface	Fluorene (ug/kg)	4	4	100	16	170	65.8	26	51	16	170	65.8	26	51
surface	Naphthalene (ug/kg)	4	4	100	20	57	31.5	23	26	20	57	31.5	23	26
surface	Phenanthrene (ug/kg)	4	4	100	112	1100	391	130	220	112	1100	391	130	220
surface	Low Molecular Weight PAH (ug/kg)	4	4	100	201 A	1627 A	602	202 A	379 A	201 A	1627 A	602	202 A	379 A
surface	Dibenz(a,h)anthracene (ug/kg)	4	1	25	14	14	14	14	14	14	20 U	18	19 U	19 U
surface	Benz(a)anthracene (ug/kg)	4	4	100	74	280	126	74	75	74	280	126	74	75
surface	Benzo(a)pyrene (ug/kg)	4	4	100	78	180	117	101	110	78	180	117	101	110
surface	Benzo(b)fluoranthene (ug/kg)	4	4	100	80	270	131	83	89	80	270	131	83	89
surface	Benzo(g,h,i)perylene (ug/kg)	4	4	100	36	84	64.8	62	77	36	84	64.8	62	77
surface	Benzo(k)fluoranthene (ug/kg)	3	3	100	58	240	126	80	80	58	240	126	80	80
surface	Chrysene (ug/kg)	4	4	100	92	400	178	100	120	92	400	178	100	120
surface	Fluoranthene (ug/kg)	4	4	100	120	1400	478	180	210	120	1400	478	180	210
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	4	4	100	61	94	77.8	76	80	61	94	77.8	76	80
surface	Pyrene (ug/kg)	4	4	100	183	1300	473	200	210	183	1300	473	200	210
surface	Benzo(b+k)fluoranthene (ug/kg)	3	3	100	138 A	510 A	270	163 A	163 A	138 A	510 A	270	163 A	163 A
surface	Benzo(j+k)fluoranthene (ug/kg)	1	1	100	86	86	86	86	86	86	86	86	86	86
surface	High Molecular Weight PAH (ug/kg)	4	4	100	912 A	4226 A	1760	927 A	992 A	912 A	4226 A	1760	927 A	992 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	4	4	100	1113 A	5853 A	2370	1194 A	1306 A	1113 A	5853 A	2370	1194 A	1306 A
surface	Benzo(e)pyrene (ug/kg)	1	1	100	75	75	75	75	75	75	75	75	75	75
surface	C1-Dibenzothiophene (ug/kg)	1	1	100	10	10	10	10	10	10	10	10	10	10
surface	C1-Chrysene (ug/kg)	1	1	100	78	78	78	78	78	78	78	78	78	78
surface	C1-Fluorene (ug/kg)	1	1	100	8	8	8	8	8	8	8	8	8	8
surface	C1-Naphthalene (ug/kg)	1	1	100	10	10	10	10	10	10	10	10	10	10
surface	C1-Fluoranthene/pyrene (ug/kg)	1	1	100	86	86	86	86	86	86	86	86	86	86
surface	C1-Phenanthrene/anthracene (ug/kg)	1	1	100	43	43	43	43	43	43	43	43	43	43
surface	C2-Dibenzothiophene (ug/kg)	1	1	100	14	14	14	14	14	14	14	14	14	14
surface	C2-Chrysene (ug/kg)	1	1	100	32	32	32	32	32	32	32	32	32	32
surface	C2-Fluorene (ug/kg)	1	1	100	14	14	14	14	14	14	14	14	14	14
surface	C2-Naphthalene (ug/kg)	1	1	100	17	17	17	17	17	17	17	17	17	17
surface	C2-Fluoranthene/pyrene (ug/kg)	1	1	100	43	43	43	43	43	43	43	43	43	43
surface	C2-Phenanthrene/anthracene (ug/kg)	1	1	100	55	55	55	55	55	55	55	55	55	55
surface	C3-Dibenzothiophene (ug/kg)	1	1	100	19	19	19	19	19	19	19	19	19	19
surface	C3-Chrysene (ug/kg)	1	1	100	20	20	20	20	20	20	20	20	20	20
surface	C3-Fluorene (ug/kg)	1	1	100	24	24	24	24	24	24	24	24	24	24
surface	C3-Naphthalene (ug/kg)	1	1	100	19	19	19	19	19	19	19	19	19	19
surface	C3-Fluoranthene/pyrene (ug/kg)	1	1	100	28	28	28	28	28	28	28	28	28	28
surface	C3-Phenanthrene/anthracene (ug/kg)	1	1	100	54	54	54	54	54	54	54	54	54	54
surface	C4-Dibenzothiophene (ug/kg)	1	1	100	18	18	18	18	18	18	18	18	18	18
surface	C4-Chrysene (ug/kg)	1	1	100	7	7	7	7	7	7	7	7	7	7
surface	C4-Naphthalene (ug/kg)	1	1	100	15	15	15	15	15	15	15	15	15	15
surface	C4-Phenanthrene/anthracene (ug/kg)	1	1	100	23	23	23	23	23	23	23	23	23	23

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Total benzofluoranthenes (b+k (+j)) (ug/kg)	1	1	100	175	175	175	175	175	175	175	175	175	175
surface	4,4'-DDD (ug/kg)	1	1	100	1.1 J	1.1 J	1.1	1.1 J	1.1 J	1.1 J	1.1 J	1.1	1.1 J	1.1 J
surface	4,4'-DDE (ug/kg)	1	1	100	1.4 J	1.4 J	1.4	1.4 J	1.4 J	1.4 J	1.4 J	1.4	1.4 J	1.4 J
surface	4,4'-DDT (ug/kg)	1	1	100	1.4 J	1.4 J	1.4	1.4 J	1.4 J	1.4 J	1.4 J	1.4	1.4 J	1.4 J
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	1	1	100	3.9 A	3.9 A	3.9	3.9 A	3.9 A	3.9 A	3.9 A	3.9	3.9 A	3.9 A
surface	Aldrin (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	alpha-Hexachlorocyclohexane (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	beta-Hexachlorocyclohexane (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	delta-Hexachlorocyclohexane (ug/kg)	1	0	0						3 UI	3 UI	3	3 UI	3 UI
surface	gamma-Hexachlorocyclohexane (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	cis-Chlordane (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	Dieldrin (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	alpha-Endosulfan (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	beta-Endosulfan (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Endosulfan sulfate (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Endrin (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Endrin aldehyde (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Endrin ketone (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Heptachlor (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	Heptachlor epoxide (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	Methoxychlor (ug/kg)	1	0	0						9.5 U	9.5 U	9.5	9.5 U	9.5 U
surface	Toxaphene (ug/kg)	1	0	0						95 U	95 U	95	95 U	95 U
surface	gamma-Chlordane (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	Diphenyl (ug/kg)	1	1	100	5	5	5	5	5	5	5	5	5	5
surface	2,4,5-Trichlorophenol (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	2,4,6-Trichlorophenol (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	2,4-Dichlorophenol (ug/kg)	3	0	0						57 U	59 U	58	58 U	58 U
surface	2,4-Dimethylphenol (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	2,4-Dinitrophenol (ug/kg)	3	0	0						190 UJ	200 UJ	193	190 UJ	190 UJ
surface	2-Chlorophenol (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	2-Methylphenol (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	2-Nitrophenol (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	3	0	0						190 U	200 U	193	190 U	190 U
surface	4-Chloro-3-methylphenol (ug/kg)	3	0	0						38 U	39 U	38.7	39 U	39 U
surface	4-Methylphenol (ug/kg)	3	1	33.3	21	21	21	21	21	19 U	21	20	20 U	20 U
surface	4-Nitrophenol (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	Pentachlorophenol (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	Phenol (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Dimethyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Diethyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Dibutyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Butylbenzyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Di-n-octyl phthalate (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	3	0	0						100 UJ	110 UJ	107	110 UJ	110 UJ
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	3	0	0						19 U	20 U	19.3	19 UJ	19 UJ
surface	2,4-Dinitrotoluene (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	2,6-Dinitrotoluene (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	2-Chloronaphthalene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	2-Nitroaniline (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	3,3'-Dichlorobenzidine (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	3-Nitroaniline (ug/kg)	3	0	0						110 U	120 U	117	120 U	120 U
surface	4-Bromophenyl phenyl ether (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	4-Chloroaniline (ug/kg)	3	0	0						57 U	59 U	58	58 U	58 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	4-Nitroaniline (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	Benzoic acid (ug/kg)	3	0	0						190 U	200 U	193	190 U	190 U
surface	Benzyl alcohol (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Bis(2-chloroethoxy) methane (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Bis(2-chloroethyl) ether (ug/kg)	3	0	0						38 U	39 U	38.7	39 U	39 U
surface	Carbazole (ug/kg)	3	1	33.3	37	37	37	37	37	19 U	37	25.3	20 U	20 U
surface	Dibenzofuran (ug/kg)	4	3	75	8	110	48.7	28	28	8	110	41.3	19 U	28
surface	Hexachlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Hexachlorobutadiene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Hexachlorocyclopentadiene (ug/kg)	3	0	0						95 U	98 U	96.7	97 U	97 U
surface	Hexachloroethane (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Isophorone (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Nitrobenzene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	N-Nitrosodipropylamine (ug/kg)	3	0	0						38 U	39 U	38.7	39 U	39 U
surface	N-Nitrosodiphenylamine (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	Dibenzothiophene (ug/kg)	1	1	100	9	9	9	9	9	9	9	9	9	9
surface	Perylene (ug/kg)	1	1	100	83	83	83	83	83	83	83	83	83	83
surface	1,2-Dichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	1,3-Dichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	1,4-Dichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
surface	1,2,4-Trichlorobenzene (ug/kg)	3	0	0						19 U	20 U	19.3	19 U	19 U
subsurface	Aroclor 1016 (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	Aroclor 1242 (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	Aroclor 1248 (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	Aroclor 1254 (ug/kg)	1	0	0						78 UIJ	78 UIJ	78	78 UIJ	78 UIJ
subsurface	Aroclor 1260 (ug/kg)	1	0	0						78 UIJ	78 UIJ	78	78 UIJ	78 UIJ
subsurface	Aroclor 1221 (ug/kg)	1	0	0						39 UJ	39 UJ	39	39 UJ	39 UJ
subsurface	Aroclor 1232 (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	Polychlorinated biphenyl (ug/kg)	1	0	0						78 UA	78 UA	78	78 UA	78 UA
subsurface	Butyltin ion (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Dibutyltin ion (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Tributyltin ion (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Tetrabutyltin (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Total organic carbon (%)	1	1	100	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
subsurface	Gravel (%)	1	1	100	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
subsurface	Sand (%)	1	1	100	22.98	22.98	23	22.98	22.98	22.98	22.98	23	22.98	22.98
subsurface	Fines (%)	1	1	100	76.54	76.54	76.5	76.54	76.54	76.54	76.54	76.5	76.54	76.54
subsurface	Silt (%)	1	1	100	58.57	58.57	58.6	58.57	58.57	58.57	58.57	58.6	58.57	58.57
subsurface	Clay (%)	1	1	100	17.97	17.97	18	17.97	17.97	17.97	17.97	18	17.97	17.97
subsurface	Aluminum (mg/kg)	1	1	100	40800	40800	40800	40800	40800	40800	40800	40800	40800	40800
subsurface	Antimony (mg/kg)	1	0	0						5 UJ	5 UJ	5	5 UJ	5 UJ
subsurface	Arsenic (mg/kg)	1	0	0						5 U	5 U	5	5 U	5 U
subsurface	Cadmium (mg/kg)	1	1	100	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
subsurface	Chromium (mg/kg)	1	1	100	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2
subsurface	Copper (mg/kg)	1	1	100	47	47	47	47	47	47	47	47	47	47
subsurface	Lead (mg/kg)	1	1	100	26	26	26	26	26	26	26	26	26	26
subsurface	Manganese (mg/kg)	1	1	100	619	619	619	619	619	619	619	619	619	619
subsurface	Mercury (mg/kg)	1	1	100	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
subsurface	Nickel (mg/kg)	1	1	100	30	30	30	30	30	30	30	30	30	30
subsurface	Selenium (mg/kg)	1	1	100	11	11	11	11	11	11	11	11	11	11
subsurface	Silver (mg/kg)	1	1	100	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
subsurface	Thallium (mg/kg)	1	0	0						5 U	5 U	5	5 U	5 U
subsurface	Zinc (mg/kg)	1	1	100	144	144	144	144	144	144	144	144	144	144
subsurface	Barium (mg/kg)	1	1	100	189	189	189	189	189	189	189	189	189	189
subsurface	Beryllium (mg/kg)	1	1	100	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
subsurface	Calcium (mg/kg)	1	1	100	8300	8300	8300	8300	8300	8300	8300	8300	8300	8300
subsurface	Cobalt (mg/kg)	1	1	100	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3
subsurface	Iron (mg/kg)	1	1	100	41100	41100	41100	41100	41100	41100	41100	41100	41100	41100
subsurface	Magnesium (mg/kg)	1	1	100	6760	6760	6760	6760	6760	6760	6760	6760	6760	6760
subsurface	Potassium (mg/kg)	1	1	100	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330
subsurface	Sodium (mg/kg)	1	1	100	1130 J	1130 J	1130	1130 J	1130 J	1130 J	1130 J	1130	1130 J	1130 J
subsurface	Titanium (mg/kg)	1	1	100	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960
subsurface	Vanadium (mg/kg)	1	1	100	103	103	103	103	103	103	103	103	103	103
subsurface	2-Methylnaphthalene (ug/kg)	1	1	100	860	860	860	860	860	860	860	860	860	860
subsurface	Acenaphthene (ug/kg)	1	1	100	5400	5400	5400	5400	5400	5400	5400	5400	5400	5400
subsurface	Acenaphthylene (ug/kg)	1	1	100	490	490	490	490	490	490	490	490	490	490
subsurface	Anthracene (ug/kg)	1	1	100	7800	7800	7800	7800	7800	7800	7800	7800	7800	7800
subsurface	Fluorene (ug/kg)	1	1	100	4600	4600	4600	4600	4600	4600	4600	4600	4600	4600
subsurface	Naphthalene (ug/kg)	1	1	100	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
subsurface	Phenanthrene (ug/kg)	1	1	100	42000	42000	42000	42000	42000	42000	42000	42000	42000	42000
subsurface	Low Molecular Weight PAH (ug/kg)	1	1	100	62190 A	62190 A	62200	62190 A	62190 A	62190 A	62190 A	62200	62190 A	62190 A
subsurface	Dibenz(a,h)anthracene (ug/kg)	1	1	100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Benz(a)anthracene (ug/kg)	1	1	100	9900	9900	9900	9900	9900	9900	9900	9900	9900	9900
subsurface	Benzo(a)pyrene (ug/kg)	1	1	100	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000
subsurface	Benzo(b)fluoranthene (ug/kg)	1	1	100	7600	7600	7600	7600	7600	7600	7600	7600	7600	7600
subsurface	Benzo(g,h,i)perylene (ug/kg)	1	1	100	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000
subsurface	Benzo(k)fluoranthene (ug/kg)	1	1	100	5400	5400	5400	5400	5400	5400	5400	5400	5400	5400
subsurface	Chrysene (ug/kg)	1	1	100	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000
subsurface	Fluoranthene (ug/kg)	1	1	100	34000	34000	34000	34000	34000	34000	34000	34000	34000	34000
subsurface	Indeno(1,2,3-cd)pyrene (ug/kg)	1	1	100	8700	8700	8700	8700	8700	8700	8700	8700	8700	8700
subsurface	Pyrene (ug/kg)	1	1	100	48000	48000	48000	48000	48000	48000	48000	48000	48000	48000
subsurface	Benzo(b+k)fluoranthene (ug/kg)	1	1	100	13000 A	13000 A	13000	13000 A	13000 A	13000 A	13000 A	13000	13000 A	13000 A
subsurface	High Molecular Weight PAH (ug/kg)	1	1	100	152700 A	152700 A	153000	152700 A	152700 A	152700 A	152700 A	153000	152700 A	152700 A
subsurface	Polycyclic Aromatic Hydrocarbons (ug/kg)	1	1	100	214890 A	214890 A	215000	214890 A	214890 A	214890 A	214890 A	215000	214890 A	214890 A
subsurface	4,4'-DDD (ug/kg)	1	1	100	23 J	23 J	23	23 J	23 J	23 J	23 J	23	23 J	23 J
subsurface	4,4'-DDE (ug/kg)	1	0	0						7.1 UIJ	7.1 UIJ	7.1	7.1 UIJ	7.1 UIJ
subsurface	4,4'-DDT (ug/kg)	1	1	100	18 J	18 J	18	18 J	18 J	18 J	18 J	18	18 J	18 J
subsurface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	1	1	100	41 A	41 A	41	41 A	41 A	41 A	41 A	41	41 A	41 A
subsurface	Aldrin (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	alpha-Hexachlorocyclohexane (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	beta-Hexachlorocyclohexane (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	delta-Hexachlorocyclohexane (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	gamma-Hexachlorocyclohexane (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	cis-Chlordane (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	Dieldrin (ug/kg)	1	0	0						1.9 UJ	1.9 UJ	1.9	1.9 UJ	1.9 UJ
subsurface	alpha-Endosulfan (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	beta-Endosulfan (ug/kg)	1	0	0						1.9 UJ	1.9 UJ	1.9	1.9 UJ	1.9 UJ
subsurface	Endosulfan sulfate (ug/kg)	1	0	0						1.9 UJ	1.9 UJ	1.9	1.9 UJ	1.9 UJ
subsurface	Endrin (ug/kg)	1	0	0						1.9 UJ	1.9 UJ	1.9	1.9 UJ	1.9 UJ
subsurface	Endrin aldehyde (ug/kg)	1	0	0						1.9 UJ	1.9 UJ	1.9	1.9 UJ	1.9 UJ
subsurface	Endrin ketone (ug/kg)	1	0	0						1.9 UJ	1.9 UJ	1.9	1.9 UJ	1.9 UJ
subsurface	Heptachlor (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	Heptachlor epoxide (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	Methoxychlor (ug/kg)	1	0	0						23 UIJ	23 UIJ	23	23 UIJ	23 UIJ
subsurface	Toxaphene (ug/kg)	1	0	0						97 UJ	97 UJ	97	97 UJ	97 UJ
subsurface	gamma-Chlordane (ug/kg)	1	0	0						0.97 UJ	0.97 UJ	0.97	0.97 UJ	0.97 UJ
subsurface	2,4,5-Trichlorophenol (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	2,4,6-Trichlorophenol (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	2,4-Dichlorophenol (ug/kg)	1	0	0						390 U	390 U	390	390 U	390 U
subsurface	2,4-Dimethylphenol (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	2,4-Dinitrophenol (ug/kg)	1	0	0						1300 UJ	1300 UJ	1300	1300 UJ	1300 UJ
subsurface	2-Chlorophenol (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	2-Methylphenol (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	2-Nitrophenol (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte & Units	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	4,6-Dinitro-2-methylphenol (ug/kg)	1	0	0						1300 UJ	1300 UJ	1300	1300 UJ	1300 UJ
subsurface	4-Chloro-3-methylphenol (ug/kg)	1	0	0						260 U	260 U	260	260 U	260 U
subsurface	4-Methylphenol (ug/kg)	1	1	100	160	160	160	160	160	160	160	160	160	160
subsurface	4-Nitrophenol (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	Phenol (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Dimethyl phthalate (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Diethyl phthalate (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Dibutyl phthalate (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Butylbenzyl phthalate (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Di-n-octyl phthalate (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Bis(2-ethylhexyl) phthalate (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	2,4-Dinitrotoluene (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	2,6-Dinitrotoluene (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	2-Chloronaphthalene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	2-Nitroaniline (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	3,3'-Dichlorobenzidine (ug/kg)	1	0	0						640 U	640 U	640	640 U	640 U
subsurface	3-Nitroaniline (ug/kg)	1	0	0						770 UJ	770 UJ	770	770 UJ	770 UJ
subsurface	4-Bromophenyl phenyl ether (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	4-Chloroaniline (ug/kg)	1	0	0						390 U	390 U	390	390 U	390 U
subsurface	4-Chlorophenyl phenyl ether (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	4-Nitroaniline (ug/kg)	1	0	0						640 UJ	640 UJ	640	640 UJ	640 UJ
subsurface	Benzoic acid (ug/kg)	1	0	0						1300 U	1300 U	1300	1300 U	1300 U
subsurface	Benzyl alcohol (ug/kg)	1	0	0						130 UJ	130 UJ	130	130 UJ	130 UJ
subsurface	Bis(2-chloroethoxy) methane (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Bis(2-chloroethyl) ether (ug/kg)	1	0	0						260 U	260 U	260	260 U	260 U
subsurface	Carbazole (ug/kg)	1	1	100	280 J	280 J	280	280 J	280 J	280 J	280 J	280	280 J	280 J
subsurface	Dibenzofuran (ug/kg)	1	1	100	470	470	470	470	470	470	470	470	470	470
subsurface	Hexachlorobenzene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Hexachlorobutadiene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Hexachlorocyclopentadiene (ug/kg)	1	0	0						640 UJ	640 UJ	640	640 UJ	640 UJ
subsurface	Hexachloroethane (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Isophorone (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	Nitrobenzene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	N-Nitrosodipropylamine (ug/kg)	1	0	0						260 U	260 U	260	260 U	260 U
subsurface	N-Nitrosodiphenylamine (ug/kg)	1	0	0						130 UJ	130 UJ	130	130 UJ	130 UJ
subsurface	1,2-Dichlorobenzene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	1,3-Dichlorobenzene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	1,4-Dichlorobenzene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U
subsurface	1,2,4-Trichlorobenzene (ug/kg)	1	0	0						130 U	130 U	130	130 U	130 U

SUPPLEMENTAL FIGURES

Figure 2. Drainage Basin and Outfall Map (CH2M HILL 2000)
Glacier Northwest Linnton Storm Water Handling Site Plan (no figure #)
Figure 2. Sampling Locations (CH2M HILL 2002b)
Figure 3. Sampling Locations (CH2M HILL 2002b)
Figure 5-1. Sampling Locations (CH2M HILL 2002a)

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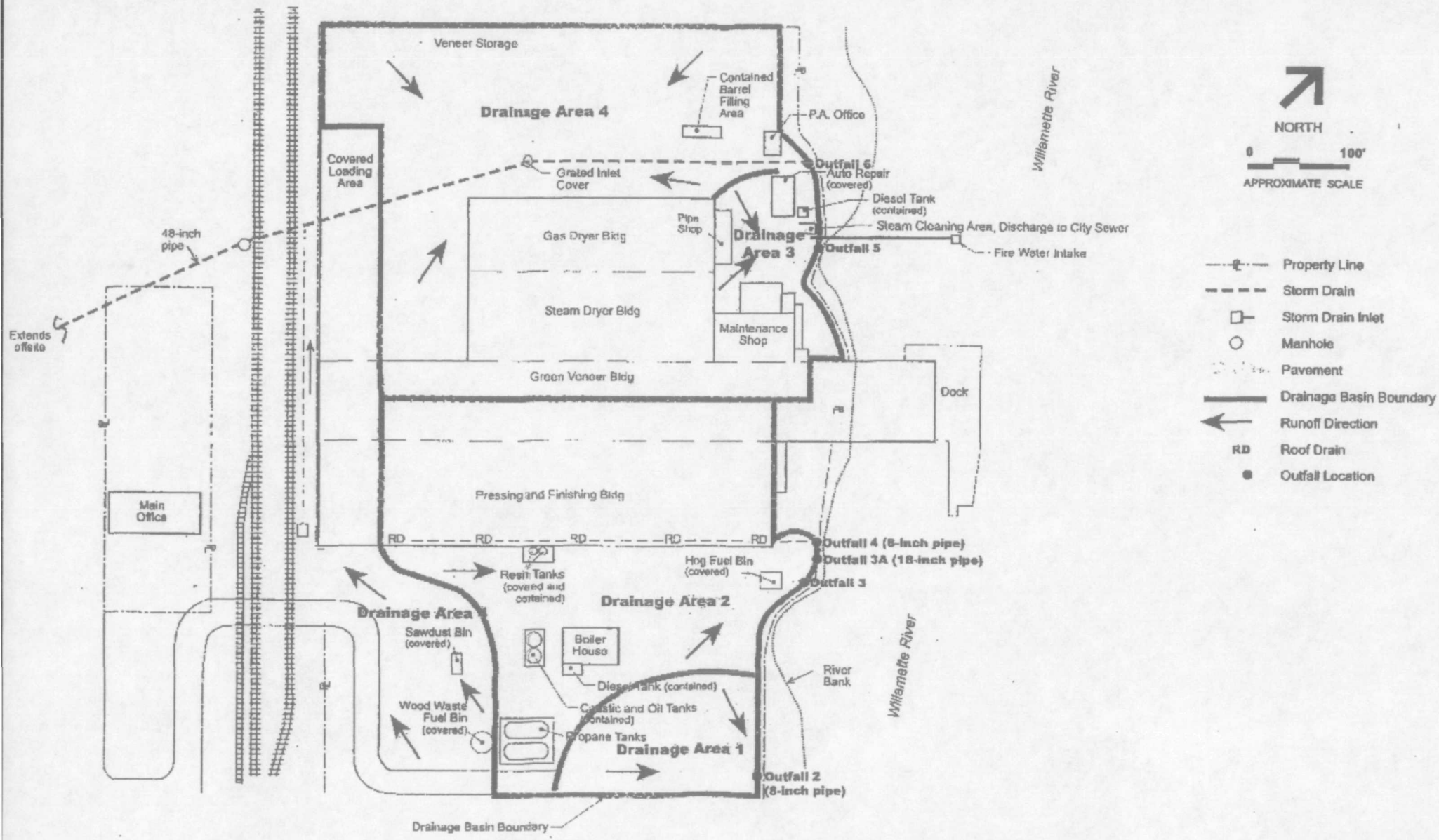
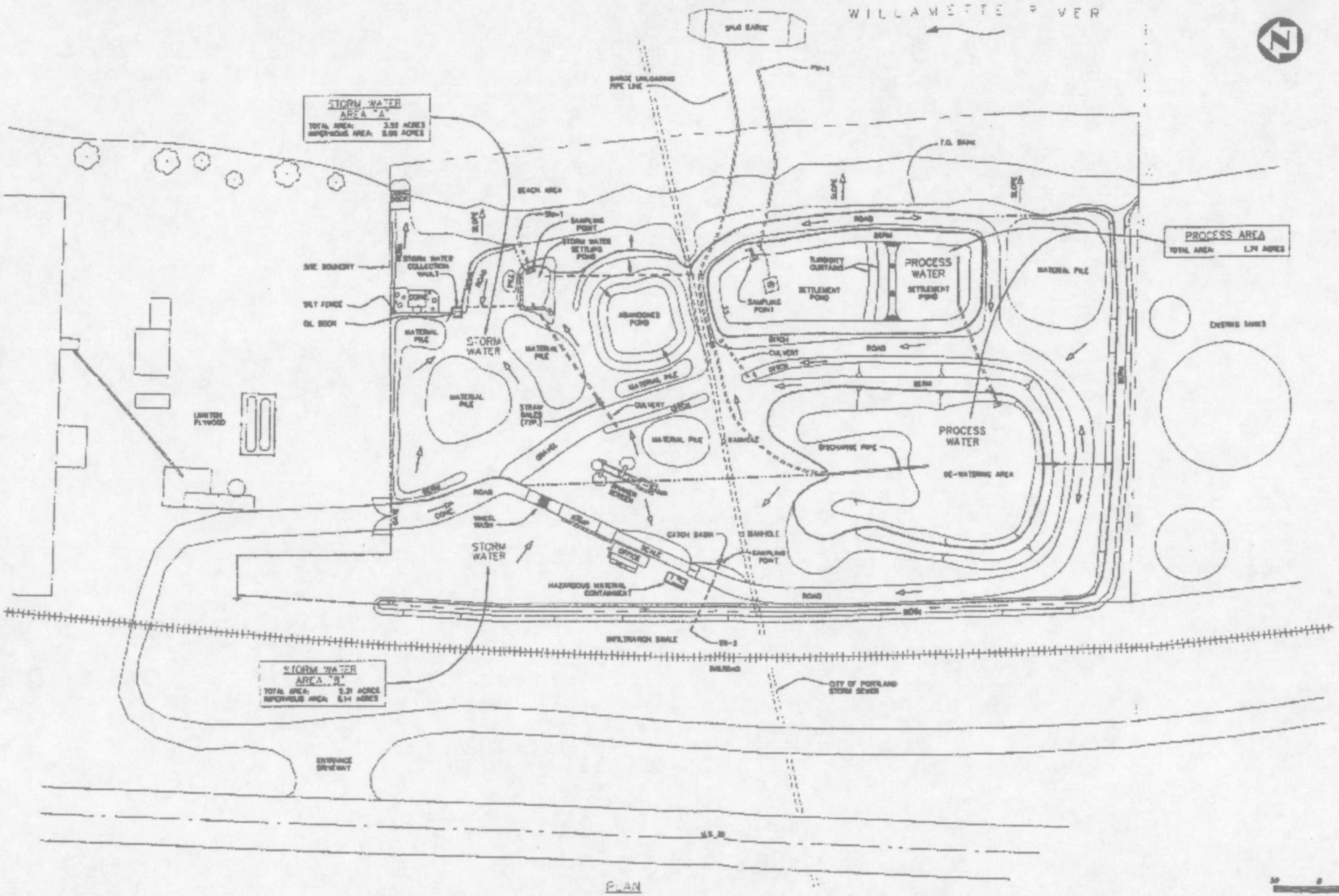


Columbia Sand and Gravel Operation

HILL

FIGURE 2
Drainage Basin and Outfall Map
LINNTON PLYWOOD ASSOCATION
PORTLAND, OREGON



PLAN

Scale: 1 inch = 50 feet

No.	Date	Description	Drawn	Chk'd	Design	Chk'd	App'd	No.	Date	Description	Drawn	Chk'd	Design	Chk'd	App'd
								A	1/15/99	ISSUED FOR CLIENT USE	JAP		RCW		

REFERENCE DRAWINGS — ISSUE / REVISIONS — ISSUE / REVISIONS

GLACIER NORTHWEST

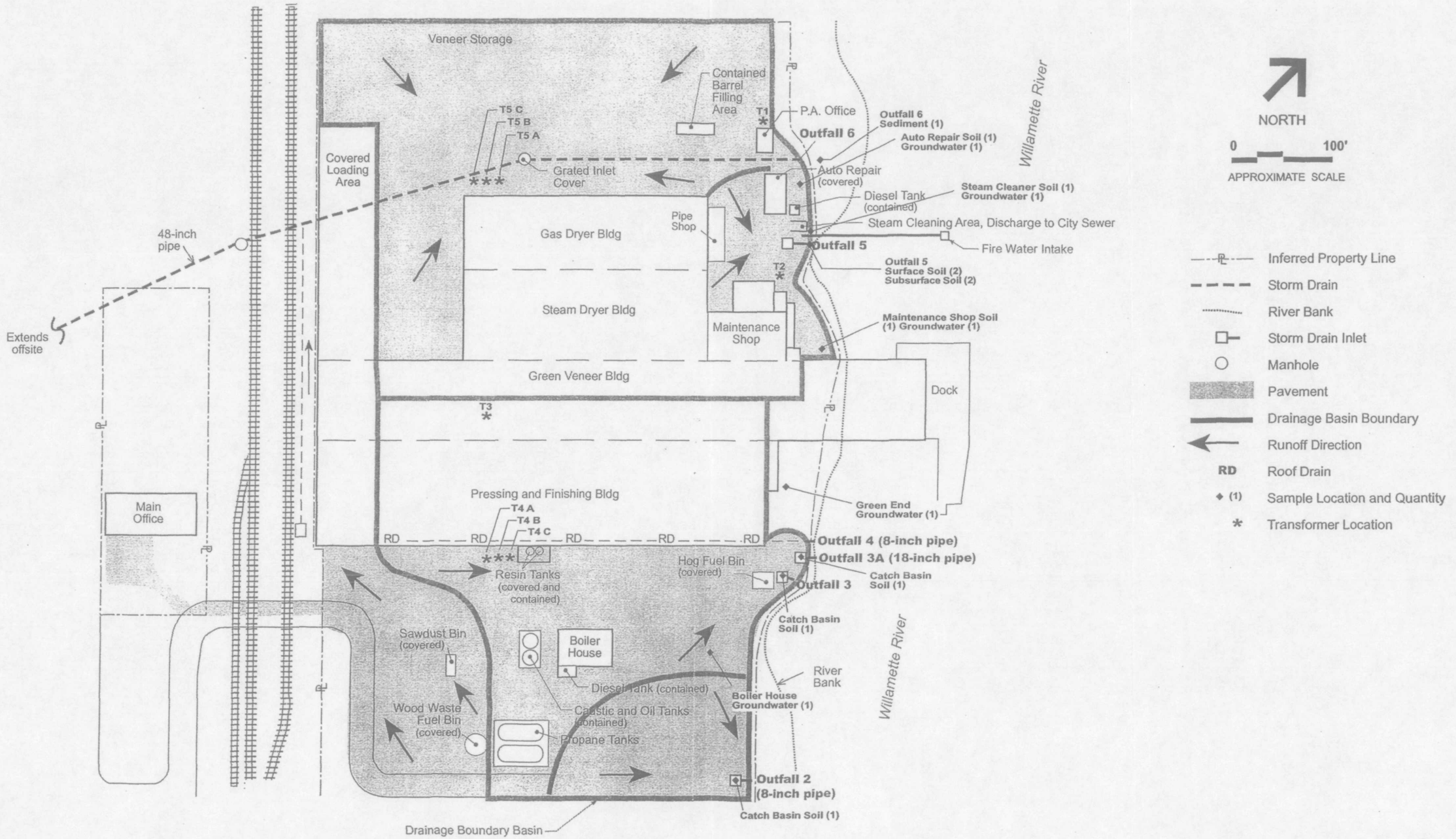
GLACIER NW / NW AGGREGATES
LINNTON SITE

Salpeco Westmar

GLACIER NORTHWEST LINNTON
STORM WATER HANDLING
SITE PLAN

Scale	Project Number	Drawing Number
1:50	80140	80140-100

167592.SA.01 E122001006 1.24.2 dr



Columbia Sand and Gravel Operation

FIGURE 2
Sampling Locations
LINNTON PLYWOOD ASSOCATION
PORTLAND, OREGON

CH2MHILL

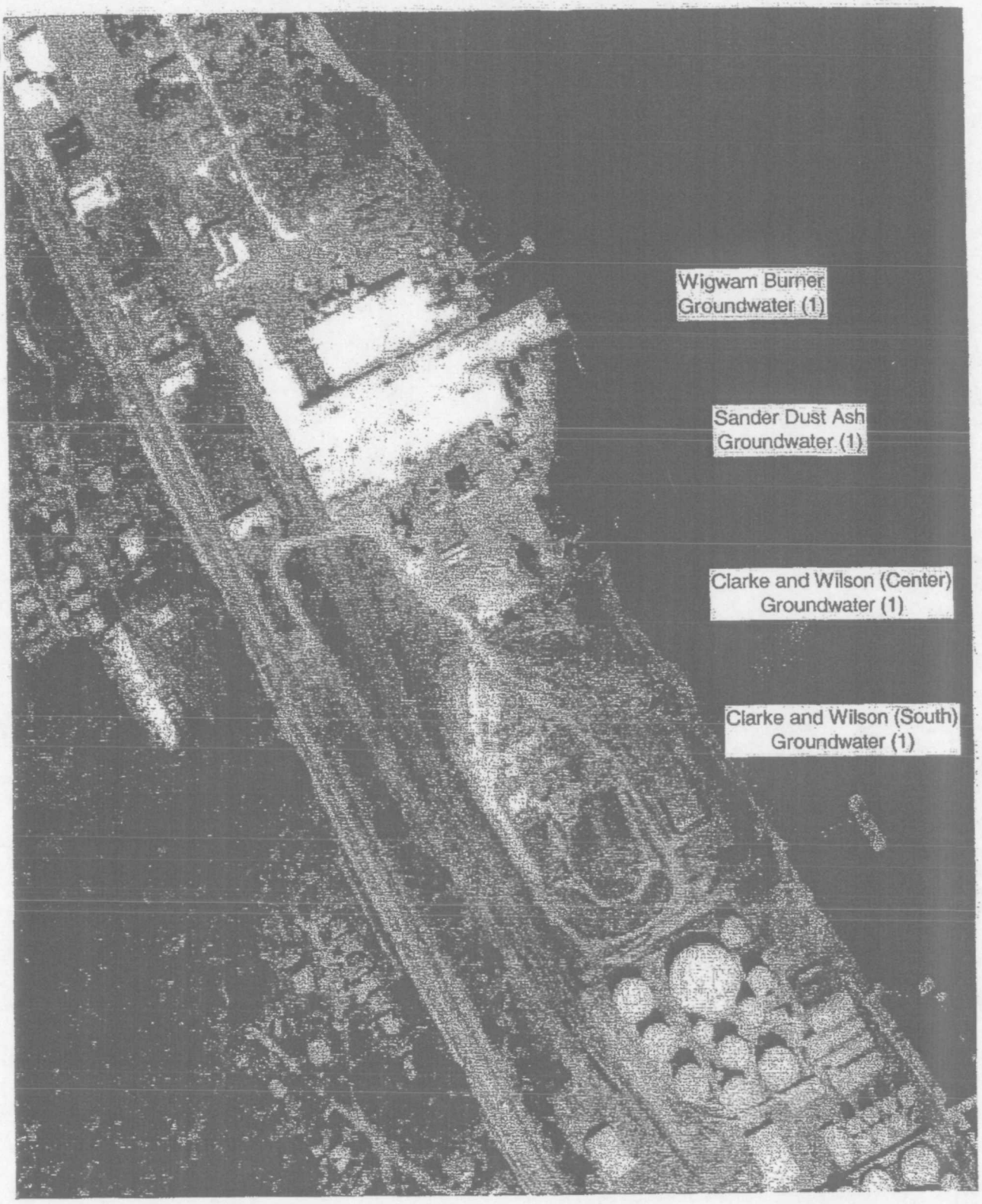


Figure 3
Sampling Locations
Linnton Plywood Association
Portland, Oregon

CH2MHILL

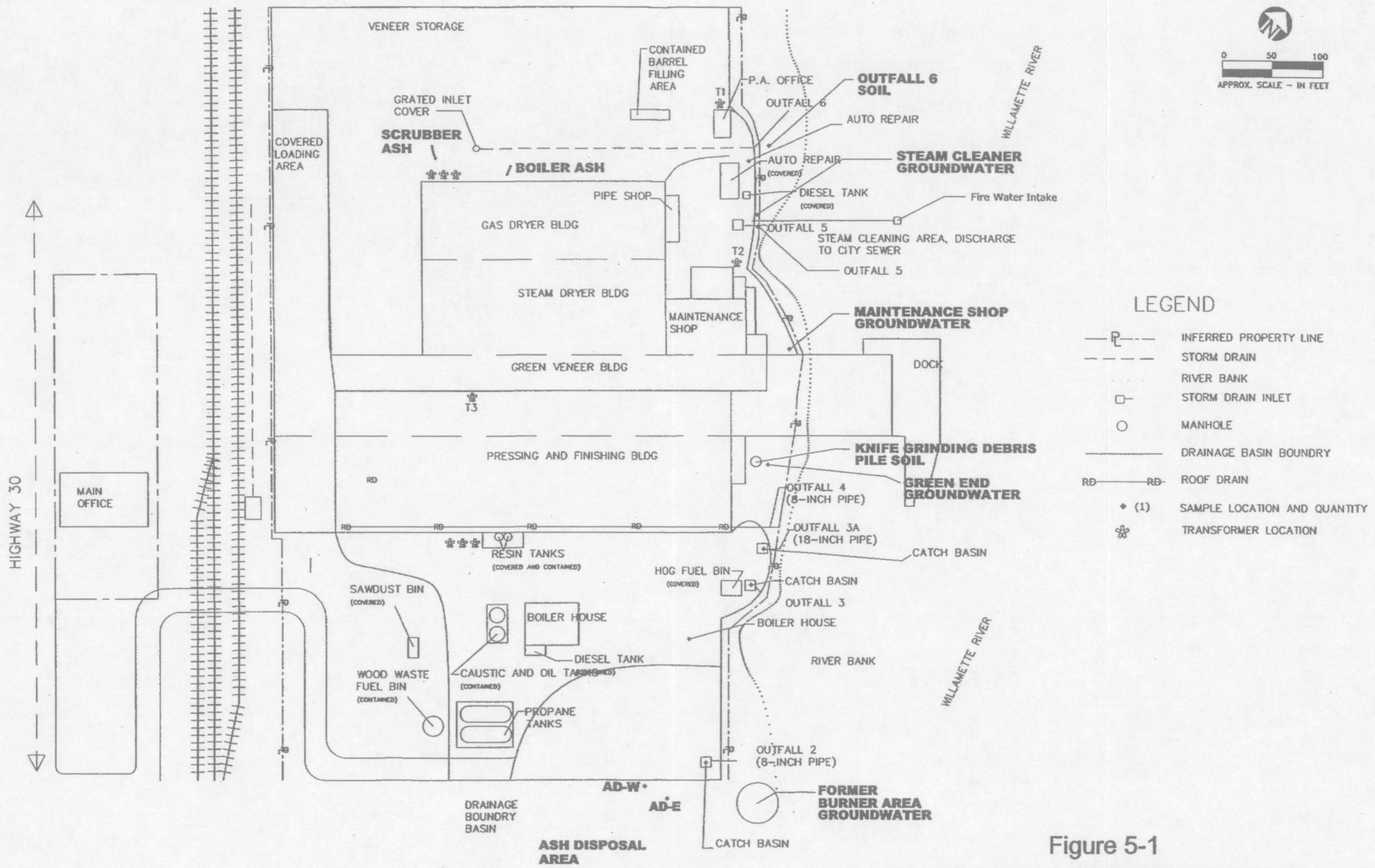


Figure 5-1

SAMPLING LOCATIONS-OCT. 2002

LINNTON PLYWOOD ASSOCIATION
PORTLAND, OREGON

CH2MHILL

SampLoc2.dwg

Noncontiguous Burgard Industrial Park Properties

NONCONTIGUOUS BURGARD INDUSTRIAL PARK PROPERTIES (Boydstun NE, Morgan CFS, NW Pipe Leases, Schnitzer Remnants) CSM Site Summary

NONCONTIGUOUS BURGARD INDUSTRIAL PARK PROPERTIES

Oregon DEQ ECSI #: None

12005 N. Burgard Road
DEQ Site Mgr: Alicia Voss
Latitude: 45.6102°
Longitude: -122.7724°
Township/Range/Section: 2N/1W/35

River Mile: 4 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the noncontiguous Burgard Industrial Park properties to the river is summarized in this section and Table 1, and supported in following sections. The locations of the nine noncontiguous Burgard properties are shown in Figure 1.

1.1. Overland Transport

The potential for overland sheet flow to be transported directly to the Willamette River is minimal at these noncontiguous properties given their great distance to the river, except for Schnitzer Steel Industry's (SSI's) Slip Remnant Area, which is an unpaved parcel located just east of the access road curing around the east end of the International Terminals Slip (Figure 1). The potential for overland transport from this parcel is unknown.

1.2. Riverbank Erosion

Only SSI's Slip Remnant Area is located adjacent to the slip at its eastern end (see Figure 1). According to Bridgewater (2000a), the shoreline at the eastern end of the slip is a "gradual, vegetated slope with only a few, scattered wood debris." The top of the bank consists of vacant, bare ground, and there are no activities or storage in this area. Evidence of erosion has not been determined.

1.3. Groundwater

Limited site-specific information is available for only two of the noncontiguous leased properties at Schnitzer's Burgard Industrial Park. Except for the Slip Remnant Area, the noncontiguous facilities do not occupy the shoreline along the Willamette River or the slip and are located 1,200 feet or more from the east bank of the Willamette River. Groundwater transport of potential contaminants at any of the noncontiguous sites will be in the general direction of groundwater flow: generally to the west toward the Willamette River. No information has been presented regarding the depths of the utilities at the facility relative to the groundwater table or if they may be considered a preferential pathway at the site.

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1.4. *Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)*

Stormwater originating on Boydstun's NE facility is conveyed via a pump station to a private outfall 19 (WR-124?) on the Willamette under an NPDES permit. Stormwater in the remaining properties infiltrates the ground or is conveyed to Burgard Industrial Park communal outfalls along the slip, primarily Burgard outfall 18 (WR-123). There are no overwater activities associated with these properties.

1.5. *Relationship of Upland Sources to River Sediments*

See Final CSM Update.

1.6. *Sediment Transport*

Not applicable to these properties.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☒	Phase I and II RI for Burgard Industrial Park (Bridgewater 2002, 2003a)
FS	☐	
Interim Action/Source Control	☒	Stormwater BMPs for Burgard Industrial Park (Bridgewater 2003b)
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 2

4. SITE OWNER HISTORY

Primary Sources: Bridgewater 2000a,b; DEQ 1999, 2004

Owner/Occupant	Type of Operation	Years
Schnitzer Investment Corporation – **Owner**	Real estate	1972 to present
Boydstun Metal Works-NE location - Lessee	Automotive trailer manufacturing	2000 to present
Schnitzer Investment Corp	Fabrication and painting of automotive transport trailers	2000 to present
Schnitzer Investment Corp.	Unknown, some log storage from 1970 to 1979	1970 - 2000
SIC/Crown Beverage (lessee)	Warehousing	1986 - 1999
SIC/Walker Manufacturing (lessee)	Automotive parts storage	1979 - 1986
Unknown	???	1945 - 1970

Owner/Occupant	Type of Operation	Years
Oregon Shipbuilding Corp.	WWII shipyard barracks	1941 - 1945
Morgan CFS - lessee	Shipping and receiving of intermodal containers, wood products distribution	1987 to present
NW Pipe - lessee	Storage	? to present
Schnitzer Steel Industries - lessee	Storage	1960s to present
Overall Noncontiguous Properties		
Various owners and lessees including U.S. Surplus Properties Corp., Beall Pipe and Tank, Dulien Steel Products, Inc., William and Elizabeth Shenker, Port of Portland and Broadway Holding Co.	Upland log storage and log rafting (1963 onward), filling of shipways (early 1960s to 1972), grain storage, steel pipe and tank manufacturing	1945 to 1972
U.S. Government, City of Portland, Oregon Shipbuilding	Ship construction and other shipyard activities. Site was filled and slip was dredged prior to construction of shipyard and associated shipways.	1941 to 1945
Gatton Family	Site generally undeveloped except for some oil storage along what is now the southwest edge of the International Terminal (Northwest Oil, predecessor of Time Oil).	Prior to 1941

5. PROPERTY DESCRIPTION

The Schnitzer Investment Corporation's (SIC) 200-acre Burgard Industrial Park property is located on the east side of the Willamette River at approximately RM 4. The properties are located in proximity to the International Terminals Slip, a shipping channel on the east side of the river. Eight tenants lease property from SIC, four of which are associated with the nine noncontiguous Burgard properties. The site locations of these nine properties and their associated tenants are shown in Figure 1.

The current site and surrounding land use is industrial in nature. Site features include offices, warehouses, and other buildings; paved or graveled work surfaces, roadways, and parking lots; railroad tracks; utilities (water, sewage, stormwater, electrical); small, aboveground storage facilities for fuels and oils, and some undeveloped areas. (Features specific to each tenant are described in Section 6.) Large portions of the park property are paved (Bridgewater 2000a).

6. CURRENT SITE USE

Current site activities for SIC and the tenants of the noncontiguous properties were summarized by Bridgewater (2000a). Figure 1 shows the location of these properties.

Boydstun Metal Works. Boydstun's in-holding is discussed separately under ECSI #2362 and is located near the southeast corner of the Burgard Industrial Park. Manufacturing facilities at the northeast facility include steel and aluminum fabrication, a paint spray booth, and hydraulic and electric fitting areas. Specific manufacturing activities include cutting steel and aluminum sheets and tubes, welding parts together as part of trailer assembly, sandblasting, painting, and installing hydraulics and electrical control systems. Boydstun also displays completed truck and trailer rigs and operates a truck-loading school at the northeast property. One 1,000-gallon AST containing hydraulic oil is located at the north facility.

Stormwater from the Boydstun facility is collected in two drainage basins and discharged to the river through a private outfall 19. [Refer to Supplemental Figure 2 from Columbia West Engineering (2001)

for a site drainage map for the Boydson NE facility.]

Morgan CFS. The 10-acre Morgan facility is located in the northeast portion of the Burgard Industrial Park. Overseas containers are unloaded and/or readied for shipment, and some contents are temporarily stored in the 72,000-square-foot building located onsite. Lumber and building materials are the primary products shipped, although appliances, sheet rock, wood doors, wood glue and resin, and motor oil are also handled. No manufacturing occurs on the site.

A 500-gallon aboveground tank surrounded by secondary containment is located inside the building. According to CH2M HILL (1996), an aboveground diesel tank was located in a wooden shed along the western perimeter of the property. This tank was removed in 1999. Waste materials include scrap wood and scrap metal bands that are recycled at the SSI facility.

Morgan does not have a stormwater permit. Stormwater drains to four catch basins that enter the general storm drain system in the area.

Northwest Pipe. Northwest Pipe leases five different areas of the Burgard Industrial Park (their in-holding is discussed separately under ECSI #138). No manufacturing occurs on any of these parcels. Their 15.5-acre total lease includes the following areas:

- **NWP Property 1** - Six unpaved, flat acres in the southeastern portion of the site. Manufactured steel pipe is stored on wooden pallets on this site.
- **NWP Property 2** – Located just west of property 1, these 3.5 acres are covered with asphalt. A small metal shed is centrally located. Large-diameter, concrete-lined pipe is stored directly on the asphalt-covered ground.
- **NWP Property 3** – Located immediately west of the Northwest Pipe office building, the 0.5-acre site is flat and unpaved. Small-diameter pipe on timber saddles is stored on this property.
- **NWP Property 4** – A 4-5-acre, triangular-shaped parcel located just east of the head of the slip and west of the Joseph Ryerson & Son facility. The property is flat and unpaved and contains no structures. Steel pipe is stored here.
- **NWP Property 5** – A 1-acre narrow strip located along the western portion of the northern edge of NWP-owned property. Steel pipe and coal tar cylinders are stored in this area. The land is flat and unpaved.

NWP Property 2 is the only NWP-leased property that is paved. Runoff drains to catch basins and is conveyed to the NWP stormwater system. Stormwater infiltrates the ground in the remaining areas.

Schnitzer Steel Industries. SSI leases two remnant areas: Slip Remnant Area, located east of the access road curving around the east end of the slip; and Northern Remnant Area, located in the northwest corner of the site. The Slip Remnant Area is about 800 feet long and less than 100 feet wide, and is used to store structural steel beams. The ground is bare in this area. An approximate 250-gallon used oil tank is located along the rail line near the northern boundary. The steel tank is set in a metal containment tray and is used to collect oil captured from locomotives operating on SSI property. This tank is periodically emptied into the used oil tank located in the petroleum storage area of Building B, where it is removed by an outside contractor and recycled. The Northern Remnant Area is about 1,000 feet long by 400 feet wide and is bordered on the east and north by a rail line and on the west by Time Oil. Small-diameter steel pipe, steel sheets, structural steel beams and bridge deck are stored on graveled surfaces in the eastern portion of this area. Stormwater in both of these areas infiltrates the ground.

SSI has a separate underground storage tank area and equipment refueling island located 200 feet southeast of the Joseph Ryerson & Son facility. There are three underground tanks located here: a 20,000-gallon diesel tank, and two 6,000-gallon gasoline tanks. These tanks meet current requirements and have interstitial automatic leak detection monitors (Bridgewater 2000a). Stormwater from this area

is conveyed to communal Burgard outfall 18 (WR-123).

Schnitzer Investment Corporation. Other noncontiguous parcels include paved roads and parking lots, graveled storage areas, railroad tracks, and bare ground. Stormwater is routed to the Burgard Industrial Park storm drain network.

7. SITE USE HISTORY

During WWII, the general site area was the location of a large shipyard owned by the Oregon Shipbuilding Corporation. The deep draft International Terminals Slip was created during this period, and much of the site was filled to address marshy, low-lying areas present on the site. Over 450 ships were built on this property from 1941 to late 1945. Sewage and stormwater was conveyed to outfalls along the river. At the end of the war, activities onsite ended immediately. Between 1945 and 1972, industrial use was limited following dismantling of the shipyard, but activities included metals fabrication, filling of shipways associated with the former shipyard, log rafting, and upland log storage. Schnitzer purchased the property in 1972 for use as a metals scrap yard (Bridgewater 2000b).

There is little pre-WWII historical information for Boydstun's northeast parcel. During the shipyard years, a barracks that housed the shipyard workers was located in the northeast corner of the site. The barracks included single-story buildings for the workers, a mess hall, theater, gymnasium, recreation building, fire station, and clinic. There was a large parking lot also located in this general area. Dredged sand was placed as fill in this area about 1970. Logs were stored here from 1970 until 1979, at which time Walker Manufacturing constructed a building on the site to store mufflers and other automotive components. Crown Beverage occupied this building from 1986 to 1999 and used it for warehousing of new beverage and food cans. In 2000, Boydstun consolidated their operations on this parcel (Bridgewater 2000b).

Specific historical information for Morgan CFS and the NW Pipe leased properties was not located during the research for this area, but is presumed to be similar to the general history of the Burgard Industrial Park described above.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

Little is known about the historical activities that occurred on these noncontiguous parcels, other than the Boydstun NE facility, which was the former barracks area for the WWII shipyard. Shipyard sanitary sewer wastes and stormwater were discharged directly to the Willamette River during this time (Bridgewater 2000b). Possible contaminants in these discharges are unknown.

A groundwater VOC (chlorinated solvents) plume has been detected on the Northwest Pipe Property 2. A complete description and characterization of the chlorinated VOC plume at Northwest Pipe Property 2 are presented in the CSM site summary for Northwest Pipe Company, ECSI #138.

8.2. Overwater Activities ☐ Yes ☒ No

8.3. Spills

No known or documented spills at the Noncontiguous Burgard properties were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor

Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence.

9. PHYSICAL SITE SETTING

The physical setting of the Schnitzer Burgard Industrial Park is based on the general Schnitzer Burgard Industrial Park reports and the limited reports that focus on the noncontiguous leased properties. Investigations of the noncontiguous leased properties include:

- Surface soil and groundwater sampling at Morgan CFS (CH2M HILL 1996).
- Several investigations at Northwest Pipe Company site (ECSI #138) and one of the adjacent noncontiguous leased properties (Property 2) completed by CH2M HILL. A portion of these investigations included soil and groundwater sampling at Northwest Pipe Company Property 2 (CH2M HILL 2001, 2002, and 2003). Fourteen soil borings and three monitoring wells were completed on or near the Northwest Pipe Company Property 2 (CH2M HILL 2003).

The Schnitzer Burgard Industrial Park is fairly level with ground-surface elevations ranging between 20 and 30 feet above msl. The topography of the industrial park gently slopes from east to west, with the exception of a steep embankment along the Willamette River and the slip channel (DEQ 1999). The noncontiguous leased properties are located 1,200 feet or more from the east bank of the Willamette River. The southern two-thirds of the industrial park lie within the Willamette River's 100-year-flood zone (DEQ 1999).

9.1. Geology

The near-surface geology at the Schnitzer Burgard Industrial Park is dominated by the presence of dredge fill placed during the development of the industrial park in the late 1930s and during filling of the shipways in the later 1960s and early 1970s. The dredge fill, consisting of a mixture of brown sand and silty sand, varies in thickness across the industrial park from 25 to 35 feet along the river and thinning to 15 feet along the eastern edge of the site (Bridgewater 2001). Based on the lithologic log from an industrial production well at Northwest Property Company (near the center of the industrial park), underlying the dredge fill to an approximate depth of 160 feet bgs are Quaternary deposits consisting of interbedded sands and silty clay. Below 160 to 220 feet bgs, the Quaternary deposits are predominantly composed of sand with gravel lenses (CH2M HILL 2000). The coarser-grained material may represent Pleistocene flood gravels (Quaternary deposit) and/or possibly the Troutdale Formation. Between 220 and 258 feet bgs, silty clay and clay with minor lenses of gravel were noted (CH2M HILL 2000). The latter unit may represent the Sandy River Mudstone. The total depth explored during installation of the onsite industrial production well was 258 feet bgs. The Oregon Water Resources Department well identification number for the onsite industrial production well is MULT 1824.

9.2. Hydrogeology

A shallow unconfined groundwater zone is present within the lower portions of the dredge fill and the alluvial deposits underlying the dredge fill, based on probe and monitoring well data (Bridgewater 2001). The groundwater flow direction in the alluvial groundwater zone is generally to the west, toward the Willamette River, with local variations in groundwater flow expected. The alluvial groundwater zone is anticipated to discharge to the river (Bridgewater 2001). Two seeps were identified at the end of the International Terminals Slip adjacent to the Slip Remnant property (GSI 2003).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

Only two soil investigations have occurred on the noncontiguous Burgard properties. A limited soil sampling of the Morgan CFS property took place in 1996. Soil and groundwater samples were collected from three soil probe borings to assess impacts from the Time Oil property located immediately north of Morgan CFS. The soil samples were analyzed for pentachlororphenol (PCP) (EPA Method 8270), but the contaminant was not detected (CH2M HILL 1996).

In 2002, soil samples were collected on or nearby NW Pipe's Property 2 (see Figure 1) in order to more fully characterize the nature and extent of VOCs that had been detected in groundwater the previous year. VOCs were detected at very low concentrations in soil from these areas (CH2M HILL 2002).

10.1.2. Riverbank Samples ☐ Yes ☒ No

10.1.3. Summary

The extent, if any, of soil contamination on these noncontiguous properties is unknown. A limited soil investigation of the Morgan CFS property provided only results for PCP (which was undetected). VOCs were detected only at very low concentrations on NW Pipe's Property 2.

10.2. Groundwater

10.2.1. Groundwater Investigations ☒ Yes ☐ No

Groundwater data are available for only two of the noncontiguous leased properties, Morgan CFS and Northwest Pipe leased Property 2, as described below. Additional subsections are completed only for the two sites where groundwater investigations have been conducted.

Boydstun Metals Works (northeast). No documented groundwater investigations.

Morgan CFS. Groundwater samples were collected from three soil probe borings (temporary well points) at Morgan CFS and analyzed for PCP (CH2M HILL 1996). The temporary well points were abandoned after groundwater samples were collected.

Northwest Pipe Property 2 (Leased). Groundwater samples were collected from soil probe borings (temporary well points) and monitoring wells at and adjacent to Northwest Pipe Property 2. CH2M HILL completed 7 soil probe borings in September 2001 (CH2M HILL 2001) and an additional 12 soil probe borings in August 2002 (CH2M HILL 2002). The groundwater samples were analyzed for VOCs and TPH. The temporary well points were abandoned after groundwater samples were collected. Three monitoring wells were installed in July 2003 to obtain additional groundwater information (CH2M HILL 2003). Groundwater samples collected from the monitoring wells were analyzed for VOCs. Because these investigations were conducted as part of the main Northwest Pipe Property investigation, a detailed presentation of the results of these investigations at the Northwest Pipe Property 2 is summarized in the CSM site summary for Northwest Pipe Company, ECSI #138.

Northwest Pipe Property 1, 3, 4, and 5 No documented groundwater investigations.

Schnitzer Steel Industries. No documented groundwater investigations.

Schnitzer Investment Corporation. No documented groundwater investigations.

10.2.2. NAPL (Historic & Current) ☐ Yes ☐ No

Morgan CFS. No NAPL is present based on available data.

Northwest Pipe Property 2 (Leased). The DEQ stated concern that the previously detected VOC concentrations in GP-1 and GP-2 of up to almost 10 mg/L tetrachloroethylene [see Supplemental Figure 3 from CH2M HILL (2003)] suggest the potential presence of DNAPL (DEQ 2004, pers. comm.). Additional discussion of the potential NAPL is presented in the CSM site summary for Northwest Pipe Company, ECSI #138.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

Morgan CFS. The groundwater samples collected from the temporary well points were nondetect for PCP. No PCP groundwater contamination was identified (CH2M HILL 1996).

Northwest Pipe Property 2 (Leased). A groundwater VOC (chlorinated solvents) plume has been identified at Northwest Pipe Company. This plume extends to Northwest Pipe Property 2. The description and characterization of the chlorinated VOC plume at Northwest Pipe Property 2 is presented in the CSM site summary for Northwest Pipe Company, ECSI #138.

Plume Characterization Status ☐ Complete ☒ Incomplete

Northwest Pipe Property 2 (Leased). The VOC plume characterization status is incomplete. The DEQ does not consider the three monitoring wells installed by CH2M HILL in 2003 [see Supplemental Figure 3 from CH2M HILL (2003)] adequate for delineating the extent of the VOC plume (DEQ 2004, pers. comm.).

Plume Extent

Northwest Pipe Property 2 (Leased). The description and characterization of the chlorinated VOC plume at the Northwest Pipe Property 2 are presented in the CSM site summary for Northwest Pipe Company, ECSI #138.

Min/Max Detections (Current situation)

Northwest Pipe Property 2 (Leased). Refer to the CSM site summary for Northwest Pipe Company, ECSI #138, for discussion of this plume.

Current Plume Data

Northwest Pipe Property 2 (Leased). Refer to the CSM site summary for Northwest Pipe Company, ECSI #138, for a presentation of the shallow groundwater plume (see Figure 2).

Preferential Pathways

It is unclear if underground utilities are intercepting the noncontiguous properties. However, no information has been presented regarding the depths of the utilities at the facility relative to the groundwater table or if they may be considered a preferential pathway at the site.

Downgradient Plume Monitoring Points (min/max detections)

Northwest Pipe Property 2 (Leased). Refer to the CSM site summary for Northwest Pipe Company, ECSI #138, for discussion of this plume.

Visual Seep Sample Data ☐ Yes ☒ No

Most of the Noncontiguous Burgard Industrial Park sites do not border the shoreline of the International Terminals Slip or the Willamette River, except for the Schnitzer's Slip Remnant (see Figure 1). Two seeps were identified at the end of the slip adjacent to the Slip Remnant property (GSI 2003). No sample data are available from these seeps.

Nearshore Porewater Data

Northwest Pipe borders neither the shoreline of the International Terminals Slip nor the Willamette River. No nearshore porewater data associated with this site have been collected.

Groundwater Plume Temporal Trend

Northwest Pipe Property 2 (Leased). Refer to the CSM site summary for Northwest Pipe Company, ECSI #138, for discussion of this plume.

10.2.4. Summary

Documented groundwater investigations have been completed at only two of the noncontiguous leased properties: Morgan CFS and Northwest Pipe Property 2. No groundwater contamination was identified at Morgan CFS (CH2M HILL 1996). A groundwater VOC (chlorinated solvents) plume has been detected on the Northwest Pipe Property 2. A complete description and characterization of the chlorinated VOC plume at Northwest Pipe Property 2 are presented in the CSM site summary for Northwest Pipe Company, ECSI #138.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

Permit Holder	Permit Type	File Number	Start Date	Outfalls	Volumes	Parameters/Frequency
Boydstun Metal Works	GEN12Z	111395	?	Private outfall	?	pH, TSS, oil & grease

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Stormwater from Boydstun's NE facility is conveyed via a pump system and pressure pipe along the western boundary of the site where it discharges through a private outfall 19 (WR-124?) into the International Terminals slip. Stormwater in the remaining properties infiltrates the ground or is conveyed to Burgard Industrial Park outfalls along the slip, primarily Burgard outfall 18 (WR-123).

10.4. Sediment

10.4.1. River Sediment Data

☐ Yes ☒ No

10.4.2. Summary

There are no sediment data associated with these noncontiguous properties in the Schnitzer Burgard Industrial Park. However, sediment chemistry data are summarized in the site summary for Burgard Industrial Park (Schnitzer Steel/Calbag Metals) ECSI #2355.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

One aboveground storage tank was removed from the Morgan CFS property in 1999.

11.2. Groundwater Cleanup/Source Control

There is no history of groundwater cleanup or groundwater source control at any of the noncontiguous leased properties at Schintzer Burgard Industrial Park.

11.3. Other

Schnitzer Investment Corporation has implemented a *Best Management Practices Storm Water Source Control Plan* at their properties in the Burgard Industrial Park. Bridgewater (2003) performed a review and assessment of their BMPs and generally found that most operational BMPs are being properly implemented. Structural BMPs in 10 of the 13 basins onsite have either sand filters, oil/water separators, Storm Water Management ™ water treatment units, or Vortechnics ™ treatment units.

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

Supplemental Figures:

Figure 2. Site Drainage Map (Columbia West Engineering 2001)
Figure 3. PCE Concentrations and Groundwater Flow (CH2M HILL 2003)

FIGURES

Figure 1. Site Features

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integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 150 300 600 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Noncontiguous Burgard Properties
Multiple ECSI

TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Noncontiguous Burgard Industrial Park Properties (Boydston NE, Morgan CFS, NW Pipe leases, Schnitzer remnants)
Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

	Media Impacted					COIs																Potential Complete Pathway				
						TPH			VOCs																	
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Pentachlorophenol (PCP)	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																										
A																										
Former shipyard sanitary sewer and stormwater discharges				?	?				?	?	?						?								?	
Northwest Pipe Property 2			✓								✓												✓			
Overwater Areas																										
B																										
Other Areas/Other Issues																										

Notes:

[1] All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

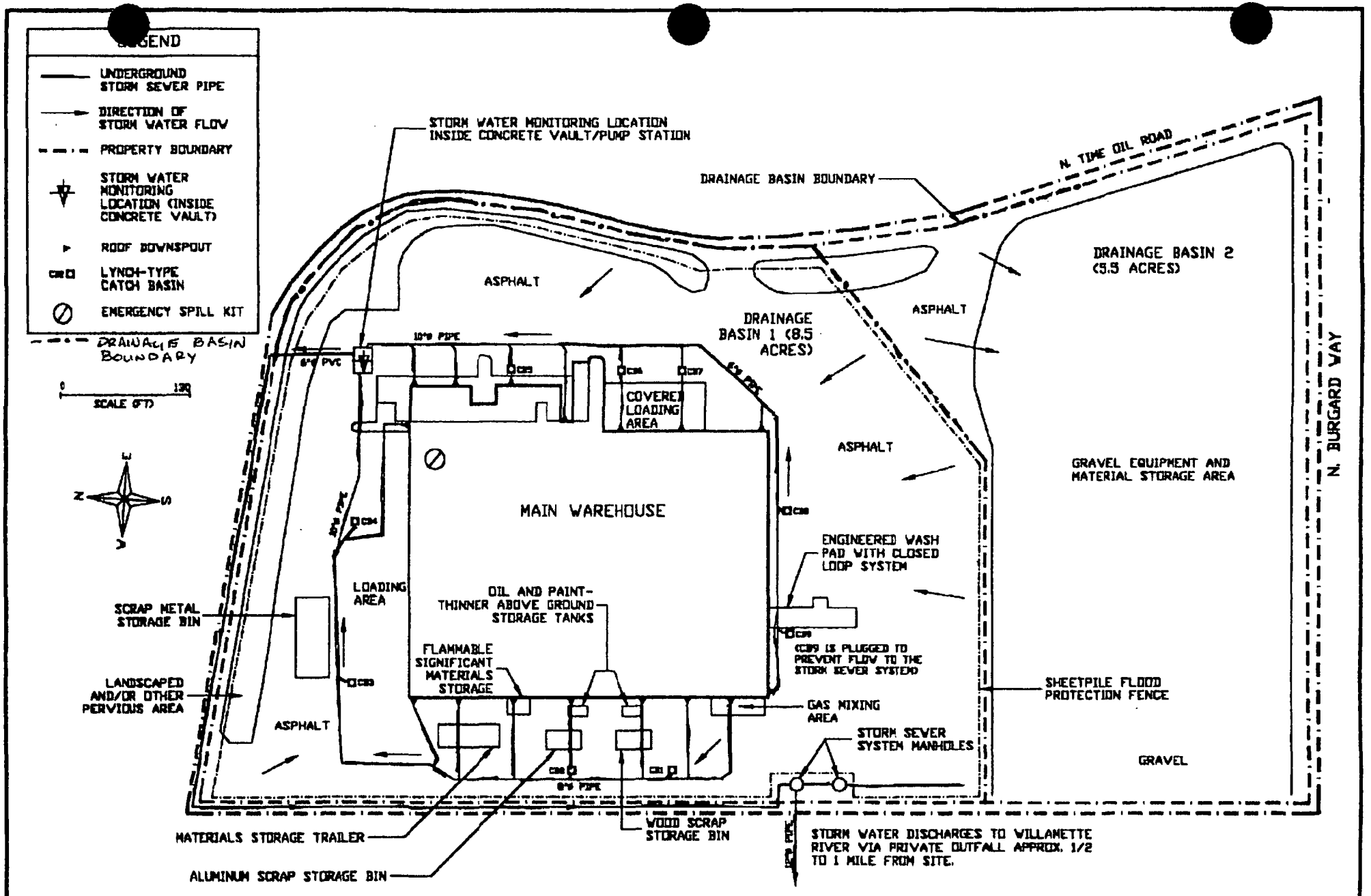
Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychlorinated biphenols

SUPPLEMENTAL FIGURES

Figure 2. Site Drainage Map (Columbia West Engineering 2001)
Figure 3. PCE Concentrations and Groundwater Flow (CH2M HILL 2003)

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and Tribal partners, and is subject to change in whole or in part



NOTES
1. BOYDSTUN METAL WORKS PROPERTY ENCOMPASSES APPROXIMATELY 14 ACRES.
2. MAP BASED ON SOURCE DRAWINGS PROVIDED BY BOYDSTUN METAL WORKS.

Columbia West Engineering

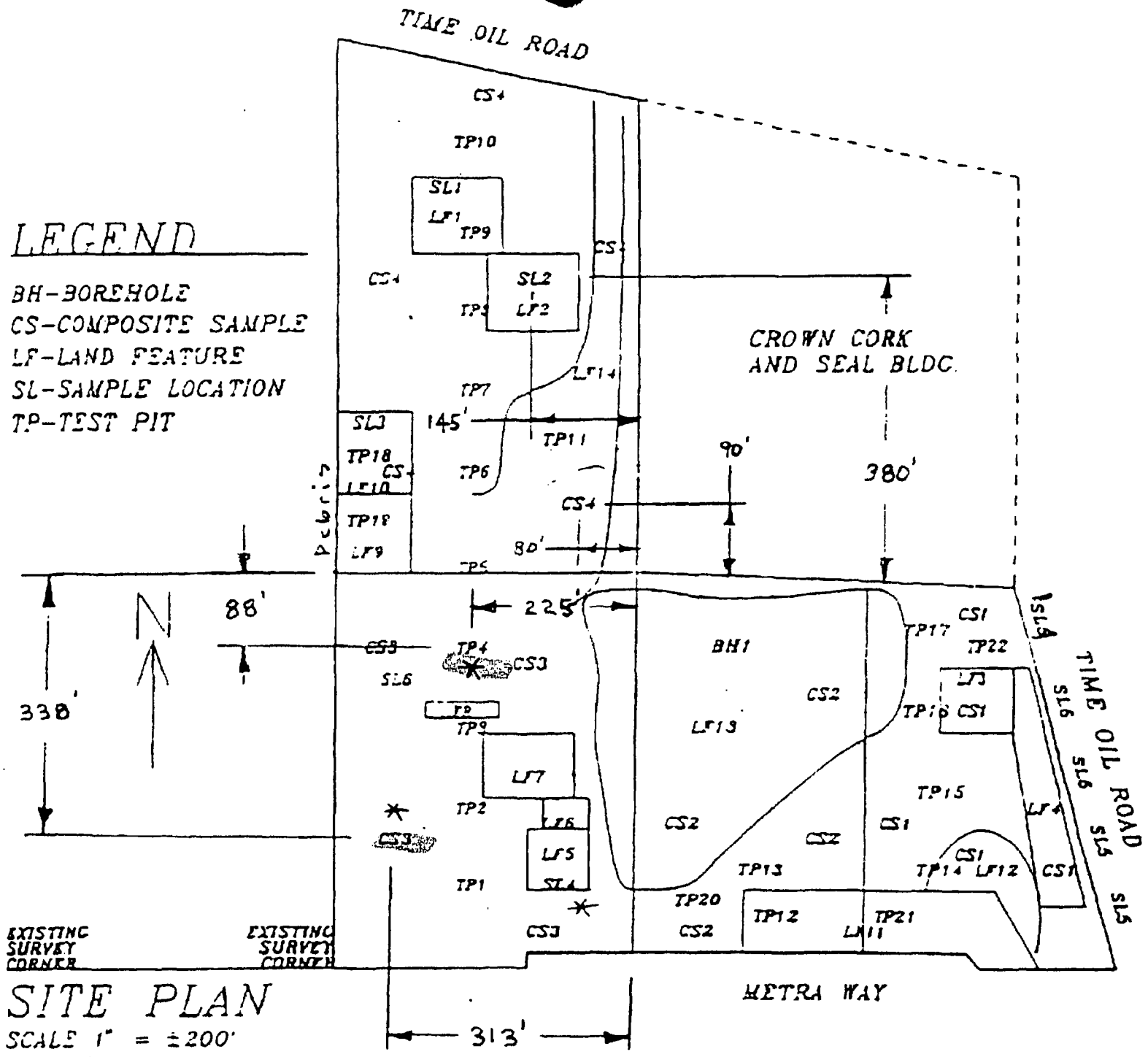
Design:	Drawn: DEL		
Checked: LVL	Date: 10-10-01		
Client: BOYDSTUN	Rev	By	Date
Job No: 0180			
CAD File: FIGURE 2			
Scale: AS SHOWN			

SITE DRAINAGE MAP

BOYDSTUN METAL WORKS, INC.
9125 N. TIME OIL RD, PORTLAND, OREGON

FIGURE 2

DRAWING NO. 1



SITE PLAN

SCALE 1" = ±200'

X DENOTES PREVIOUSLY LOCATED CONTAMINATION

FROM EMS REPORT Dated Mar. 17, 1993

Northwest Pipe Company

NORTHWEST PIPE COMPANY
CSM Site Summary

NORTHWEST PIPE COMPANY

Oregon DEQ ECSI #: 138

12005 N. Burgard St.
DEQ Site Mgr: Alicia Voss
Latitude: 45.6111°
Longitude: -122.7691°
Township/Range/Section: 2N/1W/35

River Mile: 4 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Northwest Pipe site to the river is summarized in this section and Table 1, and supported in the following sections.

1.1. Overland Transport

This site is not located on the waterfront; therefore, overland transport is not considered a pathway for contaminants from this area to reach the river. Approximately 84% of the total area of the site is covered by impervious surfaces (CH2M HILL 2000).

1.2. Riverbank Erosion

This site is not adjacent to the river.

1.3. Groundwater

Two chlorinated solvent shallow groundwater plumes (up to 10 mg/L) have been recently (2000) discovered beneath the site. Both plumes appear to flow offsite to the southeast and southwest. The sources of these plumes have not been determined. TPH has been detected in groundwater; however, TPH testing has not been consistent, and trends in concentration and distribution have not been evaluated. Although the shallow water-bearing zone has a shallow gradient with variations in flow direction across the site, the shallow groundwater flow is generally toward the Willamette River and is a potential transport pathway. Chlorinated solvents have also been detected at relatively low concentrations in a deep (200+ feet) industrial well beneath the site (CH2M HILL 2003a).

Stormwater discharge lines from Northwest Pipe empty into the east end of the International Terminals Slip where potential groundwater seepage locations have been identified (GSI 2003). The trenches associated with the stormwater discharge lines potentially could intercept and/or influence shallow groundwater movement beneath the site.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Stormwater. Stormwater originates in three drainage areas, A, B, and C. Drainage area A covers the southwest and western portions of the facility and discharges near the site's northwest corner. Drainage area B encompasses the east/northeast portion of the site and discharges near

the northeast corner. Area C includes a small area near the northern edge of the site where precipitation is assumed to infiltrate the gravel surface. Stormwater from drainage areas A and B leaves the site through a series of catch basins and pipes and is conveyed to the International Terminals Slip where it discharges through a single, communal Outfall 18/WR-123 (CH2M HILL 2003c). Historic maps indicate drainage to the river via Outfall 1/WR-108, but this has not been confirmed with recent pipe drainage testing.

Wastewater. Northwest Pipe had a 100-J industrial wastewater permit that expired in 2001. According to DEQ's wastewater permits database, the renewal of this permit is pending.

A complete pathway for potential sources from the northern two-thirds of the site to Outfall 18/WR-123 has been confirmed (CH2M HILL 2001a); however, best management practices are currently in place to minimize releases onsite that would contribute to in-river impacts. It is likely that historic releases occurred via the site's stormwater and communal drainage systems, including discharges to Outfall 18/WR-123 (slip) and Outfall 1/WR-108 (river). DEQ (2003) recommended that the LWG collect sediment samples off both outfall locations.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

This site is not adjacent to the river.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Source: DEQ (2004, 1999), CH2M HILL (2000)

Activity		Date(s)/Comments
PA/XPA	☒	PA (CH2M HILL 2000), PA Addendum (CH2M HILL 2001a)
RI	☐	
FS	☐	
Interim Action/Source Control	☒	Soil removal actions in several areas between 1988 and 1991, including the removal of a leaking UST in 1989.
ROD	☐	
RD/RA	☐	
NFA	☐	

Site investigations include: Phase I/II property transfer site assessment (Dames & Moore 1989) defined 14 areas of potential concern as presented here in Section 8; installation and sampling of five monitoring wells (OMNI Environmental 1990); environmental review (URS 2000); Southeast Area Investigation (CH2M HILL 2002); Southeast Area Groundwater Report (CH2M HILL 2003a).

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 2

4. SITE OWNER HISTORY

Primary Sources: CH2M HILL (2000)

Owner/Occupant[1]	Type of Operation	Years
Northwest Pipe Company	Pipe manufacturing	1997 - present
Multnomah Land and Equipment/Northwest Pipe and Casing Co.	Pipe manufacturing	1982/83 - 1997
L.B. Foster Company	Pipe manufacturing	1976 – 1982/83
Beall Pipe and Tank Corp.	Pipe, tank, and trailer manufacturing	1950 - 1976
Oregon Shipbuilding Corp.	Ship building	1937 - 1950
Undeveloped		Prior to 1937

[1] There are several transactions on record associated with this site because portions of the property were bought or sold. Transactions include Terminal Flour Mills Company (1949), Surplus Properties Corporation (1950), Reconstruction Finance Corporation (1951), Lawrence Warehouse Company (1952), Dulien Steel Products, Inc. (1961), and Oregon State Board of Higher Education (1977) (CH2M HILL 2000).

5. PROPERTY DESCRIPTION

Northwest Pipe is located on a 26-acre parcel at approximately RM 4 on the east side of the Willamette River. The parcel is composed of two parcels, Section 35D (26.22 acres) and Section 35C (0.03 acres). The site is about 2,100 feet east of the river, and 1,500 feet north of the International Terminals Slip (CH2M HILL 2000). The site is situated in a mixed industrial, commercial, and residential use area (Integral et al. 2004). The site and surrounding property is zoned and used as heavy industrial. Approximately 16 residences are located 0.7 mile from the facility (Integral et al. 2004).

The Northwest Pipe facility is depicted in Supplemental Figure 3-2 from CH2M HILL (2000). The site consists of a main plant (Bays 1 through 6), an annex (Bay 9), and outside buildings and storage areas. CH2M HILL (2000) indicated that the floors of the main production buildings are made of cement and the buildings are made of metal. Other buildings, structures, and areas of the site that are used for various processes include:

- Administrative office
- Pipe coating and lining operations area (built on cement pad)
- Coal tar storage areas
- General storage area for supplies
- Cement coating operations area
- Flammable materials storage shed
- Pipe and wood cutting sheds
- Belling shed
- Paper Shed
- ASTs - two ASTs near the belling shed and three ASTs near Bay 1.

The site is relatively flat and largely paved. Unpaved areas include a thin strip of property along the eastern boundary of the site, the cement coating and curing operations area, the belling shed, and finished product storage area at the northern portion of the site [Areas 4 and 10, see Supplemental Figure 3-2 from CH2M HILL (2000)].

Northwest Pipe also leases five different areas of the Burgard Industrial Park, totaling 15.5 acres (see Figure 1). These sites are described in greater detail in the Burgard Industrial Park – Noncontiguous Properties Site Summary. No manufacturing occurs on any of these parcels. Only one of the five leased areas (Property 2) is paved.

Runoff drains to catch basins and is conveyed to the Northwest Pipe stormwater system. The site's stormwater drainage plan is shown in Supplemental Figure 3-3 from CH2M HILL (2000).

According to CH2M HILL (2000), the site was undeveloped prior to World War II. In 1937, Oregon Shipbuilding leased and then purchased land in the area of Burgard Industrial Park, including the land occupied by Northwest Pipe. Review of aerial photographs by Integral indicate that the main plant and annex currently used by Northwest Pipe were present as a single building in an aerial photo dated 1948. The grounds immediately outside the main plant buildings in 1948 did not appear to be used. A historic site map available in the Preliminary Assessment Addendum (CH2M HILL 2001a) noted the following features on the site currently occupied by Northwest Pipe:

- Assembly building
- Tool room and weld rod storage
- Hull materials office
- Pipe shop
- Maintenance shop
- PFM (not defined)
- Substations
- Lockers
- Toilets
- Offices
- Union meeting hall.

Since 1956, site features have largely remained the same.

6. CURRENT SITE USE

Northwest Pipe Company manufactures welded steel pipe in two business segments. The Water Transmission Group supplies large-diameter, high-pressure, steel pipe products used primarily for water transmission in the United States and Canada. The Tubular Products Group manufactures smaller-diameter steel pipe for a wide range of construction, agricultural, energy, industrial, and mechanical applications [Northwest Pipe Company (2004), see http://www.nwpipe.com].

Steel pipe is manufactured using electric resistance welding (straight-seam pipe) and submerged arc welding (spiral weld pipe) processes. There are three straight-seam mills and three spiral weld mills. The manufactured pipe ranges in size from 2.375-inch outside diameter to 144-inch outside diameter. Pipes, if requested, can be coated or lined with cement mortar, coal tar enamel, polyethylene tape, rust-inhibitive primers, polyurethane, coal tar epoxy, or paints (CH2M HILL 2001a).

Supplemental Figure 3 from CH2M HILL (2001a) shows the facility's manufacturing areas. Pipe is cut and welded in Bays 1 through 6. Bay 1 is also used for quality control (x-ray) and shipping and receiving. Bay 3 is used for pipe fittings (elbows, tees, manifolds, reducers, and manholes) fabrication. A portion of Bay 4 is used for maintenance. Sand blasting before taping or coating processes is performed in Bay 9. A hydrotest facility is also located in Bay 9. Pipe lacquering occurs in the Bay 9 annex. Outside of the main building, cement mortar lining and coating is applied in the Cement Plant and cured in bays adjacent to the Cement Plant. Paint and coal tar enamel are applied in the Lining and Coating facility on the west edge of the property. Wood cutting, pipe cutting, and pipe belling occur in small sheds on the northern side of the property. A steam cleaning/wash pad with a closed sump is located undercover in the paper shed. The wash pad sump is pumped as needed for proper disposal. The remainder of the site is used for storage or shipping (CH2M HILL 2001a).

Chemicals are used onsite for two purposes: as primers and coatings for pipe and as cleaning or thinning agents. Northwest Pipe is listed as a RCRA small-quantity generator. As a small-quantity generator, Northwest Pipe uses aerosol degreasers, aerosol cleaners, and soluble oil. Used epoxy thinner, used

epoxy thinner absorbent, used oil, and hydraulic fluids are also generated onsite. Wastes are disposed of in the following manner:

- Offsite waste management facility – paint sludge still bottoms, jelled residual paints, cresol contaminated materials (from coal tar enameling)
- Landfill – sand/cement grit, polyethylene tapes, baghouse dust, punctured aerosol cans, welding flux, mill sludge
- Offsite waste oil recycler – used oil.

Manifests from 1998 listed 7,618 pounds of used epoxy thinner and 11,306 pounds of used epoxy thinner mixed with absorbent as being shipped from Northwest Pipe for proper disposal (CH2M HILL 2000).

Petroleum products used and stored (undercover in Bay 1) include motor oil, used motor oil, hydraulic fluid, antifreeze, and used antifreeze. There are five aboveground storage tanks: a 2,000-gallon, double-walled diesel tank; a 250-gallon gasoline tank; two 250-gallon hydraulic and motor oil tanks; and one 350-gallon hydraulic oil tank. All have secondary containment and drip pads (CH2M HILL 2000).

The largest quantity of any chemical stored onsite is coal tar enamel. It was estimated that 100,000 pounds of coal tar enamel was stored onsite in 2000. Coal tar is solid at ambient temperatures and is stored outside on unpaved areas. Other chemicals (besides coal tar and petroleum products above) stored onsite in 2000 included standard welding supplies, clear sealer, tank coating, primer 1019, aerosol coatings, Reilly's 122 primer, soluble oil B, methyl ethy ketone, epoxy thinner 4A, and xylene (CH2M HILL 2000).

7. SITE USE HISTORY

This parcel was part of the Oregon Shipbuilding Corporation during WWII years, and activities onsite included warehousing, woodworking, and shipbuilding. The Preliminary Assessment (PA) addendum (CH2M HILL 2001a) indicated that the site currently owned by Northwest Pipe was dominated by the shipbuilder's Assembly Building. Steel plate, shaped and cut east of the Northwest Pipe site, was transferred to the Assembly Building where it was welded into large ship sections weighing as much as 250 tons. Ship pieces were then transported by rail to the shipways located on the river.

The property was purchased by Beall Pipe and Tank Corporation (Beall) in 1950 and was used for pipe, tank, and trailer manufacturing (DEQ 1999). Beall's primary manufacturing focus was irrigation pipe. Processes included electric resistance welding (straight-seam pipe) and submerged arc welding (spiral weld pipe). Pipe was also produced using the pyramid roll process. Beall manufactured potable water pipe, custom pipe and tanks, square and rectangular tubing, corrugated culvert, tanks, and pressure vessels. Tanks for tanker trucks were made in portions of Bay 1 and Bay 2; galvanized culvert pipe was riveted and spot welded in Bay 4; and asphalt wrap was applied in Bay 9. The asphalt coating operations were reduced in the 1970s and discontinued in approximately 1976. Beall leased storage space to American Steel Company (dates unknown), and in approximately 1970, a Japanese company named Okura became a co-owner of Beall.

Beall was sold to L.B. Foster Company around 1976 and continued to manufacture water pipe and tubular pipe, primarily for irrigation. The pyramid roll process was discontinued. In 1982 or 1983, Multnomah Land and Equipment purchased the property and leased it to Northwest Pipe & Casting Company. Northwest Pipe later bought the land in 1997.

Northwest Pipe removed a leaking underground storage tank and about 1,900 cubic yards of soil contaminated with gasoline, oil, PAHs, chlorinated solvents, and PCBs from the site in 1988-1991 (LUST site #26-89-0047), as part of a voluntary cleanup of the facility. Although the cleanup did not receive final DEQ approval, there was insufficient information to add the site to DEQ's Confirmed Release List or Inventory.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The current understanding of the historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources at the site requiring additional discussion.

8.1. Uplands

The sources listed in Table 1 and discussed below are potential areas of environmental concern identified in DEQ's Strategy Recommendation (DEQ 1999) and the PA (CH2M HILL 2000):

- **Area 1** – Aboveground waste oil tank and ten 55-gallon drums of petroleum/paved
- **Area 2** – Pipe lining and coating building (northwest corner – stained soil)/unpaved
- **Area 3** – Pipe lining and coating building (southeast corner – stained soil and concrete)/unpaved
- **Area 4** – 2,000-gallon AST and pumps (stained soil)/unpaved
- **Area 5** – Transformer storage/paved
- **Area 6** – Sixteen 55-gallon drums of solvent with no containment/paved
- **Area 7** – Industrial well/paved
- **Area 8a** – 1,000-gallon gasoline UST/unpaved
- **Area 8b** – Bay 9 asphalt dipper tank/paved
- **Area 9** – Railroad spur (stained soil)/unpaved
- **Area 10** – Dust suppressant use and storage/paved
- **Area 11** – Transformer area (stained soil)/paved?
- **Area 12** – Alleged solvent dumping area/paved
- **Area 13** – Alleged petroleum dumping area (lay down area south of main building)/paved
- **Area 14** – Onsite catch basins associated with a wash pad and stormwater system/unpaved.

According to CH2M HILL (2001b), DEQ determined that 6 of the 14 areas needed no further action, but additional sampling was required at the remaining eight (Areas 1-3, 5, 7, 9, 12, and 14). Based on sampling efforts performed by CH2M HILL (2001b) in 2001, Area 1 (southeast area) remained a concern particularly in terms of groundwater and soils, and additional sampling took place to address these concerns. In addition, DEQ recommended the completion of a stormwater system investigation to evaluate potential contaminant source pathways to the river.

8.2. Overwater Activities

☐ Yes ☒ No

This site is not adjacent to the river.

8.3. Spills

Known or documented spills at the Northwest Pipe facility were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
2/9/96	Primer	55	building floor	Y – contained in building
7/7/99	Xylene	37	building floor	Y – contained in building

DEQ's ERIS' database contains several incidents of oily sheens observed on the river surface in the International Terminals Slip. The sources of these spills are unknown, but could have originated from stormwater outfalls.

9. PHYSICAL SITE SETTING

The environmental investigations performed at Northwest Pipe Company site include the following:

- Dames & Moore (1989) and Crosby & Overton (1989)
  - Completed soil and groundwater investigations at a number of areas of concern at the property identified during a Phase I/II property transfer site assessment.
- OMNI Environmental (1990)
  - Completed a follow-up groundwater investigation at one of the area of concerns and installed five monitoring wells.
- CH2M HILL
  - Completed follow-up soil and groundwater investigations at a number of the areas of concern in September 2001 and August 2002, installing 19 borings for soil and groundwater sampling [see Supplemental Figure 1 from CH2M HILL (2001b) and Supplemental Figure 1 from CH2M HILL (2002)].
- CH2M HILL
  - Three monitoring wells were installed at the site in July 2003 [see Supplemental Figure 2 from CH2M HILL (2003a)].

The Schnitzer Burgard Industrial Park is fairly level with ground-surface elevations ranging between 20 and 30 feet above msl. The topography of the Schnitzer Burgard Industrial Park gently slopes from east to west, with the exception of a steep embankment along the Willamette River and the slip channel (DEQ 1999). The western edge of Northwest Pipe is located approximately 0.5 mile east of the Willamette River and approximately 0.25 mile east of the International Terminals Slip. The facility is located on the floodplain of the Willamette River (CH2M HILL 2000).

9.1. Geology

The geology beneath the site is summarized from the site's soil borings, monitoring wells and the onsite industrial production well (State well report MULT 1824). The near-surface geology at the Schnitzer Burgard Industrial Park is dominated by the presence of dredge fill placed during the development of the industrial park in the late 1930s and during filling of the shipways in the later 1960s and early 1970s. The dredge fill, consisting of a mixture of brown sand and silty sand, varies in thickness across the Schnitzer Burgard Industrial Park from 25 to 35 feet along the river and thinning to 15 feet along the eastern edge of the site (Bridgewater 2001). The depth of the dredge fill at Northwest Pipe ranges from 2 to approximately 20 feet bgs based on soil probe borings and a lithologic log from an onsite industrial production well.

Underlying the dredge fill to an approximate depth of 160 feet bgs are Quaternary alluvial deposits consisting of interbedded sands and silty clay. Below 160 feet, these deposits are composed predominantly of sand with gravel lenses to 220 feet bgs (CH2M HILL 2000). The coarser-grained material may represent Pleistocene flood gravels (Quaternary alluvial deposit) and/or possibly the Troutdale Formation. Between 220 and 258 feet bgs, silty clay and clay with minor lenses of gravel were noted (CH2M HILL 2000). The latter unit may represent the Sandy River Mudstone. The Oregon Water Resource Department well identification number for the onsite industrial production well is MULT 1824.

No site-specific cross sections have been constructed for Northwest Pipe during past investigations.

9.2. Hydrogeology

Nine monitoring wells have been completed during past investigations in the dredge-fill and/or alluvium to a maximum depth of approximately 25 feet bgs (CH2M HILL 2000 and 2003a). The onsite industrial production well is completed at a depth of 220 feet bgs (drilled and logged to a depth of 258 ft bgs) and is completed in coarser-grained Pleistocene flood gravels and/or possibly the Troutdale Formation. According to CH2M HILL (2001a), water from this industrial well is used as non-contact cooling water for pumps, as cement mortar make-up water, and as a source of water for hydrotesting finished pipes. The majority of groundwater flow and hydraulic gradient information at the property pertains to the shallow subsurface: the dredge fill and underlying alluvium to a depth of approximately 30 feet bgs.

A shallow unconfined groundwater zone is present within the lower portions of the dredge fill and the alluvial deposits underlying the dredge fill, based upon probe and monitoring well data.

The groundwater flow direction in the northeastern portion of the Northwest Pipe property was determined to be toward the west-northwest (CH2M HILL 2001b). During a subsequent investigation, additional monitoring wells were installed, and the groundwater flow direction in the southeastern portion of the property was determined to be toward the south-southwest (CH2M HILL 2003a). Overall, the groundwater flow appears to be generally toward the Willamette River at a low gradient with local variations in flow direction across the site. Site-specific information related to groundwater gradient is limited. CH2M HILL (2003a) estimated that the hydraulic gradient in the southeastern portion of the property was relatively flat (values ranging from 0.001 to 0.0014).

Seep Locations. Northwest Pipe does not border the shoreline of either the International Terminals Slip or the Willamette River. However, stormwater discharge lines from Northwest Pipe empty into the east end of the slip (Outfall 18/WR-123) and along the Willamette (Outfall 1/WR-108) [see Supplemental Figure 1-3 from Bridgewater (2003)]. Potential seepage locations were identified at the east end of the slip (GSI 2003). These potential seepage locations were in the backfill next to an outfall and along the steep shoreline embankment at the east end of the slip. The seep locations were highlighted by iron (ferric hydroxide) staining and iron bacteria slime (GSI 2003). The relationship, if any, of these seeps to Northwest Pipe has not been evaluated.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

During a 1989 Phase II investigation, surface soil in the northwest portion of the site was found to be contaminated with 0.31 ppm tetrachloroethene and 22,000 ppm TPH. The work scope associated with this sampling program was not available in the documents reviewed.

The following soils data were summarized by CH2M HILL (2000) and CH2M HILL (2001b) by area of concern. Neither the scope of work associated with the soils investigation or soil chemistry data tables were available in the documents reviewed.

Area 1 – Soil samples were collected from stained soil located adjacent to an aboveground waste oil tank and ten 55-gallon drums of petroleum. PAH compounds were detected in two samples collected 1.6 and 1.7 ft bgs, respectively. PCE and 1,1,1-

trichloroethane (1,1,1-TCA) were also detected in one of the surface soil samples. Soils were removed from the area, and PCE was detected at 0.17 mg/kg in soil from the east wall and 0.16 mg/kg in a composite sample from the bottom of the excavation (9 ft bgs). These values were reported to be below DEQ's soil cleanup value for PCE.

In 2001, CH2M HILL advanced Geoprobes™ to a depth of 18 ft at two locations (GP1 and GP2) within Area 1. Using PID screening methods, soil samples were selected from 6 ft bgs at GP1 and 18 ft bgs at GP2 and analyzed for VOCs, TPH, and PAHs. TPH and PAHs were not detected in either sample. VOCs were not detected in the sample collected from GP1 (6 ft bgs), but the soil sample collected from GP2 (18 ft bgs) contained PCE (0.726 mg/kg), TCE (0.0252 mg/kg), and cis-1,2-dichloroethene (0.0211 mg/kg).

Soil samples were collected in 2002 as part of the Southeast Area Investigation (CH2M HILL 2002). This study was performed to more fully characterize the nature and extent of VOCs detected in groundwater in September 2001. Three samples were collected and analyzed for VOCs based on elevated PID readings. A Geoprobe™ advanced to 16 ft bgs was sampled for VOCs at 9 ft bgs. PCE was detected at 0.0376 mg/kg (GP-03). Two samples collected at 2.5 ft bgs and 13.5 ft bgs from GP-03 had detectable concentrations of PCE at 0.0148 mg/kg and 0.0024 mg/kg, respectively. TCE was also detected at 0.0014 mg/kg in the 2.5-ft bgs sample. No other VOCs were detected. Detected values were below DEQ's soil cleanup levels, suggesting an offsite source (CH2M HILL 2002).

Area 2 – Soil samples were collected from stained soil located adjacent to the northwest corner of the pipe lining and coating building. Dames & Moore (1989) collected six soil samples from Area 2. Low levels of PAH compounds, PCE, and TPHs were detected in samples collected from the top 2 feet. Soils were removed from the area, and confirmation sampling indicated that soils no longer contained detectable concentrations of PAHs, TPHs, or VOCs.

Area 3 - Soil samples were collected from stained soil and concrete located adjacent to the southeast corner of the pipe lining and coating building. Dames & Moore (1989) collected six soil samples from Area 3. PAH compounds, TPHs, TCE, PCE, and 1,1,1-TCA were detected largely in the top 2 feet. The deepest sample collected (8 ft bgs) contained low levels of PAHs and PCE, which were below DEQ's soil cleanup levels. Soils were removed from the area, and confirmation sampling indicated that VOCs and TPHs were still present at detectable levels. PCE concentrations ranged from 0.34 to 12.1 mg/kg. DEQ's industrial cleanup level is 10 mg/kg. 1,1,1-TCA concentrations ranged from less than 0.005 to 0.49 mg/kg, below DEQ's industrial soil cleanup level. TPH concentrations ranged from 8 to 330 mg/kg.

Area 4 – Soil samples were collected from the area affected by a leaking UST. Soils data are not provided in CH2M HILL's PA (2000); however, it was noted that benzene, toluene, ethylbenzene, and xylenes were detected in soils at "small" concentrations.

Area 5 – Soil samples were collected from depths ranging from 1 to 10 ft to investigate potential leaks from stored transformers. TPH concentrations were detected at elevated levels in surface samples but significantly decreased with depth. TPH concentrations ranged from less than 5 mg/kg at depth to 11,000 mg/kg in surface soils (maintenance shop). PCBs were detected at 0.7 mg/kg in surface soil in the vicinity of the maintenance shop and 3.1 mg/kg in front of the transformers. At both of these locations, PCBs were not detected at a depth of 4 ft bgs.

In 2001, CH2M HILL (2001b) collected surface soil samples (approximately 0.5-0.75 ft bgs) from two locations (SS1 and SS2) within Area 5. Samples were analyzed for TPH and PCBs. PCBs were detected at concentrations of 2.67 (SS1) and 6.16 mg/kg (SS2).

These levels are below DEQ's generic risk-based level for industrial land use areas. TPH-D was detected at concentrations of 46 to 603 mg/kg, and TPH-O ranged in concentration from 85 to 2,100 mg/kg.

Area 6 – Soil samples were collected in 1989 from an area used to store 55-gallon drums of solvent without containment. No VOCs were detected in two samples collected by Dames & Moore (1989) from Area 6. Crosby and Overton (1989) later collected soil samples from two locations at 1 and 2 ft bgs, respectively. TPHs were detected in all four samples. TPH concentrations decreased substantially over the 1-ft interval (i.e., from 2,900 mg/kg to 10 mg/kg).

Area 7 – This area is the industrial well, no soil samples were collected.

Area 8a, Area 9, Area 10 – No soils data were described in the PA because these areas required *No Further Action,* as determined by DEQ in 1990. However, the PA addendum (2001a), noted that TPH was present in an Area 9 surface soil sample at a concentration of 22,000 mg/kg prior to soil removal. PCE was also detected (0.31 mg/kg). At 2 ft bgs, TPH was detected at 88 mg/kg and PCE was detected 0.2 mg/kg. After soil was removed from the area, PCE ranged from 0.14 to 0.16 mg/kg at 4 ft bgs. It appeared that the contamination was confined to surficial soils in Area 9. Area 9 is the location of a railroad spur with stained soils.

Area 8b – One soil sample was collected next to the asphalt dipper tank. TPH was not detected at 1 mg/kg.

Area 11 - No soils data are described in the PA for this area (former transformer storage area). EPA indicated that it was no longer an area of concern based on a 1991 inspection (CH2M HILL 2001b).

Area 12 - Soil samples were collected from this area to detect former alleged solvent dumping activities. No VOCs were detected in one sample collected by Dames & Moore in 1989 at 1 ft bgs. Crosby and Overton (1989) later collected soil samples at 1 and 2 ft bgs for TPH and VOCs analysis. TPH concentrations ranged from 180 to 750 mg/kg. VOCs were not detected with the exception of one sample (PCE at 0.3 mg/kg at 1 ft bgs). Soils were removed from the area, and TPH was detected in two confirmation samples at concentrations of 610 and 670 mg/kg. PCE concentrations ranged from less than 0.005 to 0.011 mg/kg.

In 2001, three soil samples were collected from a Geoprobe™ advanced to a depth of 16 ft (GP5). Soil samples were analyzed for VOCs. VOCs were not detected in a sample collected from 0.5 ft bgs; however, methylene chloride was detected at low levels: 0.0012 mg/kg at 3 ft bgs and 0.0013 mg/kg at 6 ft bgs.

In 2002, two soil samples were collected from GP5 at 2.5 ft bgs and 13.5 ft bgs based on elevated PID readings. Soil from 2.5 ft bgs contained 0.0148 mg/kg PCE and 0.0014 mg/kg TCE. Soil from 13.5 ft bgs contained 0.0024 mg/kg PCE.

Area 13 – Dames & Moore (1989) collected two shallow surface soil samples (top 3 inches) through the asphalt pavement to monitor former alleged petroleum dumping in this area. TPHs were detected at 1,200 mg/kg and 2,800 mg/kg and may have been related to the asphalt itself.

Area 14 – Area 14 was investigated to characterize onsite catch basin solids associated with a wash pad and stormwater system. The results of the investigation are described in Section 10.3.4.

10.1.2. Riverbank Samples ☐ Yes ☒ No

10.1.3. Summary

Historic releases, including a leaking UST, contributed to surface and subsurface contamination. Soil sampling has determined that concentrations are generally below DEQ's industrial soil cleanup levels; however, elevated concentrations appear to remain in limited, distinct areas. In addition, most of the site (84%) is covered with impermeable surfaces, greatly restricting the potential for overland transport.

10.2. Groundwater

Groundwater investigations at the site since 1989 have included sampling groundwater from 19 temporary well points installed in the soil probe borings, nine monitoring wells, and an onsite industrial production well. All the temporary well points were abandoned after groundwater samples were collected. Four of the monitoring wells were abandoned in 2003 (CH2M HILL 2003c) and two have not been located in recent attempts.

10.2.1. Groundwater Investigations ☒ Yes ☐ No

Crosby & Overton installed one monitoring well in 1989 and OMNI Environmental installed five additional wells in 1990 in the northeast corner of the Northwest Pipe Company property (CH2M HILL 2000). Information regarding the sampling dates and analytical data for these six monitoring wells is poorly documented. These six monitoring wells were installed to assess potential impacts associated with a diesel UST in Area 4 that was granted *No Further Action* by the DEQ in 1990 (CH2M HILL 2000).

Three additional investigations collected shallow groundwater data at the site. CH2M HILL completed 7 soil probe borings in September 2001 and an additional 12 soil probe borings in August 2002 [see Supplemental Figures 1 from CH2M HILL (2001b) (2002)] in response to DEQ request for further investigation of areas of potential environmental concern originally identified in the PA (CH2M HILL 2000). Groundwater samples collected from temporary well points were analyzed for VOCs and TPH. CH2M HILL (2003a) installed three monitoring wells in July 2003 to obtain additional groundwater information to further investigate the presence of VOCs in groundwater [see Supplemental Figure 2 from CH2M HILL (2003a)]. Groundwater samples collected from the monitoring wells were analyzed for VOCs.

The onsite industrial production well [see Supplemental Figure 1 from CH2M HILL (2001b)] was sampled three times by Dames & Moore in 1989, and the groundwater samples were analyzed for PCBs, TPH, and VOCs. CH2M HILL sampled the onsite industrial well in 2001, and analyzed the groundwater sample for VOCs as requested by the DEQ to further investigate the groundwater quality in the deep aquifer at the site. In summary, most groundwater samples collected during site investigations have been collected from temporary well points installed in soil probe borings. Nine monitoring wells have been installed during site investigations; however, only the three monitoring wells installed in 2003 (CH2M HILL 2003a) are functional for groundwater sample collection. These three monitoring wells are located in the southeast corner of the Northwest Pipe property, in an area where the highest levels of VOCs have been detected.

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

DEQ stated concern that the previously detected VOC concentrations in GP-1 and GP-2 of up to almost 10 mg/L tetrachloroethylene [see Supplemental Figure 3 from CH2M HILL (2003a)] suggest the potential presence of DNAPL (DEQ 2004a, pers. comm.).

10.2.3. Dissolved Contaminant Plumes

☒ Yes ☐ No

Shallow groundwater COIs include VOCs (chlorinated solvents), SVOCs, PAHs, and TPH. Dissolved COIs have been detected in groundwater monitoring wells and groundwater collected from site borings. Constituents historically detected in shallow groundwater include:

VOCs	SVOCs	TPH
Tetrachloroethene (PCE)	Fluoranthene	TPH-Gasoline
Trichloroethene (TCE)		
1,1-Dichloroethane (1,1-DCA)		
1,1-Dichloroethene (1,1-DCE)		
cis-1,2-Dichloroethene (c-1,2-DCE)		
trans-1,2-Dichloroethene (t-1,2-DCE)		
Chloroform		
1,1,1-Trichloroethane(1,1,1 TCA)		
1,1,2-Trichloroethane		
Vinyl Chloride		

Plume Characterization Status ☐ Complete ☒ Incomplete

The VOC plume characterization status is incomplete. DEQ does not consider the three monitoring wells installed by CH2M HILL in 2003 [see Supplemental Figure 3 from CH2M HILL (2003a)] adequate for delineating the extent of the VOC plume (DEQ 2004b, pers. comm.).

Plume Extent

Groundwater samples collected from the alluvial groundwater zone have had detections of VOCs, SVOCs, and TPH. Based on data provided in the (2003a), GSI has interpreted the two VOC plumes (chlorinated solvents) in the shallow groundwater beneath the site shown in Figure 2.

The first VOC plume is located in the southeast corner of the Northwest Pipe property. The highest concentration of VOCs was 9,800 µg/L of PCE (sampled in September 2001) in GP-1, located along the eastern property boundary of Northwest Pipe [see Supplemental Figure 3 from CH2M HILL (2003a)]. The full extent of this VOC plume has not been delineated, but it appears to extend beyond the Northwest Pipe property toward the southeast. The source of the chlorinated solvents has not been determined by site investigations. The southeast corner of Northwest Pipe is referred to as Northwest Pipe Property 2 in site investigation reports. This 3.5-acre piece of property adjacent to Northwest Pipe has been leased from Burgard Industrial Park by Northwest Pipe Company (Bridgewater 2000). It is unclear in the site investigations specific to Northwest Pipe Company whether the Northwest Pipe Property 2 is still a leased property or whether it was purchased by Northwest Pipe Company.

The second VOC plume (chlorinated solvents) extends beneath the central portion of the Northwest Pipe property (see Figure 2). The full extent of this VOC plume has not been delineated, but it appears to extend beyond the Northwest Pipe property to the southwest. Various chlorinated solvents have been detected in groundwater throughout the property, with the exception of MW-2, which was non-detect for all VOCs [see Supplemental Figure 3 from CH2M HILL (2003a)].

The source and extent of the chlorinated solvents in groundwater has not been established by past investigations, and the DEQ has expressed uncertainty regarding the plume extent and source (DEQ 2004b, pers. comm.)

TPH has not been consistently analyzed in groundwater samples; accordingly, the detections of TPH are identified as isolated impacts to groundwater.

Industrial Water Well. Low levels (≤ 0.5 µg/L) of chlorinated solvents also have been detected in the onsite industrial production well (the completed depth of the well is 220 feet bgs). It has been suggested that the low levels of chlorinated solvents detected in the onsite production well may be related to a regionally dispersed deep chlorinated solvent plume in north Portland (CH2M HILL 2000).

Fluoranthene (the only SVOC detected) was detected in the initial groundwater sample from the onsite industrial production well; subsequent groundwater samples have not detected fluoranthene. The source of the fluoranthene in groundwater at the onsite industrial production well was attributed to past use of an oil-lubricated vertical turbine pump (CH2M HILL 2000). TPH also was detected in the onsite industrial production well and was also attributed to the oil-lubricated pump (CH2M HILL 2000). TPH also was detected at several other groundwater sampling locations; however, TPH has not been consistently analyzed in groundwater samples, so the distribution and trends in TPH concentrations have not been evaluated.

Min/Max Detections (Current situation)

The most recently reported groundwater samples were collected in July 2003 (CH2M HILL 2003a). The minimum and maximum detections in groundwater are provided in the table below.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Volatile Organic Compounds (VOCs)		
Tetrachloroethene (PCE)	< 0.5	9,800
Trichloroethene (TCE)	< 0.5	1,210
1,1-Dichloroethane (1,1-DCA)	< 1	3.7
1,1-Dichloroethene (1,1-DCE)	< 1	21.5
cis-1,2-Dichloroethene (c-1,2-DCE)	< 1	4,210
trans-1,2-Dichloroethene (t-1,2-DCE)	< 1	12.8
Chloroform	< 1	1.8
1,1,1-Trichloroethane	< 1	1.1
1,1,2-Trichloroethane	< 1	1.1
Vinyl Chloride	< 1	47.6
Semivolatile Organic Compounds (SVOCs)		
Fluoranthene	< 0.1	0.026
Total Petroleum Hydrocarbons (TPH)		
C7 - C12 Range	170	18,000

Current Plume Data

The current estimated extent of the two chlorinated VOC plumes in the shallow groundwater zone is shown in Figure 2. TPH has not been consistently analyzed in groundwater samples; therefore, the distribution and trends in TPH concentrations have not been evaluated.

Preferential Pathways

Stormwater discharge lines from Northwest Pipe empty into the east end of the International Terminals Slip (Outfall 18/WR-123) and potentially along the Willamette River (Outfall 1/WR-108) [see Supplemental Figure 1-2 from Bridgewater (2003)]. The utility trenches containing the stormwater discharge lines beneath the site potentially could be intercepting shallow groundwater flow beneath the site; however, this potential for intercepting shallow groundwater has not been evaluated.

Downgradient Plume Monitoring Points (min/max detections)

An adequate monitoring well network (including downgradient plume monitoring points) for delineating the extent of the VOC plume has not been established (DEQ 2004b, pers. comm.).

Visual Seep Sample Data ☐ Yes ☒ No

Northwest Pipe borders neither the shoreline of the International Terminals Slip nor the Willamette River. Additional discussion is presented in Section 9.2.

Nearshore Porewater Data

No nearshore porewater data associated with this site have been collected.

Groundwater Plume Temporal Trend

Groundwater sampling is limited to one event in the three monitoring wells (installed in July 2003) and temporary well points. No groundwater plume temporal trends can be evaluated from the limited data set.

10.2.4. Summary

Groundwater investigations at the site since 1989 have included sampling groundwater from 19 temporary well points installed in the soil probe borings, 9 monitoring wells, and an onsite industrial production well. VOCs (chlorinated solvents), SVOCs (fluoranthene only), and TPH have been detected in groundwater. Two chlorinated solvent plumes have been identified at the site. The first is located in the southeast corner of the property, and the other extends beneath the center of the Northwest Pipe property. Both plumes appear to extend beyond the Northwest Pipe property boundary. The source(s) of the VOC plumes has not been determined by site investigations.

Fluoranthene (SVOC) was detected in the initial groundwater sample from the onsite industrial production well; subsequent groundwater samples have been non-detect. The source of the fluoranthene in the onsite industrial production well (as well as detected TPH) was attributed to past use of an oil-lubricated vertical turbine pump (CH2M HILL 2000). TPH also was detected at several other groundwater sampling locations at Northwest Pipe; however, TPH has not been consistently analyzed in groundwater samples so the distribution and trends in TPH concentrations have not been evaluated.

10.3. Surface Water

10.3.1. Surface Water Investigation ☒ Yes ☐ No

CH2M HILL completed a stormwater characterization study in 2003. Stormwater data are summarized below.

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN12Z	6739	10/28/97	Outfall 18/WR-123	Standard[1]

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, zinc, and visual monitoring. Monitored twice yearly.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☐ No

Unknown.

10.3.3. Stormwater Data ☒ Yes ☐ No

Stormwater originates in three Northwest Pipe drainage areas, A, B, and C [see Supplemental Figure 1 from CH2M HILL (2002)]. Drainage area A covers the southwest and western portions of the facility and discharges near the site's northwest corner. Drainage area B encompasses the east/northeast portion of the site and discharges near the northeast corner. Area C includes a small area near the northern edge of the site where precipitation is assumed to infiltrate the gravel surface. In the area of the cement plant, stormwater runoff, if any, is expected to flow into process settling vaults arranged to separate mortar solids from water. Stormwater from drainage areas A and B leaves the site through a series of catch basins and pipes and is conveyed to the International Terminals Slip where it discharges through a single, communal outfall (Outfall 18/WR-123) (CH2M HILL 2003c).

NPDES monitoring conducted at WR-123 in 1998-1999 found 2.4 mg/L of zinc and trace amounts of cadmium, chromium, and lead. Up to 26 mg/L of oil and grease was detected in 1993 (DEQ 1999).

Stormwater samples were collected in 2003 from five locations shown in Supplemental Figure 1, Stormwater System Sampling Locations, from CH2M HILL (2003b). Sample locations were selected to evaluate stormwater quality entering and leaving the Northwest Pipe site:

- **CB1** was collected from a catch basin *offsite* near southeast corner to monitor stormwater flowing onto the site from North Terminal Road and areas east.
- **CB5** was collected *offsite* northeast of Northwest Pipe from a catch basin draining a stormwater line running from Ryerson to a communal outfall.
- **CB2** was collected *onsite* from a catch basin in the southeast corner to compare to nearby CB1.
- **CB3 and CB4** were collected *onsite* from two pipes that convey stormwater to communal Outfall 18 (WR-123).

Samples were analyzed for PAHs, PCBs, dissolved and total metals, pH, oil and grease, and TSS. Results were compared to DEQ's risk-based Level II screening level values (SLVs) for freshwater. Benzo(a)anthracene exceeded the SLV in four of five samples (2 onsite and 2 offsite), and benzo(a)pyrene exceeded the SLV in three of five samples (1 onsite and 2 offsite). Several total metals exceeded SLVs, but only two dissolved metals (manganese and zinc) exceeded SLVs in onsite samples. The highest number of metal (total and dissolved) exceedances occurred in offsite samples. However, exceedances among all samples appear to be highly correlated with high TSS values; samples were collected during a rainy period (CH2M HILL 2003b).

It should be noted that a second outfall, Outfall 1 or WR-108 is shown on historical Oregon Shipbuilding Corporation maps to drain the southern third of the Northwest Pipe

site (CH2M HILL 2001a). CH2M HILL (2001a) performed a dye study of Northwest Pipe stormwater drainage and did not observe dyes exiting from Outfall 1/WR-108. A representative from Schnitzer (not named) indicated that the outfall is plugged on Schnitzer's property between Northwest Pipe and the river. CH2M HILL (2001a) confirmed that the northern two-thirds of the site currently discharge to Outfall 18/WR-123, but that there was no confirmation on the location of stormwater discharge from the southern third of the Northwest Pipe property.

10.3.4. Catch Basin Solids Data

☒ Yes ☐ No

Dames & Moore (1989) collected two samples and two duplicate samples of sludge from a catch basin located in the southwest corner of the site in 1989. One pair of samples was analyzed for VOCs, and the other pair was analyzed for PAHs and TPH. PCE ranged in concentration from 0.055 mg/kg to 0.73 mg/kg. TPH ranged in concentration from 2,500 to 3,300 mg/kg (CH2M HILL 2000). In 1989, Crosby & Overton removed the top 2 ft of sludge from the bottom of the catch basin and tested the material for disposal purposes (CH2M HILL 2001a). Metals and VOCs were not detected, TPH was detected at 740 mg/kg, and PCBs were detected at 4.5 mg/kg (CH2M HILL 2000). This catch basin is currently empty and no longer in use (CH2M HILL 2001a).

10.3.5. Wastewater Permit

☒ Yes ☐ No

The facility had a 100-J permit to discharge non-contact cooling water via pipe to the slip. Northwest Pipe received a *Notice of Noncompliance* from DEQ in 1989 for lack of monitoring and another in 1983 for not submitting an annual report (DEQ 1999).

Permit Type	Permit No.	Start Date	Outfalls	Volumes	Parameters/Frequency
GEN01/100-J	6739	9/25/81	Unknown	unknown	Standard[1]

[1] Standard GEN01 permit requirements include flow, temperature, pH, and total residual chlorine. Other parameters may apply.

10.3.6. Wastewater Data

☐ Yes ☒ No

10.3.7. Summary

There is the potential for historic transport of contaminants from Northwest Pipe to the Willamette River and International Terminals Slip through the site's stormwater conveyance system. Currently, best management practices (regular replacement of catch basin socks and catch basin cleanings) at Northwest Pipe help prevent releases from occurring through Outfall 18/WR-123.

10.4. Sediment

10.4.1. River Sediment Data

☐ Yes ☒ No

10.4.2. Summary

NW Pipe's stormwater exits the site through a communal stormwater system. Sediment chemistry data are not summarized here for this reason; however, sediment chemistry data are summarized in the site summary for Burgard Industrial Park (Schnitzer Steel/Calbag Metals) ECSI #2355.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Contaminated soil and a leaking underground storage tank were removed from Northwest Pipe between 1988 and 1991. The following information was contained in the PA (CH2M HILL 2000):

- **Area 1** – Soils impacted with VOCs were excavated to 9 ft bgs, removing 170 cubic yards (cy) (20 cy disposed offsite and 150 cy placed in an onsite bermed treatment area for aeration).
- **Area 2 & 3** – A total of 40 cy of contaminated soil impacted with PAHs, TPHs, and VOCs_were removed from, presumably, the top 4-8 ft. Soil was placed in an onsite bermed area for treatment.
- **Area 4 & 8a** – A total of 300 cy of soil contaminated by a leaking UST were removed. The disposal location was not indicated in the documents reviewed.
- **Area 12** – A total of 15 cy of soil impacted with TPHs and VOCs_were removed from approximately the top 2 ft to an onsite bermed area.

11.2. Groundwater Cleanup/Source Control

There is no history of groundwater cleanup or groundwater source control at Northwest Pipe Company.

11.3. Other

In 1989, sludge was removed from a catch basin and contained in two drums for offsite disposal (CH2M HILL 2000).

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

Supplemental Figures:

Figure 3-2. Site Plan (CH2M HILL 2000)
Figure 1. Sample Locations (CH2M HILL 2001b)
Figure 1. Tetrachloroethene Concentrations (CH2M HILL 2002)
Figure 2. Groundwater Elevation and Flow Direction – July 31, 2003 (CH2M HILL 2003a)
Figure 1-3. Storm Water System (Bridgewater 2003)
Figure 3. PCE Concentrations and Groundwater Flow (CH2M HILL 2003a)
Figure 3-3. Stormwater Runoff System (CH2M HILL 2003b)
Figure 1. Stormwater System Sampling Locations (CH2M HILL 2003b)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 150 300 600 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Burgard Industrial Park
ECSI 2355

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 225 450 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002 and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_Burgard_NWPipe_SummaryMap.mxd

LEGEND

Site Boundary

General Groundwater Flow

Maximum Detection Location

Contaminant Type

Petroleum related

VOCs (HVOC's)

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Burgard Industrial Park - Northwest Pipe
Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Northwest Pipe Company #138
Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources		Media Impacted					COIs															Potential Complete Pathway				
							TPH			VOCs																
	Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																										
1	Aboveground waste oil tank and ten 55-gallon drums	✓	✓	✓			✓		✓	✓		✓		✓			✓						?			
2	Pipe lining and coating building - northwest corner	✓	✓	✓					?		✓	✓		✓	✓								?			
3	Pipe lining and coating building - southeast corner	✓	✓	✓					?		✓	✓		✓	✓								?			
4	2,000-gallon diesel AST and pumps		✓	✓			✓	✓		✓				✓												
5	Transformer storage	✓			✓				✓			?						✓					?			
6	Sixteen 55-gallon drums of solvent with no containment	✓		✓							✓	✓											?			
7	Industrial well			✓			✓					✓		✓												
8a	1,000-gallon gasoline UST		✓	✓			✓			✓													?			
8b	Bay 9 asphalt dipper tank			?					✓		?	?														
9	Railroad spur	✓		✓					✓					✓									?			
10	Dust suppressant use and storage	?		?					?			?														
11	Transformer area	✓		?					✓			?						✓								
12	Alleged solvent dumping area	✓		✓					✓		✓	✓											?			
13	Alleged petroleum dumping area	✓		?					✓					✓												
14	Onsite catch basin/wash pad and stormwater system				✓				✓		✓	✓		✓											✓	
Overwater Areas																										
	None																									
Other Areas/Other Issues																										
1	Groundwater plume potentially originating from offsite			✓								?											?			

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychlorinated biphenols

SUPPLEMENTAL FIGURES

Figure 3-2. Site Plan (CH2M HILL 2000)
Figure 1. Sample Locations (CH2M HILL 2001b)
Figure 1. Tetrachloroethene Concentrations (CH2M HILL 2002)
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Figure 3. PCE Concentrations and Groundwater Flow (CH2M HILL 2003a)
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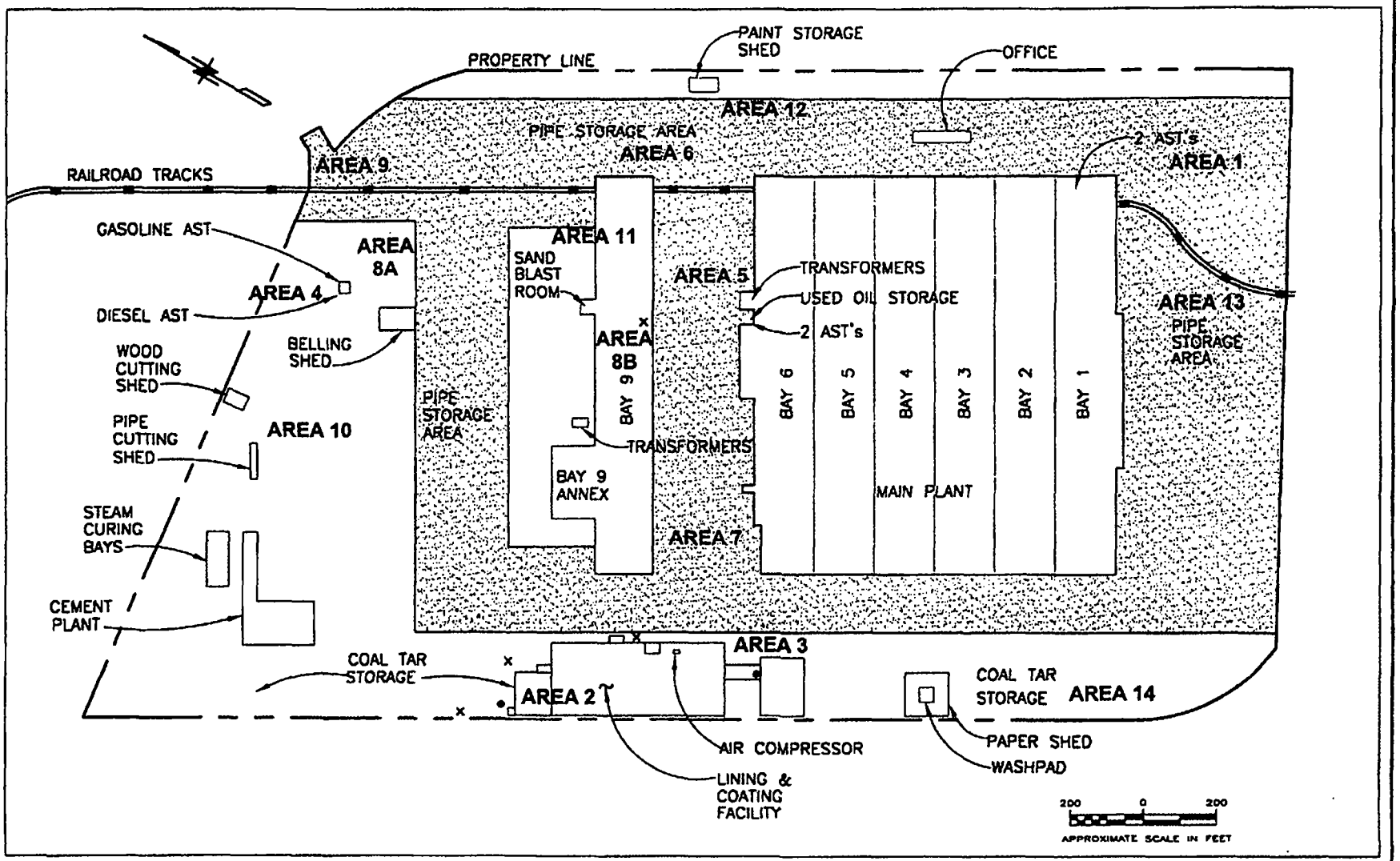


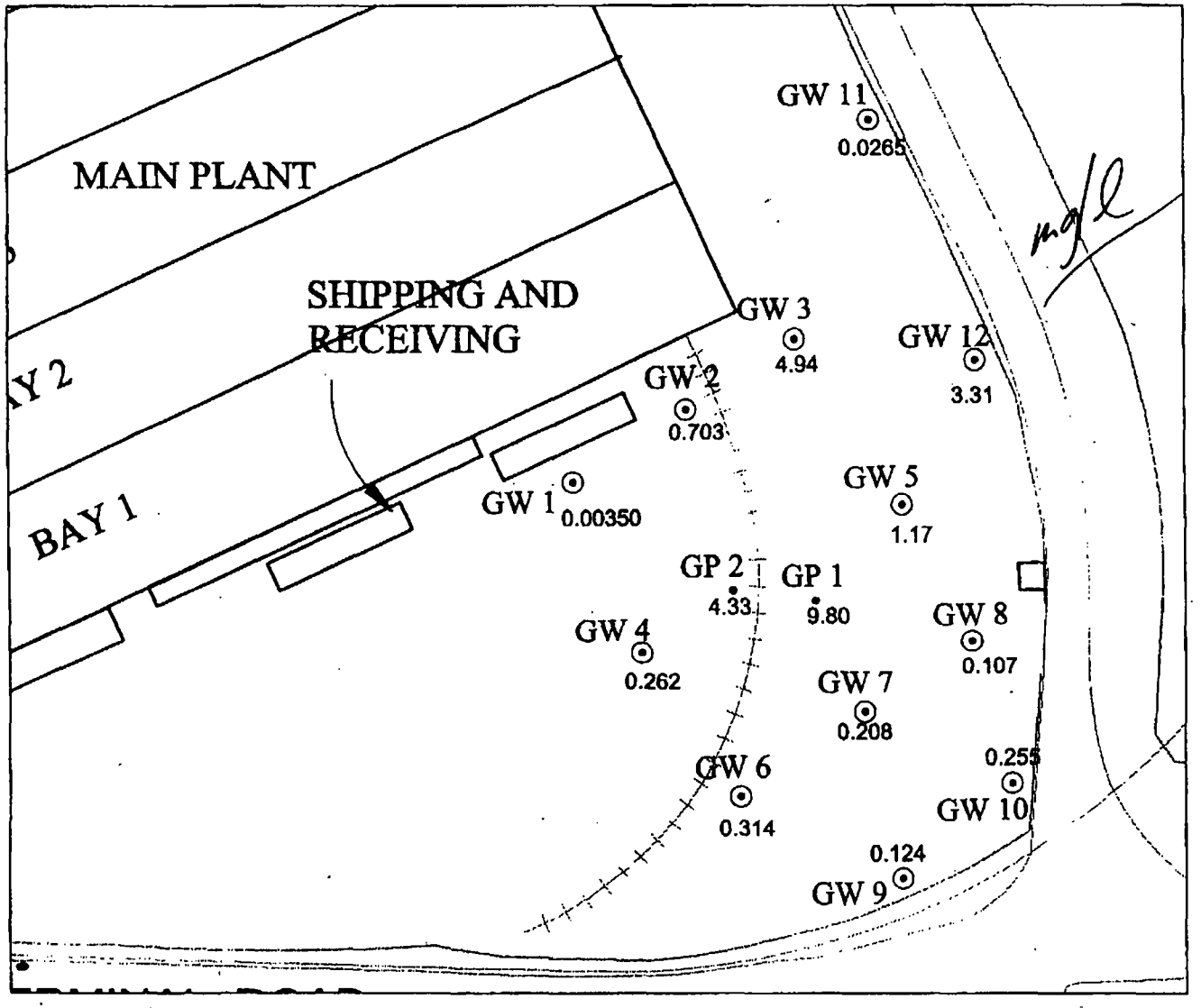
EXPLANATION:

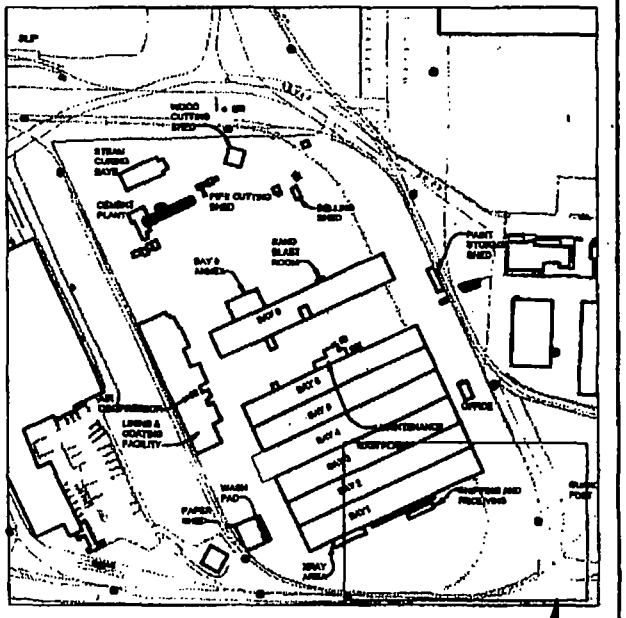
- • SUMP
- × COAL TAR RECLAMATION BLOWERS
- PAVEMENT AREA (APPROXIMATE)

Figure 3-2
Site Plan
NORTHWEST PIPE COMPANY
PORTLAND, OREGEON

CH2MHILL

9/26/02





AREA OF DETAIL

LEGEND:

⊙ 2002 AUGUST SAMPLING LOCATION

• SEPTEMBER 2001 GEOPROBE SAMPLE

262 TETRACHLOROETHENE CONCENTRATION ug/L

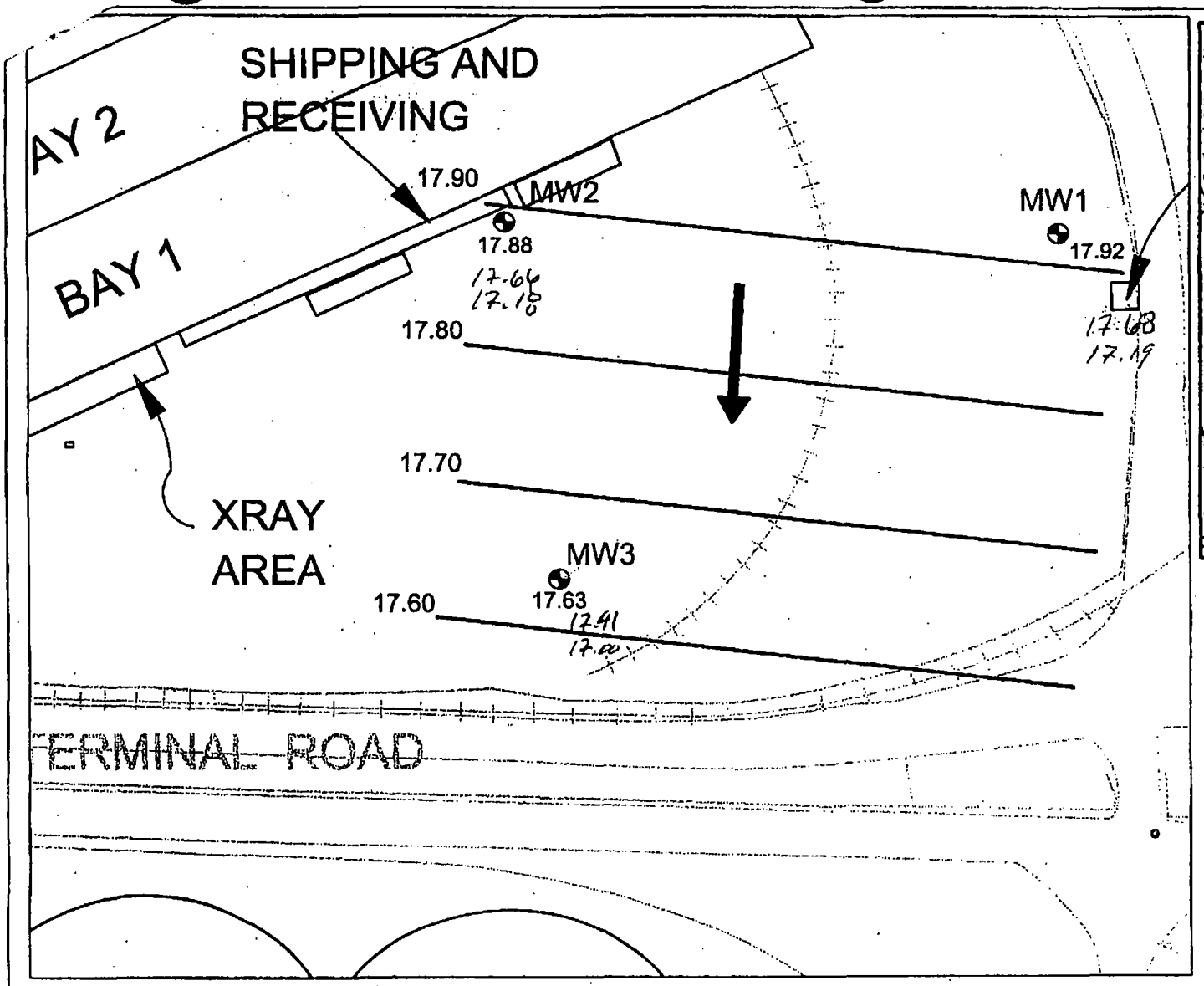
N

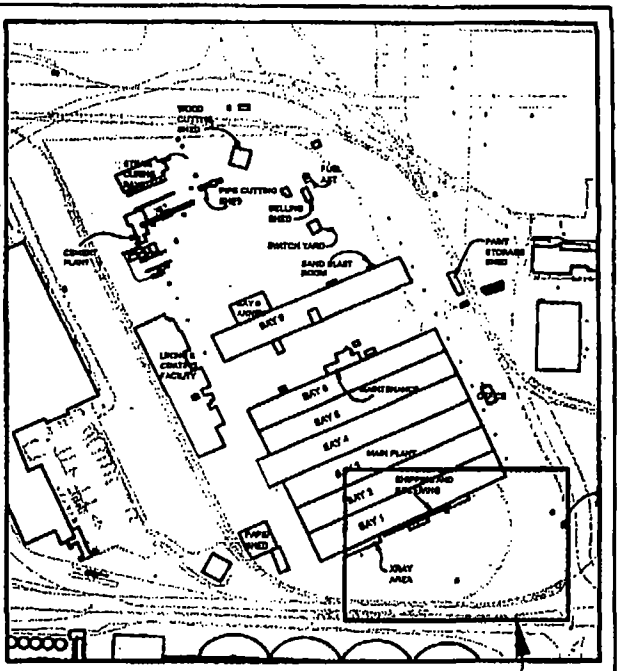
0 30 60
SCALE IN FEET

Figure 1
TETRACHLOROETHENE CONCENTRATIONS
NORTHWEST PIPE COMPANY
PORTLAND, OREGON

CH2MHILL

SC84401.DWG





Area of detail

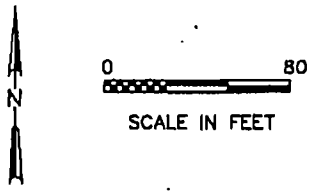


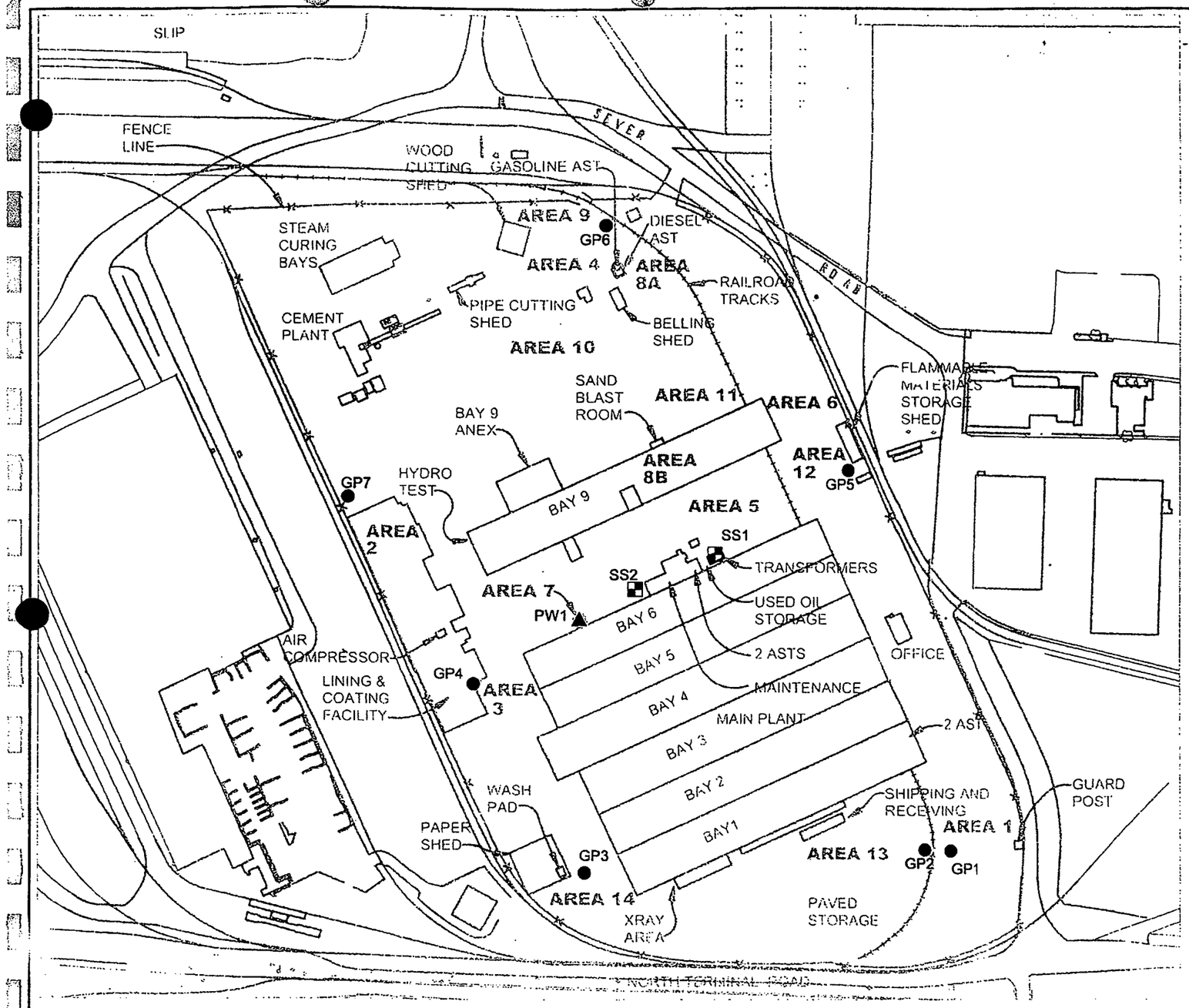
FIGURE 2
GROUNDWATER ELEVATION
AND FLOW DIRECTION
JULY 31, 2003

NORTHWEST PIPE COMPANY
PORTLAND, OREGON

CH2MHILL

Northwest Pipe Company\161844\CAD\Groundwater Flow.DWG

NOV 2001



LEGEND:

- ● SEPTEMBER 2001 GEOPROBE SAMPLE
- ◪ SEPTEMBER 2001 SURFACE SOIL SAMPLE
- ▲ SEPTEMBER 2001 PRODUCTION WELL SAMPLE

N

0 100 200

SCALE IN FEET

Figure 1

SAMPLE LOCATIONS

NORTHWEST PIPE COMPANY
PORTLAND, OREGON

CH2MHILL

NWPIPEBASE.DWG

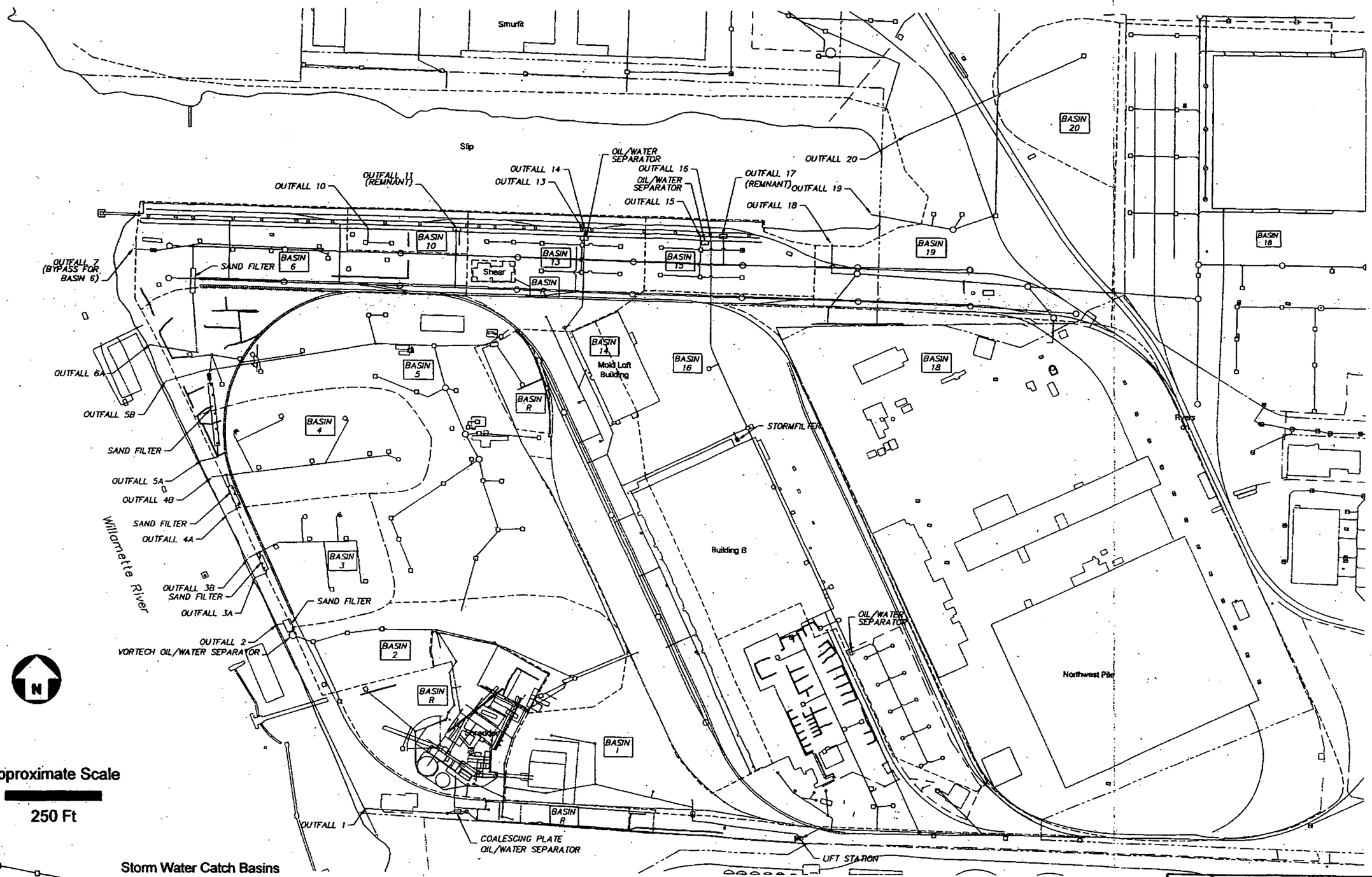
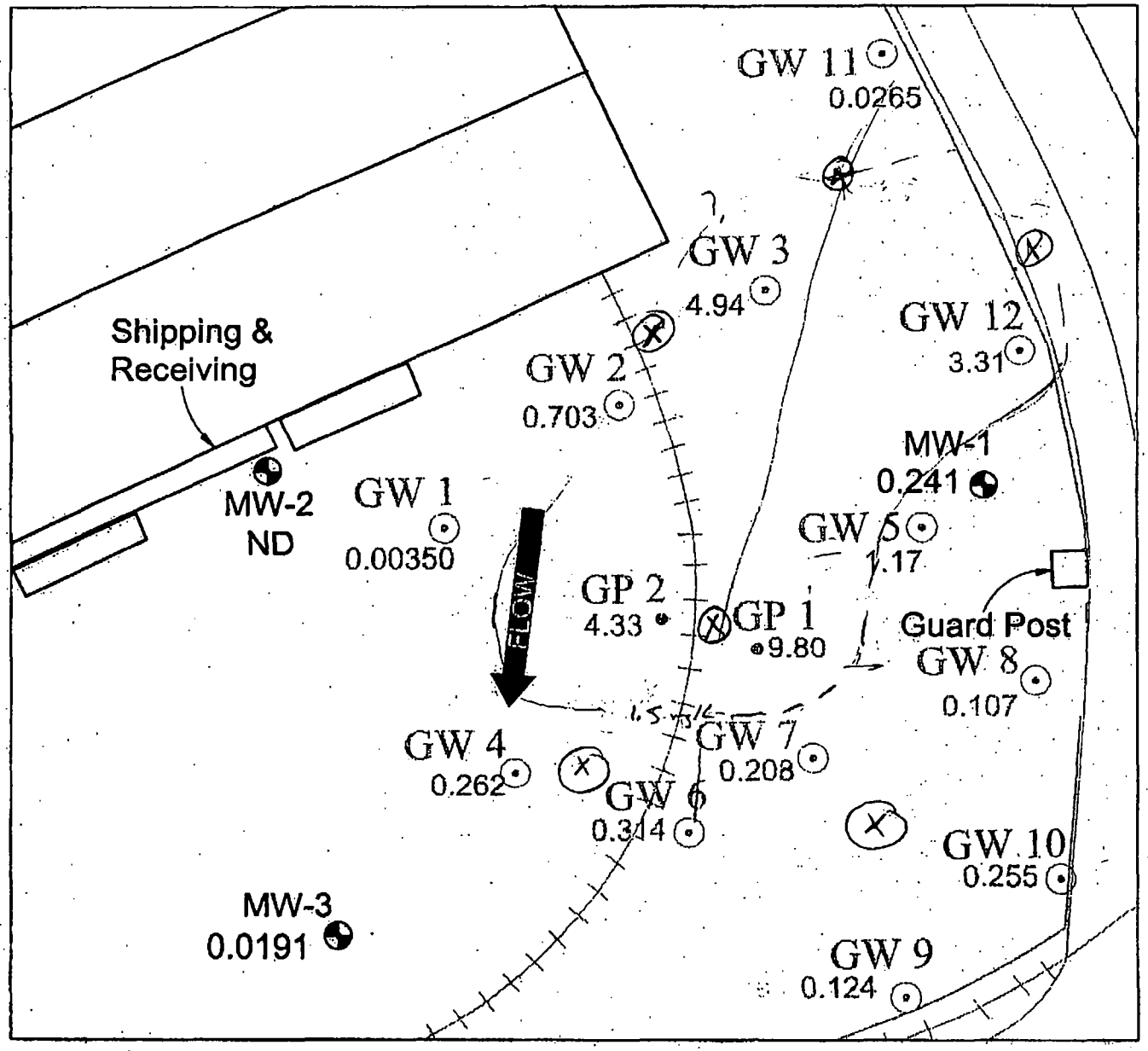
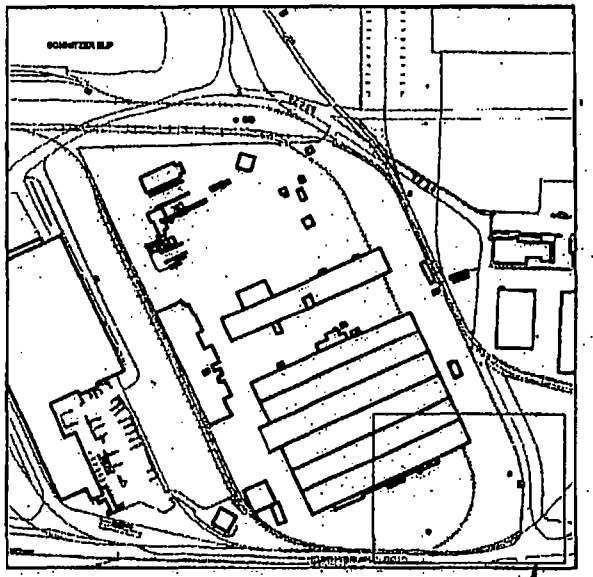


Figure 1-3
Storm Water System
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

12/16/03





AREA OF DETAIL

LEGEND:

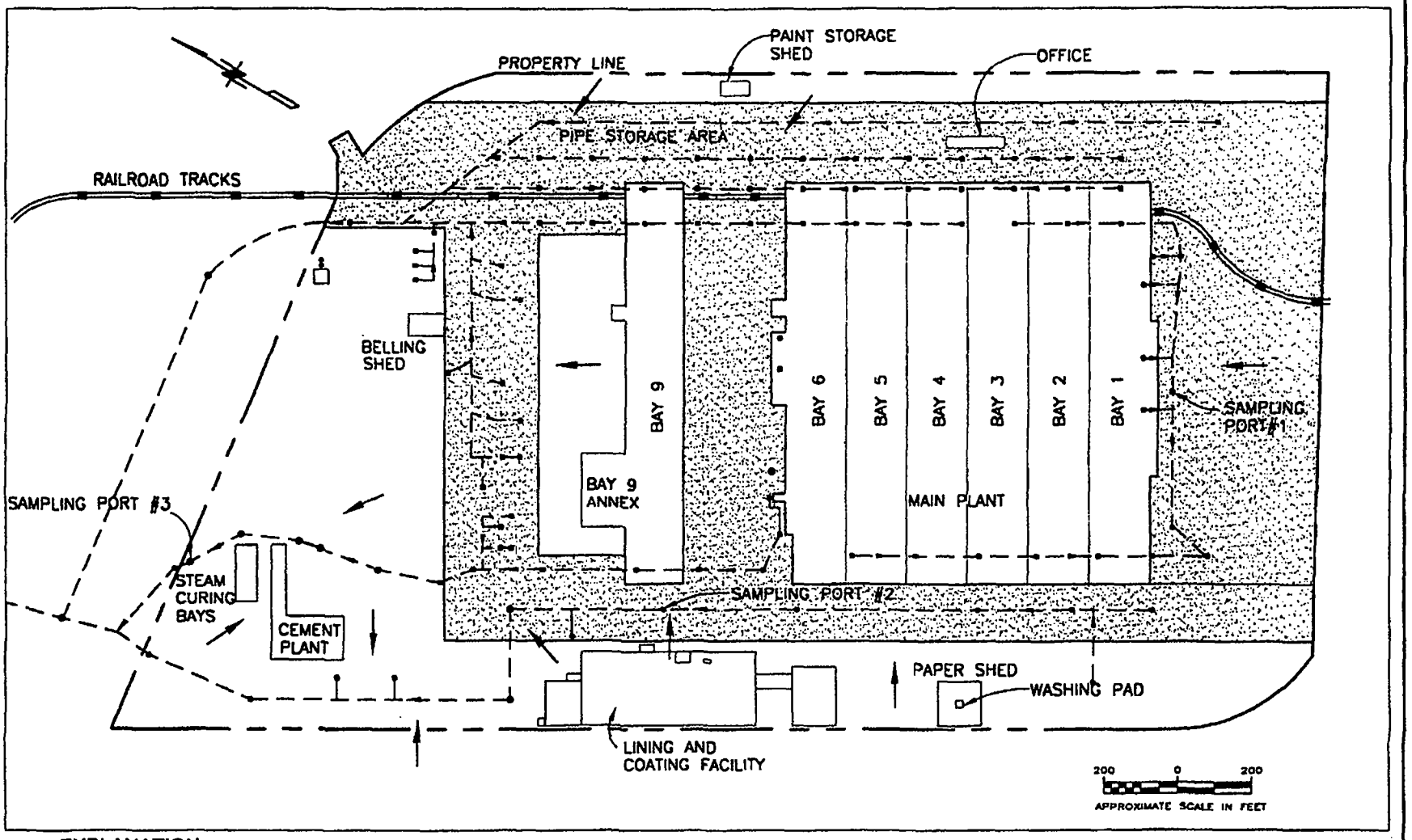
- Monitoring wells sampled August 2003
- 2002 August sampling location
- September 2001 geoprobe sample
- 0.262 Tetrachloroethene concentration mg/L
- ND Not detected at a reporting limit of 0.001 mg/L
- Groundwater flow direction July 31, 2003 (See Fig 2 for groundwater contour)

FIGURE 3
PCE CONCENTRATIONS
AND GROUNDWATER FLOW

NORTHWEST PIPE COMPANY
PORTLAND, OREGON

CH2MHILL

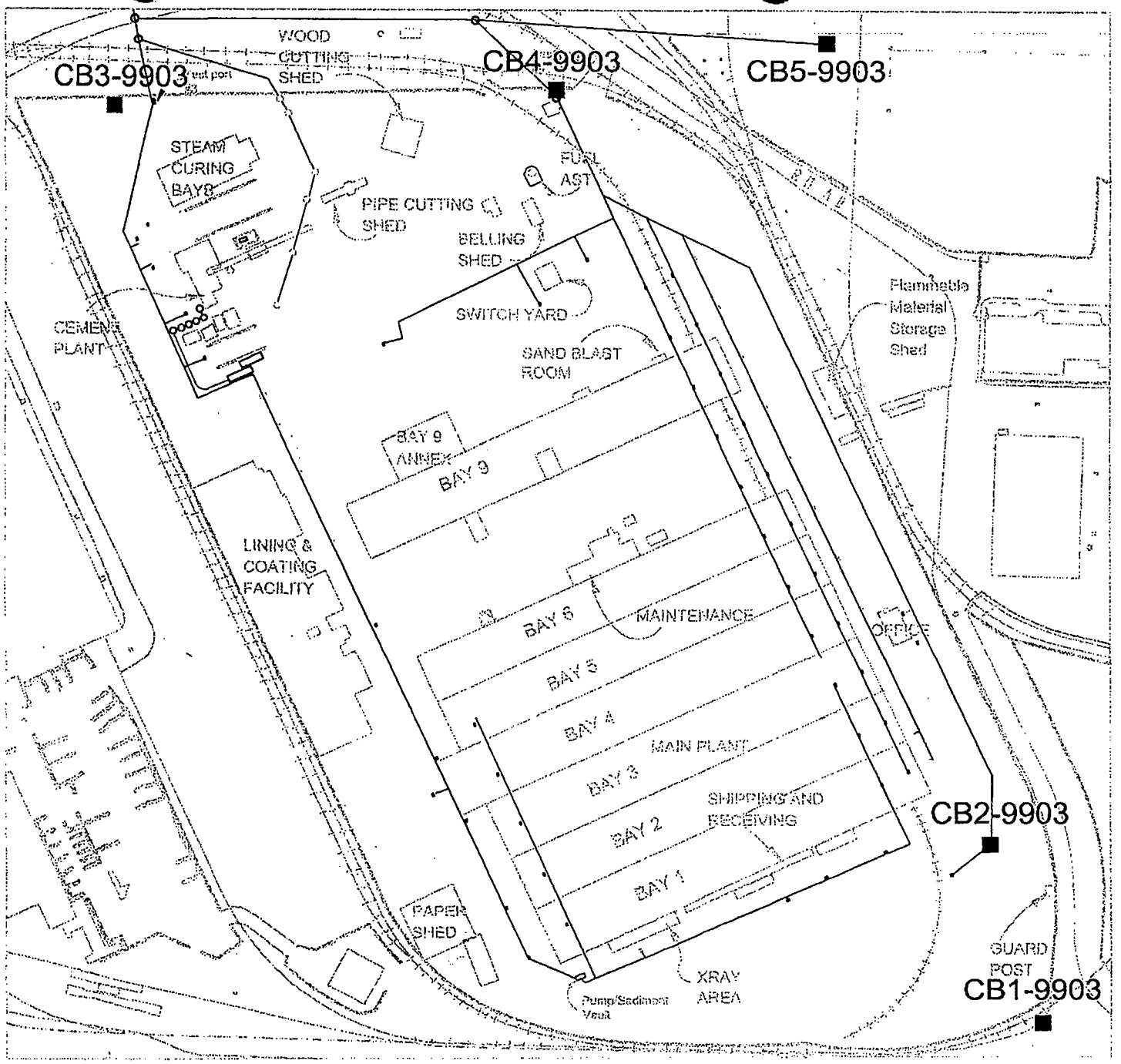
Northwest Pipe Comsm\161644\CAD\187253.DWG



EXPLANATION:
- APPROXIMATE LOCATION OF UNDERGROUND STORM DRAIN PIPING AND FLOW DIRECTION
- SUMP
- WATER SUPPLY WELL
- CATCH BASIN
- MANHOLE
- STORMWATER FLOW DIRECTION
- PAVEMENT AREA (APPROXIMATE)

Figure 3-3
Stormwater Runoff System
NORTHWEST PIPE COMPANY
PORTLAND, OREGON

CH2MHILL



LEGEND:

■ CATCH BASINS SAMPLED SEPTEMBER 9, 2003

Sample #	Lab #
CB1-9903	C200801
CB2-9903	C200802
CB3-9903	C200803
CB4-9903	C200804
CB5-9903	C200805

FIGURE 1
STORMWATER SYSTEM SAMPLING LOCATIONS
NORTHWEST PIPE COMPANY
PORTLAND, OREGON

CH2MHILL

Northwest Pipe Company\161844\CAD\SW1680S2.DWG

Owens Corning Linnton

OWENS CORNING LINNTON
CSM Site Summary

OWENS CORNING LINNTON

Oregon DEQ ECSI #: 1036

Address: 11444 NW St. Helens Rd./11910 NW St. Helens Rd
DEQ Site Manager: Tom Gainer
Latitude: 45.6069°
Longitude: 122.7900°
Township/Range/Section: 2N/1W/34

River Mile: 3.8 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Owens Corning Linnton site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

Although contaminants are present in surface soils, Kennedy/Jenks Consultants (KJC) (2002) concluded that stormwater runoff and soil erosion were not complete pathways for contaminants to migrate to the river. Stormwater from the southern portion of the site is uncontrolled, but most of this area is vegetated and not paved and so most stormwater likely infiltrates into the soil. DEQ has recommended that the site be maintained to manage surface runoff and prevent PAHs in surface soil from migrating to the river (Palochka 2002, pers. comm.).

1.2. Riverbank Erosion

The bank along the northern portion of the site is overgrown with vegetation and has rock along the shoreline. The bank on the southern portion of the site does not have rock protection and is more steeply eroded. No evidence of surface water channeling was observed on either the northern or southern banks during a significant storm event in 2001. DEQ has recommended that the bank be maintained to manage surface runoff and prevent PAHs in surface soil from migrating to the river (Palochka 2002, pers. comm.). In 2002, Owens Corning implemented riverbank improvements to prevent transport of surface soil to the river. The bank is monitored for signs of erosion or indications of storm water drainage to the river.

1.3. Groundwater

Based on the results from the Expanded Preliminary Assessment (KJC 2000) and information from the DEQ project manager for the site (Gainer 2004, pers. comm.), impacted groundwater at the site is not significant and does not appear to be a current or ongoing source of Willamette River water or sediment contamination.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Stormwater from the northern portion of the site is collected in a combined stormwater/wastewater collection system that discharges to the Willamette River via a private

outfall. Most stormwater passes through an oil/water separator prior to discharge. DEQ (1999) reported that there have been several periods of minor non-compliance with discharge standards that have not likely adversely affected sediment quality in the Willamette River.

Historic vessel and product transfer activities at the existing and former docks could have resulted in releases to the river; however, there is no record of historic spills in these areas.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Owens Corning - Linnton site is located on the west river bank at and downstream of RM 4. This portion of the river was characterized in the Portland Harbor Work Plan (Integral et al. 2004) as transitional between the upstream transport zone (RM 5-7) and the downstream depositional zone (RM 1-3). The Sediment Trend Analysis® results indicate that the channel environment off of this site is a mixture of dynamic equilibrium and episodic net accretion and erosion. Time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA in prep.) reveal areas of sediment accumulation up to 1 ft around the site's T-dock and along the toe of the bank slope along the -20 ft NAVD88 contour. Areas inshore of the –10 ft NAVD88 contour show either no change or net erosion up to about 1 ft. The main channel offshore of the site is dominated by areas of no measurable riverbed elevation change.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Primary Source: DEQ (2004). In 1991, the southern area of the site was evaluated and cleaned up and received *No Further Action* status from DEQ, but was re-evaluated as part of the XPA.

Activity		Date(s)/Comments
PA/XPA	☒	XPA completed 2002
RI	☐	
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	1991 – southern part only

DEQ Portland Harbor Site Ranking (Tier 1, 2, 3, or Not ranked): Tier 2

4. SITE OWNER HISTORY

Sources: Multnomah County Taxation records, Polk City of Portland directories, Sanborn fire insurance maps, USACE Port Series reports, KJC 2000, and DEQ 1999.

Owner/Occupant	Type of Operation	Years
Entire Site		
Owens Corning Corp. - **owner/operator**	Asphalt product production	1981 - present
Medford Corp. - **owner**	Woodchip exporter (never operated on site)	1972 – 1981
Southern Portion		
G.H. McCulloch, Inc. - **operator** (location unconfirmed)	General contractor (equipment storage)	1978 - 1990
Linnton Planing Mill - **operator**	Lumber mill, planning mill, veneer production for plywood manufacturer	1978 - 1990
Rivergate Timber Co. - **operator**	Pole (pier pilings) treating	1969 – 1971
Kingsley Lumber Co. - **owner/operator** (C.W. Kingsley listed as owner ~ 1944)	Sawmill and planning mill	Owner (? – 1971); Operator (1940 – late 1950s or early 1960s)
Beaver-Linnton Mills - **operator**	Unknown	1924 - ?
Oregon Ship Timber Mills - **operator**	Saw mill	1917 – 1934?
Northern Portion		
West Oregon Lumber Co. - **operator**	Lumber saw and planning mill with wood treating plant	~1917 – late 1950s or early 1960s
Willamette Box & Lumber Co. - **operator**	Lumber and box plant	1908 - ?
Uncertain Location		
Misco Services - **operator**	Industrial supply	1977 – 1985

5. PROPERTY DESCRIPTION

The site information summarized in this section was obtained from DEQ (1999) and KJC (2000). The 44-acre Owens Corning site is zoned for industrial use. The property can be divided into a northern, developed portion and a southern, undeveloped portion. An asphalt plant occupies the northern portion of the property. There are 11 aboveground storage tanks (ASTs) at the asphalt plant containing petroleum-based products. The total capacity of the ASTs is about 7.5 million gallons. There is an additional AST at the plant containing ferric chloride. An underground storage tank used to store gasoline was removed in 1990. All piping at the plant is above ground except the piping which passes under the roadway between the storage tanks and the processing equipment. These underground pipes have a secondary containment pipe. All manufacturing facilities and operations are located within bermed containment areas.

Support buildings at the plant include an office, laboratory, locker room, power center and boiler room, and maintenance and storage facilities. The parking and product storage areas are paved with asphalt. The site is mostly flat; approximately 100 ft from the river the crest of the bank slopes steeply down to the water.

Storm water on the northern, developed part of the site and process water are directed to an oil-water separator treatment before discharge to the Willamette River. The site facilities are not connected to the city sanitary sewer system. Sewage at the site is directed to an onsite septic tank and drain field.

The southern portion of the site is currently undeveloped and mostly vegetated. All buildings on this portion of the site have been demolished and removed with small amounts of rubble and asphalt pavement remaining.

Owens Corning leases a 2,500-ft^2 area (50 ft x 50 ft) of in-river state land to maintain a spill response

boat house and access ramp [see Supplemental Figure Exhibit A (DSL 2000)].

6. CURRENT SITE USE

Current site use information was reported by KJC (2000) and DEQ (1999). Owens Corning currently manufactures asphalt products on the northern portion of the site. Products include various grades of asphalt and asphaltic mixtures for paving, residential and commercial roofing, and industrial use. In addition to petroleum products (e.g., hot asphalt and fuel oil), ferric chloride and sodium hydroxide are used and are stored in aboveground tanks and drums. The final bulk products are shipped via truck. The plant currently receives petroleum product by rail and tanker truck, and materials are pumped directly into tanks that are located in diked secondary containment areas.

The southern portion of the site is vacant. This part of the site is used to store asphalt shingles (which are produced elsewhere and packaged and wrapped in plastic) until final shipment.

7. SITE USE HISTORY

Information on past site use was reported by KJC (2000) in the XPA and DEQ (1999), and is summarized in this section.

Past operations on the site include various wood product operations (sawmill, planning mill, box plant), a wood treatment facility, a wholesale lumberyard, and an equipment yard for a construction firm. A former pole barn located on the southern portion of the site was reportedly used for storage of solvents, fuels and lubricants. The Medford Corporation constructed a wood chip-loading terminal at the site in the 1970s and early 1980s but it was apparently never used, although remnants remain on the site. A large dock on the southern portion of the property is observed in aerial photographs from 1938 through 1963, but is no longer present.

Owens Corning constructed the asphalt facility on the northern portion of the property as a terminal for raw asphalt material storage and loading in 1982. Ships delivered product to the existing dock on the northern part of the site on an approximate 35-day cycle between 1982 and 1987. There was one barge and one ship delivery in 1991. Asphalt manufacturing facilities were constructed at the site and began operation in 1993.

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion. Information on upland and overwater sources at the site was obtained from DEQ (1999) and KJC (2000). Site maps for the northern and southern portions of the site are provided in Supplemental Figures 3 and 4 from KJC (2000), respectively.

8.1. Uplands

Potential source areas associated with current operations are the asphalt transfer lines, tank storage area, and asphalt plant. However, all of these facilities have secondary containment systems, and KJC (2000) reports that there have been no uncontrolled releases from these systems.

Potential source areas associated with historical operations of the lumber mills include a former pole barn, wood treatment, and former UST areas in the southern portion of the site. The former UST was used to store gasoline. It has a capacity of 350 gallons and was removed in 1990. The XPA (KJC 2001, 2002) sampling investigations eliminated the former wood treatment and UST areas as potential upland sources to the river.

8.2. Overwater Activities

☒ Yes ☐ No

Historically, vessels delivered asphalt products to the site at the facility's dock from 1982 to 1987. With one exception (in 1991), overwater product transfer ceased in 1987. This dock remains on the site although it is no longer used. A former dock was located on the southern portion of the property. Although there are no recorded spills, vessel activity and product transfer are potential historic sources.

8.3. Spills

Known or documented spills at the Owens Corning Linnton site were obtained either from DEQ SPINS database for the period of 1995 to 2003, from oil and chemical spills recorded from 1982 to 1989 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
5/17/02	runoff following fire and explosion at above ground asphalt storage tank	not reported	not reported	runoff contained, no release to surface water
3/25/2003	asphalt	800	soil	contained, some entered storm drain, no surface water affected

DEQ (1999) reported that, according to Owens Corning, "small asphalt and heavy hydrocarbon spills have been the only spills since the property was purchased in 1981." Small asphalt spills at the facility typically solidify at ambient temperature and are picked up and disposed of as solid waste or recycled (KJC 2000).

9. PHYSICAL SITE SETTING

The Expanded Preliminary Assessment report for the site (KJC 2000) includes a summary of the site-specific geology and hydrogeology information collected during prior investigations. Subsurface data collected prior to the KJC 2000 report focused on the southern portion of the site [see Supplemental Figure 4 from KJC (2000)]. Additional subsurface data were collected during subsequent XPA sampling phases, including from soil borings and shallow soil sampling completed in both the north and south portions of the site [see Supplemental Figure 1 from KJC (2001)]. This section relies on the summaries of geologic and hydrogeologic information provided by KJC (2000 and 2001).

9.1. Geology

Data collected from test pits and boring logs indicate that the stratigraphy at the site consists of recent fill overlying Quaternary alluvial deposits that in turn overlie the Columbia River Basalt Group. The fill material was identified as consisting mostly of sand with clay, silt, and gravel. The thickness of the fill ranges from 8 to at least 24 feet. The Quaternary alluvial deposits were identified as mostly silt and sand with sandy gravel observed below 70 feet bgs in the northern portion of the site. The top of the basalt ranged from 49 feet to more than 92 feet bgs and appears to slope downwards toward the northeast.

9.2. Hydrogeology

The depth to groundwater at the site was reported to be between 8 and 21 feet bgs in the six shallow monitoring wells at the site (KJC 2001). The shallow groundwater beneath the site was

determined to flow northeast toward the Willamette River. Water level data were not available for the deeper water-bearing zone.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

The initial data collection at the site was conducted in 1989 and was limited to the southern part of the site. Sampling locations are shown in Supplemental Figure 4 from KJC (2000). Samples from the former wood treatment area contained arsenic (10.6 to 46.2 mg/kg), chromium (13.0 to 21.3 mg/kg), copper (10.9 to 547 mg/kg), and pentachlorophenol (nondetected to 2,700 ug/kg). TPH was found in shallow soils in the vicinity of the pole barn area (82 to 28,000 mg/kg) and the former UST (1,696 and 2,165 mg/kg). Subsurface soil sampling was conducted in 1990 as part of monitoring well installation. PCP was undetected in soils from 2.5 and 7.5-foot depths intervals at MW-1A (at the former wood treatment area). No TPH and BTEX were detected in soils from the 5 and 10-foot depth intervals in monitoring well MW-2A, at the former location of the UST . In addition, analysis of samples from four test pits (1.5 and 4-foot depths) in the former wood treatment area did not detect pentachlorophenol or TPH. Petroleum-impacted soils in the vicinity of the former UST were removed in 1990. Subsequent sampling did not detect TPH or BTEX in this area.

Additional soil sampling was conducted in 2000 and 2001 as part of the XPA for the site (KJC 2001). Sampling locations are shown in Supplemental Figure 1 from KJC (2001); subsurface soil sampling results are discussed below and summarized in the following table. Of the subsurface soil samples obtained from four borings advanced in 2000, HPAHs were detected in subsurface samples at SB-4 and SB-1; LPAHs were also detected at SB-1. Arsenic was detected in subsurface soil samples at the 5 and 11-foot depth intervals at SB-3

	Subsurface Samples[a]	
Chemical	**Minimum**	**Maximum**
Arsenic (mg/kg)	17.3	20.4
TPH (mg/kg)	<20	<100
Total LPAH (ug/kg)	<13.4	32.3
Total HPAH (ug/kg)	<13.4	202.1
Pentachlorophenol (ug/kg)	not analyzed	

[a]Samples from various depth intervals ranging from 2.5 - 3 ft to 13.5 - 14 ft below ground surface.

10.1.2. Riverbank Samples ☒ Yes ☐ No

Near-surface soil samples were also collected as part of the XPA (KJC 2001, 2002). The initial samples were collected at four locations near or along the bank in February 2001 [Supplemental Figure 1 from KJC (2001)]. The locations were in areas observed to have the greatest potential for surface water runoff from the site to the river. Samples from SS-1 and SS-4 contained HPAH and LPAH. The SS-4 sample also contained TPH as heavy oil. Arsenic was detected only at location SS-3. SS-1 (active process area) and SS-4 (former pole barn area) were identified as the areas of potential concern and additional near-surface samples were collected to evaluate potential contaminant migration to the river (KJC

2002). Although some elevated concentrations were reported, DEQ (2004) concluded that contaminants were not reaching the river.

Results of both the February and October near-surface sample collection are summarized in the table below.

Chemical	Near-Surface[a]			
	Feb 2001 (KJC 2001)		Oct 2001 (KJC 2002)	
	Minimum	Maximum	Minimum	Maximum
Arsenic (mg/kg)	4.67 (1 sample)		not analyzed	
TPH (mg/kg)	<20	1,190	<20	803
Total LPAH (ug/kg)	<13.4	236	<13.4	2,450
Total HPAH (ug/kg)	130.7	3,414	319.1	8,459
Pentachlorophenol (ug/kg)	<33 (one sample)		not analyzed	

[a]0 - 6 inches depth

10.1.3. Summary

In the 2000 sampling, PAHs were detected in only two subsurface soil samples and KJC (2001) concluded that subsurface soils are not a source of contaminants to the river. There are areas of elevated petroleum constituents in surface soil, but DEQ determined that there is no complete pathway to the river via surface runoff (DEQ 2004).

10.2. Groundwater

10.2.1. Groundwater Investigations ☒ Yes ☐ No

Groundwater investigations focused on the southern portion of the property as early as 1989. Six monitoring wells have been completed at the site (KJC 2000). All of the monitoring wells penetrate the shallow water-bearing zone.

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

Available records indicate no evidence of NAPL at the site.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

Petroleum was detected in groundwater samples collected along the southern boundary of the site. However, the impacted groundwater was believed to originate from the adjacent GATX (Kinder Morgan) site (DEQ 2004). Refer to the Kinder Morgan Liquids Terminal - Linnton Petroleum Terminal site summary (ECSI No. 1096) for information regarding this plume. During earlier groundwater sampling, copper and chromium were detected in unfiltered groundwater samples collected in the former wood treatment area at concentrations of 740 µg/L and 320 µg/L, respectively. During subsequent sampling, these metals were not detected in any of the monitoring wells.

Plume Characterization Status ☒ Complete ☐ Incomplete

According to the DEQ, impacted groundwater at the site has been characterized with regards to potential impacts to the Willamette River (Gainer 2004, pers. comm.).

Plume Extent

The petroleum plume along the southern property boundary (within the Owens Corning site) is not expected to extend to the Willamette River. Figure 2 shows the estimated extent of the petroleum plume at the site based on available data collected at the site.

Min/Max Detections (Current situation)

The following table summarizes minimum and maximum concentrations of constituents detected in groundwater at the site.

Analyte	Minimum Concentration µg/L	Maximum Concentration µg/L
Volatile Organic Compounds (VOCs)		
Benzene	ND	150
Toluene	ND	6
Total Xylenes	ND	180

Preferential Pathways

No preferential groundwater flow pathways were identified during the Preliminary Assessment and Expanded Preliminary Assessment or prior investigations.

Visual Seep Sample Data

☐ Yes ☒ No

No seeps have been identified at the site (GSI 2003).

Nearshore Porewater Data

A sample of porewater extracted from a surface sediment sample was obtained in prior sediment investigations to evaluate potential soluble fractions of contaminants detected in the sediments. The sample was not representative of potential groundwater pathway discharges. The data from the sediment porewater sample are summarized in Table 2.

Groundwater Plume Temporal Trend

Insufficient data are available to assess plume distributions over time.

10.2.4. Summary

Six shallow groundwater monitoring wells have been installed on the site. Petroleum was detected in groundwater along the southern boundary of the site; however, the impacted groundwater was believed to originate from the adjacent GATX (Kinder Morgan) site (DEQ 2004). Based on the results from the Expanded Preliminary Assessment (KJC 2000) and information from the DEQ project manager for the site (Gainer 2004, pers. comm.), groundwater impacts at the site are not significant and do not appear to be a current or ongoing source of Willamette River water or sediment contamination.

10.3. Surface Water

Stormwater from the undeveloped southern portion of the site is uncontrolled; most of this area is vegetated and not paved and so stormwater likely infiltrates into the soil.

10.3.1. Surface Water Investigation

☒ Yes ☐ No

Stormwater was sampled in 2001 at three locations [see Supplemental Figure 1 from KJC (2000)]. The results of this sampling are discussed in Section 10.3.3.

10.3.2. General or Individual Stormwater Permit [Current or Past] ☒ Yes ☐ No

KJC (2000) reports that the site has two private outfalls [see Supplemental Figure 3 from KJC (2000)], although three outfalls are shown in the city's outfall records (Figure 1). Wastewater and stormwater from the northern portion of the site drain to a combined stormwater/wastewater collection system that is processed through an oil/water separator and then discharges to the Willamette River at an outfall just south of the loading dock (Outfall No. 2 [see Supplemental Figure 3 from KJC (2000)]). KJC (2000) reported that stormwater upgradient of the site, including from the Highway 30 area, also discharges through this outfall. No information was located on Outfall No.1, although KJC [see Supplemental Figure 3 from KJC (2000)] indicates that the gate valve is locked and closed.

The facility has the following NPDES permit for stormwater:

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN13	65589	1986 or earlier	Outfall 2	Standard[1]

[1] Standard GEN13 permit requirements include flow and oil and grease. Total suspended solids, pH, copper, lead, zinc, ethanol and methyl-t-butyl ether (MTBE) may also be required.

Do other non-stormwater wastes discharge to the system? ☒ Yes ☐ No

Non-contact cooling water and boiler discharge are combined with stormwater prior to processing through an oil/water separator and subsequent discharge (see Section 10.3.5).

10.3.3. Stormwater Data ☒ Yes ☐ No

The XPA (KJC 2000) reported that runoff and stormwater from the northern area of the site have been monitored on a regular basis. DEQ (1999) reported that there have been several periods of minor non-compliance with discharge standards that have not likely adversely affected sediment quality in the Willamette River.

Stormwater was sampled in 2001at three locations, as shown in Supplemental Figure 1 from KJC (2000). LPAHs were detected in a sample from the facility's oil/water separator (SW-2). However, no other PAHs were detected in stormwater samples collected from other locations, including the discharge point to the river. Additional stormwater sampling at the oil/water separator did not detect PAHs.

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☒ Yes ☐ No

The facility has NPDES general permits for discharge of non-contact cooling water (GEN01) and boiler blowdown (GEN05). Wastewater discharges to a combined stormwater/wastewater collection system (see above).

Permit Type	File No.	Start Date	Outfalls	Volumes	Parameters/Frequency
GEN01	65589	1992	No. 2	unknown	flow, temp, pH, total residual chlorine
GEN05	65589	1992	No. 2	unknown	flow, temp, pH, TSS

10.3.6. Wastewater Data

☒ Yes ☐ No

The cooling water and boiler blowdown discharges are combined with stormwater. See Section 10.3.3.

10.3.7. Summary

Currently, stormwater and wastewater from the northern portion of the site are discharged to the river and monitored under NPDES general permits. DEQ (1999) reported that there have been several periods of minor non-compliance with discharge standards that have not likely adversely affected sediment quality in the Willamette River. Stormwater from the undeveloped southern portion of the site is uncontrolled; most of this area is vegetated and not paved and so stormwater likely infiltrates into the soil.

There is no information on potential historic discharges from the site.

10.4. Sediment

10.4.1. River Sediment Data

☒ Yes ☐ No

Sediment data were collected off of the Owens Corning Linnton site as part of the following investigations:

- Georgia Pacific Linnton Site Assessment (CH2M Hill 2000) (Survey WLCGPE00)
- EPA Site Inspection 1997 (Weston 1998) (Survey WR-WSI98)
- Lower Willamette Group Portland Harbor Remedial Investigation, Round 1 Sampling (Integral 2004) (Survey LWG01)

A total of 6 surface sediment samples and 1 subsurface sediment sample have been collected, although not all samples were analyzed for all compounds. In addition, one sediment porewater sample was collected in 1997 by Weston and analyzed for metals and organotins. Three stations are proposed for LWG Round 2 sampling. Existing and proposed station locations are shown in Figure 1.

The data from all three sampling investigations are summarized in Table 2. Chromium, copper, lead, nickel, and zinc were detected at all surface stations and in the subsurface sample. Arsenic, cadmium, mercury and silver were detected at over half of the stations. LPAHs, which were detected in six of the seven surface samples, ranged from <19 to 1,995 ug/kg; the subsurface sample was 23,720 µg/kg. HPAHs were also detected in all surface samples and ranged from 44.6 to 9,598 ug/kg; the subsurface sample was 45,580 µg/kg. Tributyltin was analyzed in one surface sample and detected at 81 ug/kg, but was undetected in porewater. Pesticides were analyzed in three surface samples: DDT isomers were the only pesticide detected with concentrations of 3.9 to 25 ug/kg. PCBs were detected in one of the three samples at 27 ug/kg (Aroclors 1254 and 1260). Other organic chemicals detected in two or more surface samples include phenol, 4-methylphenol, dibenzofuran, carbazole, and diesel.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Soil cleanup and source control measures included removal and onsite treatment of 600 cubic yards of gasoline-contaminated soils associated with a former UST (August 1990).

11.2. Groundwater Cleanup/Source Control

No groundwater source controls have been conducted at the site.

11.3. Other

Bank improvements were implemented in 2002 to prevent surface soil from migrating to the river. Actions include landscaping and visual monitoring for signs of erosion, surface water pooling, storm water drainage, or sheens on the river. DEQ (Palochko 2002) determined that no other source control measures were necessary, but recommended that riverbank improvements be maintained to manage surface runoff to the river.

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Figure 3. Site Map (KJC 2000)
Figure 4. South Site Plan Showing Previous Sampling Locations (KJC 2000)
Figure 1. Site Sampling Locations (KJC 2001)
Exhibit A. DSL Waterway Lease Application Form – Owens Corning Lease Area (DSL 2000)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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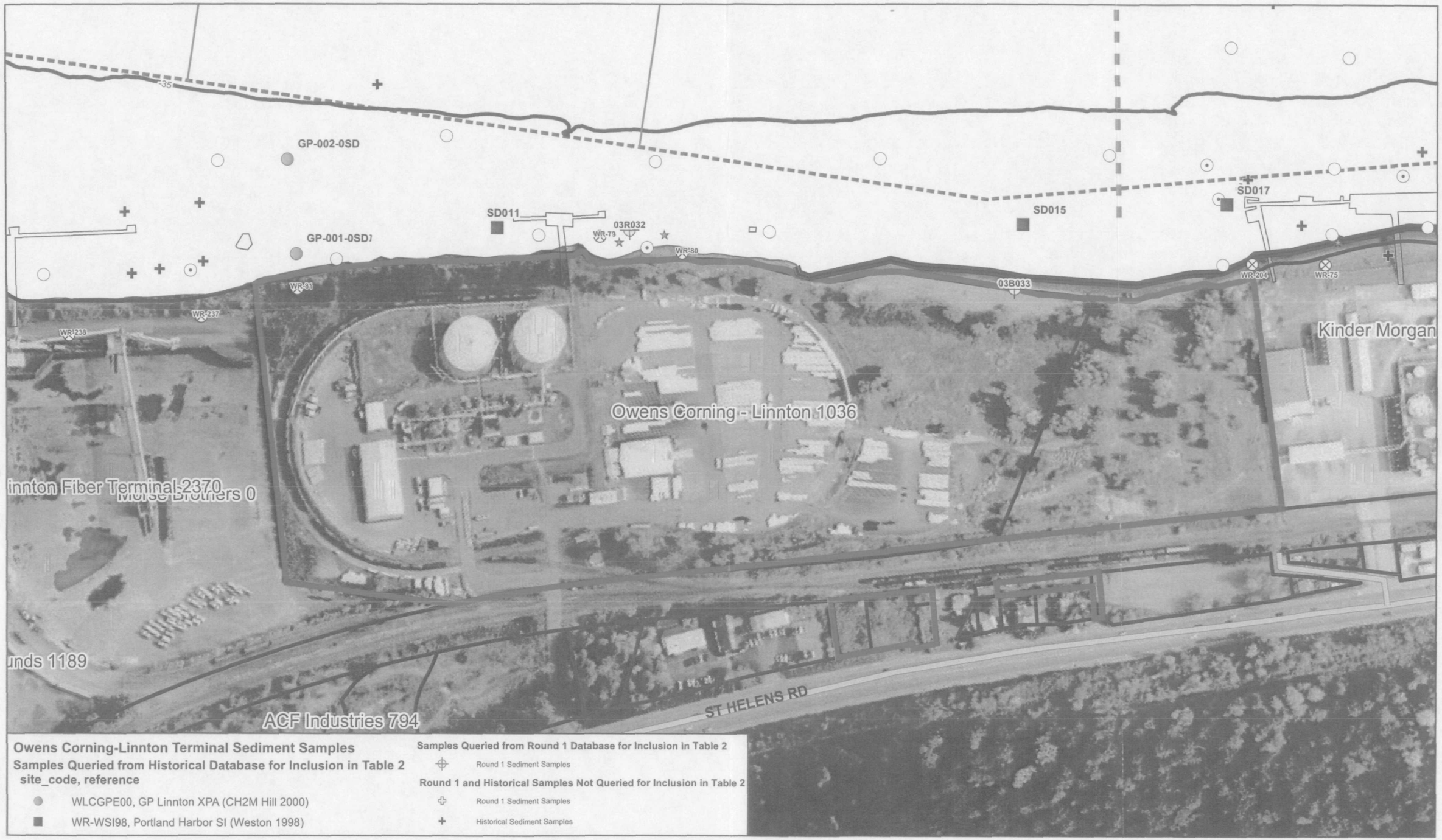

integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Owens Corning-Linnton Terminal
ECSI 1036

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 150 300 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_OwensCorning_SummaryMap.mxd

LEGEND

Site Boundary

General Groundwater Flow

Maximum Detection Location

Contaminant Type

Petroleum related

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Owens Corning Linnton
Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

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Owens Corning Linnton #1036

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources		Media Impacted					COIs																Potential Complete Pathway				
							TPH			VOCs																	
Description of Potential Source		Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Others - Pentachlorophenol	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																											
Southern Portion																											
	Pole barn storage area - historic releases	✓	✓			?		✓	✓					✓									?			?	?
	Former wood processing area[2]	✓	✓											✓			✓					✓	?			?	
	Former UST[2]	✓	✓					✓	✓					✓													
Northern Portion																											
	Process area releases	✓			?	?								✓												?	
Overwater Areas																											
Historic releases during product unloading at dock						?		✓	✓					✓											✓		
Other Areas/Other Issues																											

Notes:

[1] All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

[2] The XPA (KJC 2001, 2002) sampling investigations eliminated the former wood treatment and UST areas as current upland sources to the river.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychlorinated biphenols

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	3	0	0						3.9 U	20 U	9.27	3.9 U	3.9 U
surface	Aroclor 1242 (ug/kg)	3	0	0						3.9 U	20 U	9.27	3.9 U	3.9 U
surface	Aroclor 1248 (ug/kg)	3	0	0						3.9 U	20 U	10	6.1 U	6.1 U
surface	Aroclor 1254 (ug/kg)	3	1	33.3	17	17	17	17	17	3.9 U	20 U	13.6	17	17
surface	Aroclor 1260 (ug/kg)	3	1	33.3	10	10	10	10	10	3.9 U	20 U	11.3	10	10
surface	Aroclor 1221 (ug/kg)	3	0	0						7.7 U	40 U	18.5	7.8 U	7.8 U
surface	Aroclor 1232 (ug/kg)	3	0	0						3.9 U	20 U	9.27	3.9 U	3.9 U
surface	Polychlorinated biphenyls (ug/kg)	3	1	33.3	27 A	27 A	27	27 A	27 A	7.8 UA	40 UA	24.9	27 A	27 A
surface	Butyltin ion (ug/kg)	1	0	0						6 U	6 U	6	6 U	6 U
surface	Dibutyltin ion (ug/kg)	1	0	0						6 U	6 U	6	6 U	6 U
surface	Tributyltin ion (ug/kg)	1	1	100	81	81	81	81	81	81	81	81	81	81
surface	Tetrabutyltin (ug/kg)	1	0	0						6 U	6 U	6	6 U	6 U
surface	Total solids (percent)	2	2	100	51.4	92.7	72.1	51.4	51.4	51.4	92.7	72.1	51.4	51.4
surface	Total organic carbon (percent)	7	7	100	0.19	5.98	2.23	1.8	2.54	0.19	5.98	2.23	1.8	2.54
surface	< 0.075 mm (percent)	2	2	100	59.5	77.9	68.7	59.5	59.5	59.5	77.9	68.7	59.5	59.5
surface	0.075 to 0.85 mm (percent)	2	2	100	22	39.5	30.8	22	22	22	39.5	30.8	22	22
surface	Gravel (percent)	4	4	100	0.22	0.91	0.688	0.76	0.86	0.22	0.91	0.688	0.76	0.86
surface	Sand (percent)	3	3	100	20.71	40.05	30.7	31.22	31.22	20.71	40.05	30.7	31.22	31.22
surface	Very coarse sand (percent)	2	2	100	1.13	1.21	1.17	1.13	1.13	1.13	1.21	1.17	1.13	1.13
surface	Coarse sand (percent)	2	2	100	1.66	14.7	8.18	1.66	1.66	1.66	14.7	8.18	1.66	1.66
surface	Medium sand (percent)	2	2	100	4.93	65.3	35.1	4.93	4.93	4.93	65.3	35.1	4.93	4.93
surface	Fine sand (percent)	2	2	100	12.6	14.2	13.4	12.6	12.6	12.6	14.2	13.4	12.6	12.6
surface	Very fine sand (percent)	2	2	100	1.81	31.1	16.5	1.81	1.81	1.81	31.1	16.5	1.81	1.81
surface	Fines (percent)	3	3	100	59.73	79.29	69	67.92	67.92	59.73	79.29	69	67.92	67.92
surface	Silt (percent)	3	3	100	50.93	70.01	58.8	55.56	55.56	50.93	70.01	58.8	55.56	55.56
surface	Coarse silt (percent)	2	2	100	2.09	16.8	9.45	2.09	2.09	2.09	16.8	9.45	2.09	2.09
surface	Medium silt (percent)	2	2	100	0.83	11	5.92	0.83	0.83	0.83	11	5.92	0.83	0.83
surface	Fine silt (percent)	2	2	100	0.83	7.21	4.02	0.83	0.83	0.83	7.21	4.02	0.83	0.83
surface	Very fine silt (percent)	2	2	100	0.15	3.99	2.07	0.15	0.15	0.15	3.99	2.07	0.15	0.15
surface	Clay (percent)	3	3	100	8.8	12.36	10.1	9.28	9.28	8.8	12.36	10.1	9.28	9.28
surface	8-9 Phi clay (percent)	2	2	100	0.07	2.64	1.36	0.07	0.07	0.07	2.64	1.36	0.07	0.07
surface	9-10 Phi clay (percent)	2	2	100	0.05	1.96	1.01	0.05	0.05	0.05	1.96	1.01	0.05	0.05
surface	>10 Phi clay (percent)	2	2	100	0.12	2.43	1.28	0.12	0.12	0.12	2.43	1.28	0.12	0.12
surface	Dalapon (ug/kg)	2	0	0						15 U	27 U	21	15 U	15 U
surface	Dicamba (ug/kg)	2	0	0						3 U	3.2 U	3.1	3 U	3 U
surface	MCPA (ug/kg)	2	0	0						3200 U	14000 U	8600	3200 U	3200 U
surface	Dichloroprop (ug/kg)	2	0	0						6.5 U	17 UJ	11.8	6.5 U	6.5 U
surface	2,4-D (ug/kg)	2	0	0						6.5 U	7.4 UJ	6.95	6.5 U	6.5 U
surface	Silvex (ug/kg)	2	0	0						4 UJ	19 U	11.5	4 UJ	4 UJ
surface	2,4,5-T (ug/kg)	2	0	0						1.9 U	28 U	15	1.9 U	1.9 U
surface	2,4-DB (ug/kg)	2	0	0						40 U	43 U	41.5	40 U	40 U
surface	Dinoseb (ug/kg)	2	0	0						3 U	3.2 U	3.1	3 U	3 U
surface	MCPP (ug/kg)	2	0	0						3000 U	10000 U	6500	3000 U	3000 U
surface	Aluminum (mg/kg)	7	7	100	14000	36900	29700	30800	36800	14000	36900	29700	30800	36800
surface	Antimony (mg/kg)	5	0	0						0.86 U	5 UJ	3.37	5 UJ	5 UJ

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Arsenic (mg/kg)	7	5	71.4	4	10.1	6.86	5.6	9.6	4	10.1	6.33	5 U	9.6
surface	Cadmium (mg/kg)	7	5	71.4	0.06	0.4	0.228	0.2	0.3	0.06	0.99 U	0.427	0.3	0.86 U
surface	Chromium (mg/kg)	7	7	100	15 J	35.5	30.4	33.5	34.7	15 J	35.5	30.4	33.5	34.7
surface	Copper (mg/kg)	7	7	100	15.8	47.9	35.9	37.5	40	15.8	47.9	35.9	37.5	40
surface	Lead (mg/kg)	7	7	100	12	18.5	14.8	14	17.5	12	18.5	14.8	14	17.5
surface	Manganese (mg/kg)	5	5	100	452	686	594	583	679	452	686	594	583	679
surface	Mercury (mg/kg)	7	5	71.4	0.05 J	0.15	0.082	0.06 J	0.1	0.05 J	0.15	0.0757	0.06 J	0.1
surface	Nickel (mg/kg)	7	7	100	18 J	28	25.8	27	27.8	18 J	28	25.8	27	27.8
surface	Selenium (mg/kg)	7	3	42.9	7	11	9.67	11	11	0.2 UJ	11	4.47	0.91 U	11
surface	Silver (mg/kg)	7	4	57.1	0.04 J	0.7	0.535	0.7	0.7	0.02 UJ	2 U	0.837	0.7	1.7 U
surface	Thallium (mg/kg)	3	3	100	17	23	20.7	22	22	17	23	20.7	22	22
surface	Zinc (mg/kg)	7	7	100	62	151	103	97	118	62	151	103	97	118
surface	Barium (mg/kg)	5	5	100	156	182	172	175	176	156	182	172	175	176
surface	Beryllium (mg/kg)	5	5	100	0.6	0.8	0.67	0.6	0.75	0.6	0.8	0.67	0.6	0.75
surface	Calcium (mg/kg)	3	3	100	8020	9850	8670	8150	8150	8020	9850	8670	8150	8150
surface	Cobalt (mg/kg)	5	5	100	17.5 J	18.3	17.9	17.9 J	18 J	17.5 J	18.3	17.9	17.9 J	18 J
surface	Iron (mg/kg)	5	5	100	30200	40900	36800	39600	40400	30200	40900	36800	39600	40400
surface	Magnesium (mg/kg)	5	5	100	5780	6560	6330	6450	6510	5780	6560	6330	6450	6510
surface	Potassium (mg/kg)	3	3	100	1280	1340	1320	1330	1330	1280	1340	1320	1330	1330
surface	Sodium (mg/kg)	3	3	100	1140	1200	1160	1150	1150	1140	1200	1160	1150	1150
surface	Tin (mg/kg)	2	0	0						4.3 U	5 U	4.65	4.3 U	4.3 U
surface	Titanium (mg/kg)	3	3	100	943	1960	1290	955	955	943	1960	1290	955	955
surface	Vanadium (mg/kg)	5	5	100	78.5	99.5	90.9	97.5	97.6	78.5	99.5	90.9	97.5	97.6
surface	2-Methylnaphthalene (ug/kg)	5	3	60	26	140	68	38	38	19 U	140	48.6	26	38
surface	Acenaphthene (ug/kg)	7	6	85.7	30	120	63.2	48	99	19 U	120	56.9	48	99
surface	Acenaphthylene (ug/kg)	7	5	71.4	25	132	50.4	32	32	19 U	132	41.6	31	32
surface	Anthracene (ug/kg)	7	6	85.7	32	299	95.5	52	100	19 U	299	84.6	52	100
surface	Fluorene (ug/kg)	7	5	71.4	29	86	55.6	48	75	19 U	86	45.4	40	75
surface	Naphthalene (ug/kg)	7	6	85.7	28	270	135	75	270	19 U	270	118	75	270
surface	Phenanthrene (ug/kg)	7	6	85.7	150	1120	408	250	480	19 U	1120	353	250	480
surface	Low Molecular Weight PAH (ug/kg)	7	6	85.7	273 A	1995 A	790	507	1087 A	19 U	1995 A	680	507	1087 A
surface	Dibenz(a,h)anthracene (ug/kg)	7	5	71.4	23	74	44.2	42	44 M	1.9 U	74	34.7	38	44 M
surface	Benz(a)anthracene (ug/kg)	7	7	100	5.2	1050	266	170	210	5.2	1050	266	170	210
surface	Benzo(a)pyrene (ug/kg)	7	7	100	5.2	1180	317	211	280	5.2	1180	317	211	280
surface	Benzo(b)fluoranthene (ug/kg)	7	7	100	5.2	1190	298	180	252	5.2	1190	298	180	252
surface	Benzo(g,h,i)perylene (ug/kg)	7	7	100	8.9	1240	304	170	280	8.9	1240	304	170	280
surface	Benzo(k)fluoranthene (ug/kg)	7	7	100	5	333	154	140	230	5	333	154	140	230
surface	Chrysene (ug/kg)	7	7	100	8.7	645	231	210	240	8.7	645	231	210	240
surface	Fluoranthene (ug/kg)	7	6	85.7	240	1340	521	348	470	19 U	1340	450	348	470
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	7	7	100	6.4	806	210	140	160	6.4	806	210	140	160
surface	Pyrene (ug/kg)	7	6	85.7	240	1740	632	420	560	19 U	1740	545	420	560
surface	Benzo(b+k)fluoranthene (ug/kg)	5	5	100	196 A	1523 A	568	360 A	430 A	196 A	1523 A	568	360 A	430 A
surface	High Molecular Weight PAH (ug/kg)	7	7	100	44.6	9598 A	2800	2148 A	2522 A	44.6	9598 A	2800	2148 A	2522 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	5	5	100	1401 A	11593 A	4320	2702 A	3609 A	1401 A	11593 A	4320	2702 A	3609 A
surface	C1-Dibenzothiophene (ug/kg)	2	1	50	93	93	93	93	93	21 U	93	57	21 U	21 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	C1-Chrysene (ug/kg)	2	2	100	70	119	94.5	70	70	70	119	94.5	70	70
surface	C1-Fluorene (ug/kg)	2	2	100	22	66	44	22	22	22	66	44	22	22
surface	C1-Naphthalene (ug/kg)	2	2	100	22	102	62	22	22	22	102	62	22	22
surface	C1-Fluoranthene/pyrene (ug/kg)	2	2	100	168	655	412	168	168	168	655	412	168	168
surface	C1-Phenanthrene/anthracene (ug/kg)	2	2	100	106	517	312	106	106	106	517	312	106	106
surface	C2-Dibenzothiophene (ug/kg)	2	2	100	42	161	102	42	42	42	161	102	42	42
surface	C2-Chrysene (ug/kg)	2	2	100	31	54	42.5	31	31	31	54	42.5	31	31
surface	C2-Fluorene (ug/kg)	2	2	100	22	113	67.5	22	22	22	113	67.5	22	22
surface	C2-Naphthalene (ug/kg)	2	2	100	41	171	106	41	41	41	171	106	41	41
surface	C2-Phenanthrene/anthracene (ug/kg)	2	2	100	100	403	252	100	100	100	403	252	100	100
surface	C3-Dibenzothiophene (ug/kg)	2	2	100	42	119	80.5	42	42	42	119	80.5	42	42
surface	C3-Chrysene (ug/kg)	2	2	100	21	25	23	21	21	21	25	23	21	21
surface	C3-Fluorene (ug/kg)	2	2	100	27	117	72	27	27	27	117	72	27	27
surface	C3-Naphthalene (ug/kg)	2	2	100	37	188	113	37	37	37	188	113	37	37
surface	C3-Phenanthrene/anthracene (ug/kg)	2	2	100	106	412	259	106	106	106	412	259	106	106
surface	C4-Dibenzothiophene (ug/kg)	2	2	100	24	33	28.5	24	24	24	33	28.5	24	24
surface	C4-Chrysene (ug/kg)	2	0	0						17 U	21 U	19	17 U	17 U
surface	C4-Fluorene (ug/kg)	2	1	50	66	66	66	66	66	21 U	66	43.5	21 U	21 U
surface	C4-Naphthalene (ug/kg)	2	2	100	23	174	98.5	23	23	23	174	98.5	23	23
surface	C4-Phenanthrene/anthracene (ug/kg)	2	2	100	61	93	77	61	61	61	93	77	61	61
surface	2,4'-DDD (ug/kg)	2	0	0						0.39 U	1.3 U	0.845	0.39 U	0.39 U
surface	2,4'-DDE (ug/kg)	2	0	0						0.39 U	2.7 U	1.55	0.39 U	0.39 U
surface	2,4'-DDT (ug/kg)	2	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	4,4'-DDD (ug/kg)	3	2	66.7	4.7	7.3 J	6	4.7	4.7	0.39 U	7.3 J	4.13	4.7	4.7
surface	4,4'-DDE (ug/kg)	3	2	66.7	2.7	3.2	2.95	2.7	2.7	0.39 U	3.2	2.1	2.7	2.7
surface	4,4'-DDT (ug/kg)	3	1	33.3	15	15	15	15	15	0.39 U	15	5.86	2.2 U	2.2 U
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	3	2	66.7	7.9	25 A	16.5	7.9	7.9	0.39 U	25 A	11.1	7.9	7.9
surface	Aldrin (ug/kg)	3	0	0						0.19 U	0.99 U	0.457	0.19 U	0.19 U
surface	alpha-Hexachlorocyclohexane (ug/kg)	3	0	0						0.19 U	0.99 UJ	0.457	0.19 U	0.19 U
surface	beta-Hexachlorocyclohexane (ug/kg)	3	0	0						0.19 UJ	0.99 U	0.57	0.53 U	0.53 U
surface	delta-Hexachlorocyclohexane (ug/kg)	3	0	0						0.19 U	2.5 UIJ	0.96	0.19 U	0.19 U
surface	gamma-Hexachlorocyclohexane (ug/kg)	3	0	0						0.19 U	0.99 U	0.457	0.19 U	0.19 U
surface	cis-Chlordane (ug/kg)	3	0	0						0.19 U	0.99 U	0.477	0.25 U	0.25 U
surface	trans-Chlordane (ug/kg)	2	0	0						0.19 U	0.6 U	0.395	0.19 U	0.19 U
surface	Oxychlordane (ug/kg)	2	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	cis-Nonachlor (ug/kg)	2	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	trans-Nonachlor (ug/kg)	2	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Dieldrin (ug/kg)	3	0	0						0.39 U	2 U	1.11	0.95 U	0.95 U
surface	alpha-Endosulfan (ug/kg)	3	0	0						0.19 U	0.99 U	0.457	0.19 U	0.19 U
surface	beta-Endosulfan (ug/kg)	3	0	0						0.39 U	2 U	0.927	0.39 U	0.39 U
surface	Endosulfan sulfate (ug/kg)	3	0	0						0.39 U	2 U	0.927	0.39 U	0.39 U
surface	Endrin (ug/kg)	3	0	0						0.39 U	2 U	0.927	0.39 U	0.39 U
surface	Endrin aldehyde (ug/kg)	3	0	0						0.39 U	2 U	0.927	0.39 U	0.39 U
surface	Endrin ketone (ug/kg)	3	0	0						0.39 U	2 U	0.927	0.39 UJ	0.39 UJ
surface	Heptachlor (ug/kg)	3	0	0						0.19 U	0.99 U	0.457	0.19 U	0.19 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Heptachlor epoxide (ug/kg)	3	0	0						0.19 U	0.99 U	0.457	0.19 U	0.19 U
surface	Methoxychlor (ug/kg)	3	0	0						1.9 U	9.9 U	4.57	1.9 U	1.9 U
surface	Mirex (ug/kg)	2	0	0						0.39 U	0.94 U	0.665	0.39 U	0.39 U
surface	Toxaphene (ug/kg)	3	0	0						19 U	99 U	45.7	19 U	19 U
surface	gamma-Chlordane (ug/kg)	1	0	0						0.99 U	0.99 U	0.99	0.99 U	0.99 U
surface	Diesel fuels (mg/kg)	2	2	100	154	160	157	154	154	154	160	157	154	154
surface	2,3,4,6-Tetrachlorophenol (ug/kg)	2	0	0						96 U	97 U	96.5	96 U	96 U
surface	2,4,5-Trichlorophenol (ug/kg)	7	0	0						17 U	100 U	75	96 U	99 U
surface	2,4,6-Trichlorophenol (ug/kg)	7	0	0						1.7 U	100 U	70.1	96 U	99 U
surface	2,4-Dichlorophenol (ug/kg)	5	0	0						57 U	60 U	58.4	58 U	59 U
surface	2,4-Dimethylphenol (ug/kg)	7	0	0						1.7 U	58 U	25.5	20 U	58 U
surface	2,4-Dinitrophenol (ug/kg)	5	0	0						190 UJ	200 UJ	194	190 U	200 UJ
surface	2-Chlorophenol (ug/kg)	7	0	0						17 U	21 U	19.3	19 U	20 U
surface	2-Methylphenol (ug/kg)	7	0	0						1.7 U	20 U	14.4	19 U	20 U
surface	2-Nitrophenol (ug/kg)	5	0	0						95 U	100 U	97.4	97 U	99 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	5	0	0						190 U	200 U	194	190 U	200 U
surface	4-Chloro-3-methylphenol (ug/kg)	7	0	0						17 U	40 U	33.4	39 U	40 U
surface	4-Methylphenol (ug/kg)	7	4	57.1	21	71	35.3	24	25	19 U	71	28.7	21	25
surface	4-Nitrophenol (ug/kg)	5	0	0						95 U	100 U	97.4	97 U	99 U
surface	Pentachlorophenol (ug/kg)	7	0	0						9.7 U	100 UJ	53	29 U	99 U
surface	Phenol (ug/kg)	7	2	28.6	58	98	78	58	58	19 U	98	41.9	39 U	58
surface	2,3,4,5-Tetrachlorophenol (ug/kg)	2	0	0						96 U	97 U	96.5	96 U	96 U
surface	2,3,5,6-Tetrachlorophenol (ug/kg)	2	0	0						96 U	97 U	96.5	96 U	96 U
surface	Dimethyl phthalate (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	Diethyl phthalate (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	Dibutyl phthalate (ug/kg)	5	0	0						19 UJ	20 UJ	19.4	19 U	20 UJ
surface	Butylbenzyl phthalate (ug/kg)	5	1	20	36	36	36	36	36	19 U	36	22.8	20 U	20 U
surface	Di-n-octyl phthalate (ug/kg)	5	1	20	21	21	21	21	21	19 U	21	19.6	19 U	20 U
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	5	1	20	46	46	46	46	46	46	170 UJ	114	120 UJ	140 UJ
surface	Azobenzene (ug/kg)	2	0	0						19 U	19 U	19	19 U	19 U
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	2,4-Dinitrotoluene (ug/kg)	5	0	0						95 U	100 U	97.4	97 U	99 U
surface	2,6-Dinitrotoluene (ug/kg)	5	0	0						95 U	100 U	97.4	97 U	99 U
surface	2-Chloronaphthalene (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	2-Nitroaniline (ug/kg)	5	0	0						95 U	100 U	97.4	97 U	99 U
surface	3,3'-Dichlorobenzidine (ug/kg)	5	0	0						95 U	100 U	97.4	97 U	99 U
surface	3-Nitroaniline (ug/kg)	5	0	0						110 U	120 U	118	120 U	120 U
surface	4-Bromophenyl phenyl ether (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	4-Chloroaniline (ug/kg)	5	0	0						57 U	60 U	58.4	58 U	59 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	4-Nitroaniline (ug/kg)	5	0	0						95 UJ	100 U	97.4	97 U	99 UJ
surface	Aniline (ug/kg)	2	0	0						19 U	19 U	19	19 U	19 U
surface	Benzoic acid (ug/kg)	5	0	0						190 U	200 U	194	190 U	200 U
surface	Benzyl alcohol (ug/kg)	5	0	0						19 UJ	97 U	50.4	20 UJ	96 U
surface	Bis(2-chloroethoxy) methane (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Bis(2-chloroethyl) ether (ug/kg)	5	0	0						38 U	40 U	39.2	39 U	40 U
surface	Carbazole (ug/kg)	5	2	40	20	26	23	20	20	1.9 U	26	17.4	20 UJ	20
surface	Dibenzofuran (ug/kg)	5	2	40	23	25	24	23	23	1.9 U	25	17.8	20 U	23
surface	Hexachlorobenzene (ug/kg)	5	0	0						0.19 U	20 U	11.9	19 U	20 U
surface	Hexachlorobutadiene (ug/kg)	5	0	0						0.19 U	20 U	11.9	19 U	20 U
surface	Hexachlorocyclopentadiene (ug/kg)	5	0	0						95 UJ	100 UJ	97.4	97 U	99 UJ
surface	Hexachloroethane (ug/kg)	5	0	0						1.9 U	20 U	13.3	19 U	20 U
surface	Isophorone (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	Nitrobenzene (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	N-Nitrosodimethylamine (ug/kg)	2	0	0						96 U	97 UJ	96.5	96 U	96 U
surface	N-Nitrosodipropylamine (ug/kg)	5	0	0						38 U	40 UJ	39.2	39 U	40 U
surface	N-Nitrosodiphenylamine (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	Dibenzothiophene (ug/kg)	2	1	50	151	151	151	151	151	21 U	151	86	21 U	21 U
surface	1,2-Dichlorobenzene (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	1,3-Dichlorobenzene (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	1,4-Dichlorobenzene (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
surface	1,2,4-Trichlorobenzene (ug/kg)	5	0	0						19 U	20 U	19.4	19 U	20 U
porewater	Butyltin ion (ug/l)	1	0	0						0.06 U	0.06 U	0.06	0.06 U	0.06 U
porewater	Dibutyltin ion (ug/l)	1	0	0						0.06 U	0.06 U	0.06	0.06 U	0.06 U
porewater	Tributyltin ion (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
porewater	Tetrabutyltin (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
porewater	Aluminum (mg/l)	1	1	100	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
porewater	Antimony (mg/l)	1	0	0						0.05 U	0.05 U	0.05	0.05 U	0.05 U
porewater	Arsenic (mg/l)	1	1	100	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
porewater	Cadmium (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U
porewater	Chromium (mg/l)	1	0	0						0.005 U	0.005 U	0.005	0.005 U	0.005 U
porewater	Copper (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U
porewater	Lead (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
porewater	Manganese (mg/l)	1	1	100	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94
porewater	Mercury (mg/l)	1	0	0						0.0001 U	0.0001 U	0.0001	0.0001 U	0.0001 U
porewater	Nickel (mg/l)	1	0	0						0.01 U	0.01 U	0.01	0.01 U	0.01 U
porewater	Selenium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
porewater	Silver (mg/l)	1	0	0						0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U
porewater	Thallium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
porewater	Zinc (mg/l)	1	0	0						0.004 U	0.004 U	0.004	0.004 U	0.004 U
porewater	Barium (mg/l)	1	1	100	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094
porewater	Beryllium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
porewater	Calcium (mg/l)	1	1	100	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2
porewater	Cobalt (mg/l)	1	1	100	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
porewater	Iron (mg/l)	1	1	100	6.49	6.49	6.49	6.49	6.49	6.49	6.49	6.49	6.49	6.49
porewater	Magnesium (mg/l)	1	1	100	20	20	20	20	20	20	20	20	20	20
porewater	Potassium (mg/l)	1	1	100	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
porewater	Sodium (mg/l)	1	1	100	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
porewater	Vanadium (mg/l)	1	0	0						0.003 U	0.003 U	0.003	0.003 U	0.003 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Total organic carbon (percent)	1	1	100	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
subsurface	Gravel (percent)	1	1	100	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
subsurface	Sand (percent)	1	1	100	32.23	32.23	32.2	32.23	32.23	32.23	32.23	32.2	32.23	32.23
subsurface	Fines (percent)	1	1	100	67.22	67.22	67.2	67.22	67.22	67.22	67.22	67.2	67.22	67.22
subsurface	Silt (percent)	1	1	100	53.71	53.71	53.7	53.71	53.71	53.71	53.71	53.7	53.71	53.71
subsurface	Clay (percent)	1	1	100	13.51	13.51	13.5	13.51	13.51	13.51	13.51	13.5	13.51	13.51
subsurface	Aluminum (mg/kg)	1	1	100	37100	37100	37100	37100	37100	37100	37100	37100	37100	37100
subsurface	Antimony (mg/kg)	1	0	0						5 UJ	5 UJ	5	5 UJ	5 UJ
subsurface	Arsenic (mg/kg)	1	0	0						5 U	5 U	5	5 U	5 U
subsurface	Cadmium (mg/kg)	1	1	100	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
subsurface	Chromium (mg/kg)	1	1	100	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2
subsurface	Copper (mg/kg)	1	1	100	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9	40.9
subsurface	Lead (mg/kg)	1	1	100	27	27	27	27	27	27	27	27	27	27
subsurface	Manganese (mg/kg)	1	1	100	529	529	529	529	529	529	529	529	529	529
subsurface	Mercury (mg/kg)	1	1	100	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
subsurface	Nickel (mg/kg)	1	1	100	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
subsurface	Selenium (mg/kg)	1	1	100	9	9	9	9	9	9	9	9	9	9
subsurface	Silver (mg/kg)	1	1	100	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
subsurface	Thallium (mg/kg)	1	0	0						5 U	5 U	5	5 U	5 U
subsurface	Zinc (mg/kg)	1	1	100	125	125	125	125	125	125	125	125	125	125
subsurface	Barium (mg/kg)	1	1	100	175	175	175	175	175	175	175	175	175	175
subsurface	Beryllium (mg/kg)	1	1	100	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
subsurface	Calcium (mg/kg)	1	1	100	7490	7490	7490	7490	7490	7490	7490	7490	7490	7490
subsurface	Cobalt (mg/kg)	1	1	100	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
subsurface	Iron (mg/kg)	1	1	100	40200	40200	40200	40200	40200	40200	40200	40200	40200	40200
subsurface	Magnesium (mg/kg)	1	1	100	6510	6510	6510	6510	6510	6510	6510	6510	6510	6510
subsurface	Potassium (mg/kg)	1	1	100	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330
subsurface	Sodium (mg/kg)	1	1	100	1060 J	1060 J	1060	1060 J	1060 J	1060 J	1060 J	1060	1060 J	1060 J
subsurface	Vanadium (mg/kg)	1	1	100	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2	98.2
subsurface	2-Methylnaphthalene (ug/kg)	1	1	100	730	730	730	730	730	730	730	730	730	730
subsurface	Acenaphthene (ug/kg)	1	1	100	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
subsurface	Acenaphthylene (ug/kg)	1	1	100	220	220	220	220	220	220	220	220	220	220
subsurface	Anthracene (ug/kg)	1	1	100	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
subsurface	Fluorene (ug/kg)	1	1	100	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
subsurface	Naphthalene (ug/kg)	1	1	100	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
subsurface	Phenanthrene (ug/kg)	1	1	100	16000	16000	16000	16000	16000	16000	16000	16000	16000	16000
subsurface	Low Molecular Weight PAH (ug/kg)	1	1	100	23720 A	23720 A	23700	23720 A	23720 A	23720 A	23720 A	23700	23720 A	23720 A
subsurface	Dibenz(a,h)anthracene (ug/kg)	1	1	100	680	680	680	680	680	680	680	680	680	680
subsurface	Benz(a)anthracene (ug/kg)	1	1	100	2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
subsurface	Benzo(a)pyrene (ug/kg)	1	1	100	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
subsurface	Benzo(b)fluoranthene (ug/kg)	1	1	100	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
subsurface	Benzo(g,h,i)perylene (ug/kg)	1	1	100	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300
subsurface	Benzo(k)fluoranthene (ug/kg)	1	1	100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
subsurface	Chrysene (ug/kg)	1	1	100	3300	3300	3300	3300	3300	3300	3300	3300	3300	3300
subsurface	Fluoranthene (ug/kg)	1	1	100	11000	11000	11000	11000	11000	11000	11000	11000	11000	11000

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
subsurface	Indeno(1,2,3-cd)pyrene (ug/kg)	1	1	100	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
subsurface	Pyrene (ug/kg)	1	1	100	15000	15000	15000	15000	15000	15000	15000	15000	15000	15000
subsurface	Benzo(b+k)fluoranthene (ug/kg)	1	1	100	3900 A	3900 A	3900	3900 A	3900 A	3900 A	3900 A	3900	3900 A	3900 A
subsurface	High Molecular Weight PAH (ug/kg)	1	1	100	45580 A	45580 A	45600	45580 A	45580 A	45580 A	45580 A	45600	45580 A	45580 A
subsurface	Polycyclic Aromatic Hydrocarbons (ug/kg)	1	1	100	69300 A	69300 A	69300	69300 A	69300 A	69300 A	69300 A	69300	69300 A	69300 A
subsurface	2,4,5-Trichlorophenol (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	2,4,6-Trichlorophenol (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	2,4-Dichlorophenol (ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	2,4-Dimethylphenol (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	2,4-Dinitrophenol (ug/kg)	1	0	0						350 UJ	350 UJ	350	350 UJ	350 UJ
subsurface	2-Chlorophenol (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	2-Methylphenol (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	2-Nitrophenol (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	4,6-Dinitro-2-methylphenol (ug/kg)	1	0	0						350 UJ	350 UJ	350	350 UJ	350 UJ
subsurface	4-Chloro-3-methylphenol (ug/kg)	1	0	0						69 U	69 U	69	69 U	69 U
subsurface	4-Methylphenol (ug/kg)	1	1	100	280	280	280	280	280	280	280	280	280	280
subsurface	4-Nitrophenol (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	Pentachlorophenol (ug/kg)	1	0	0						170 UJ	170 UJ	170	170 UJ	170 UJ
subsurface	Phenol (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Dimethyl phthalate (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Diethyl phthalate (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Dibutyl phthalate (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Butylbenzyl phthalate (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Di-n-octyl phthalate (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Bis(2-ethylhexyl) phthalate (ug/kg)	1	1	100	120	120	120	120	120	120	120	120	120	120
subsurface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	2,4-Dinitrotoluene (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	2,6-Dinitrotoluene (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	2-Chloronaphthalene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	2-Nitroaniline (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	3,3'-Dichlorobenzidine (ug/kg)	1	0	0						170 U	170 U	170	170 U	170 U
subsurface	3-Nitroaniline (ug/kg)	1	0	0						210 UJ	210 UJ	210	210 UJ	210 UJ
subsurface	4-Bromophenyl phenyl ether (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	4-Chloroaniline (ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
subsurface	4-Chlorophenyl phenyl ether (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	4-Nitroaniline (ug/kg)	1	0	0						170 UJ	170 UJ	170	170 UJ	170 UJ
subsurface	Benzoic acid (ug/kg)	1	0	0						350 U	350 U	350	350 U	350 U
subsurface	Benzyl alcohol (ug/kg)	1	0	0						35 UJ	35 UJ	35	35 UJ	35 UJ
subsurface	Bis(2-chloroethoxy) methane (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Bis(2-chloroethyl) ether (ug/kg)	1	0	0						69 U	69 U	69	69 U	69 U
subsurface	Carbazole (ug/kg)	1	1	100	310 J	310 J	310	310 J	310 J	310 J	310 J	310	310 J	310 J
subsurface	Dibenzofuran (ug/kg)	1	1	100	220	220	220	220	220	220	220	220	220	220
subsurface	Hexachlorobenzene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Hexachlorobutadiene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Hexachlorocyclopentadiene (ug/kg)	1	0	0						170 UJ	170 UJ	170	170 UJ	170 UJ

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Hexachloroethane (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Isophorone (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	Nitrobenzene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	N-Nitrosodipropylamine (ug/kg)	1	0	0						69 U	69 U	69	69 U	69 U
subsurface	N-Nitrosodiphenylamine (ug/kg)	1	0	0						35 UJ	35 UJ	35	35 UJ	35 UJ
subsurface	1,2-Dichlorobenzene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	1,3-Dichlorobenzene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	1,4-Dichlorobenzene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U
subsurface	1,2,4-Trichlorobenzene (ug/kg)	1	0	0						35 U	35 U	35	35 U	35 U

SUPPLEMENTAL FIGURES

Figure 3. Site map (KJC 2000)
Figure 4. South Site Plan Showing Previous Sampling Locations (KJC 2000)
Figure 1. Site Sampling Locations (KJC 2001)
Exhibit A. DSL Waterway Lease Application Form – Owens Corning Lease Are (DSL 2000)

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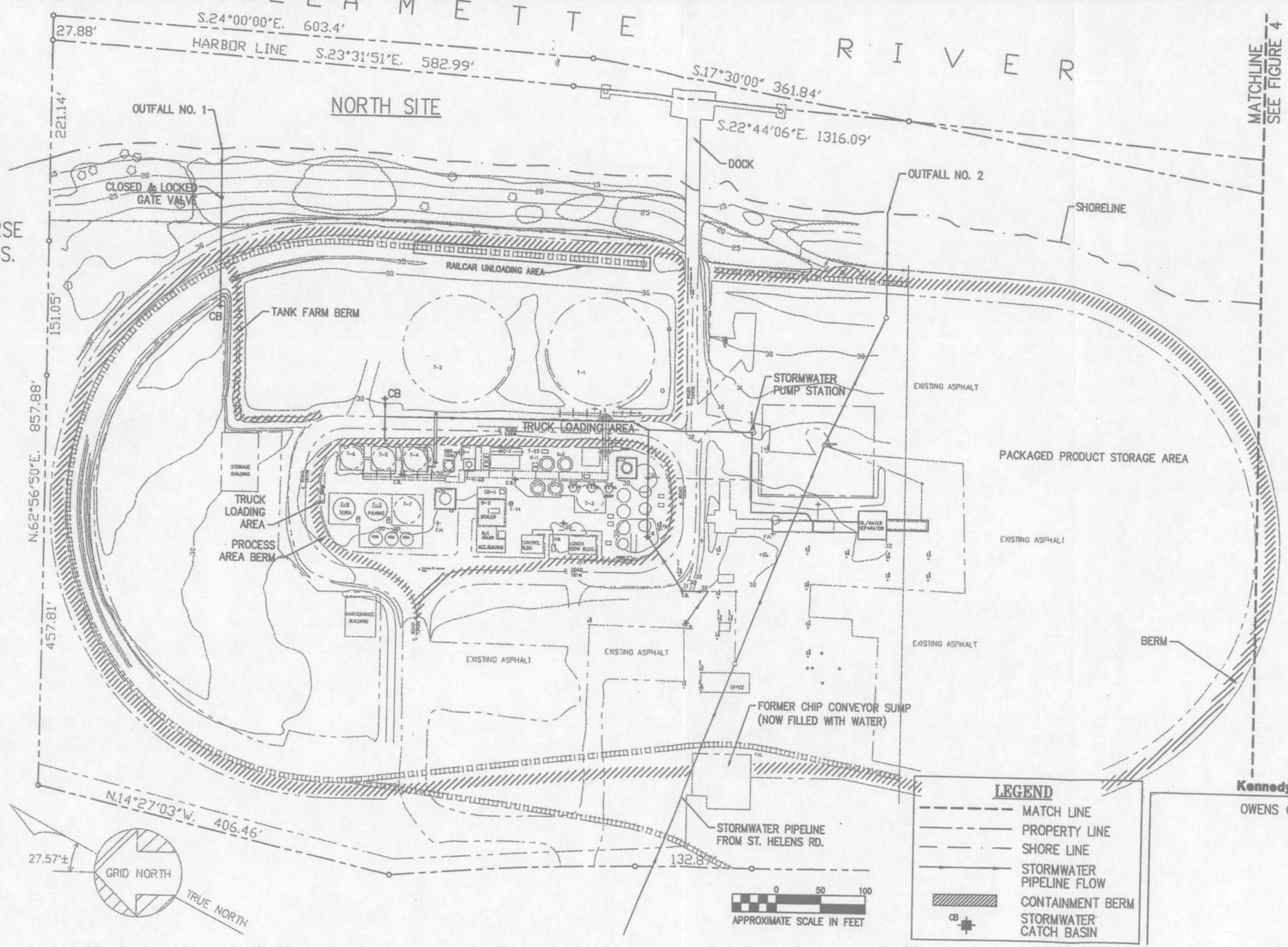


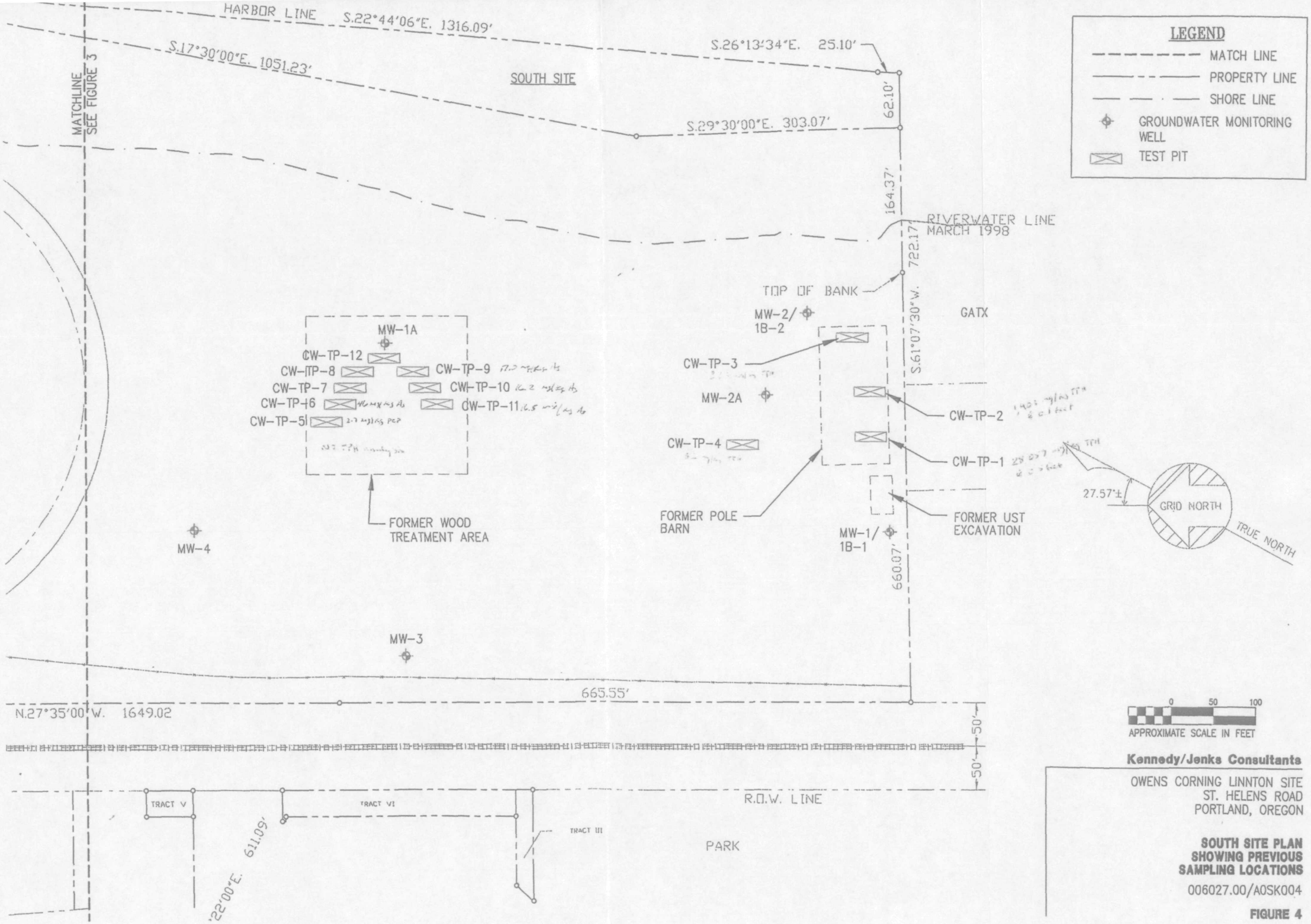
Kennedy/Jenks Consultants

OWENS CORNING LINNTON SITE
ST. HELENS ROAD
PORTLAND, OREGON

NORTH SITE PLAN

006027.00/A0SK003

FIGURE 3



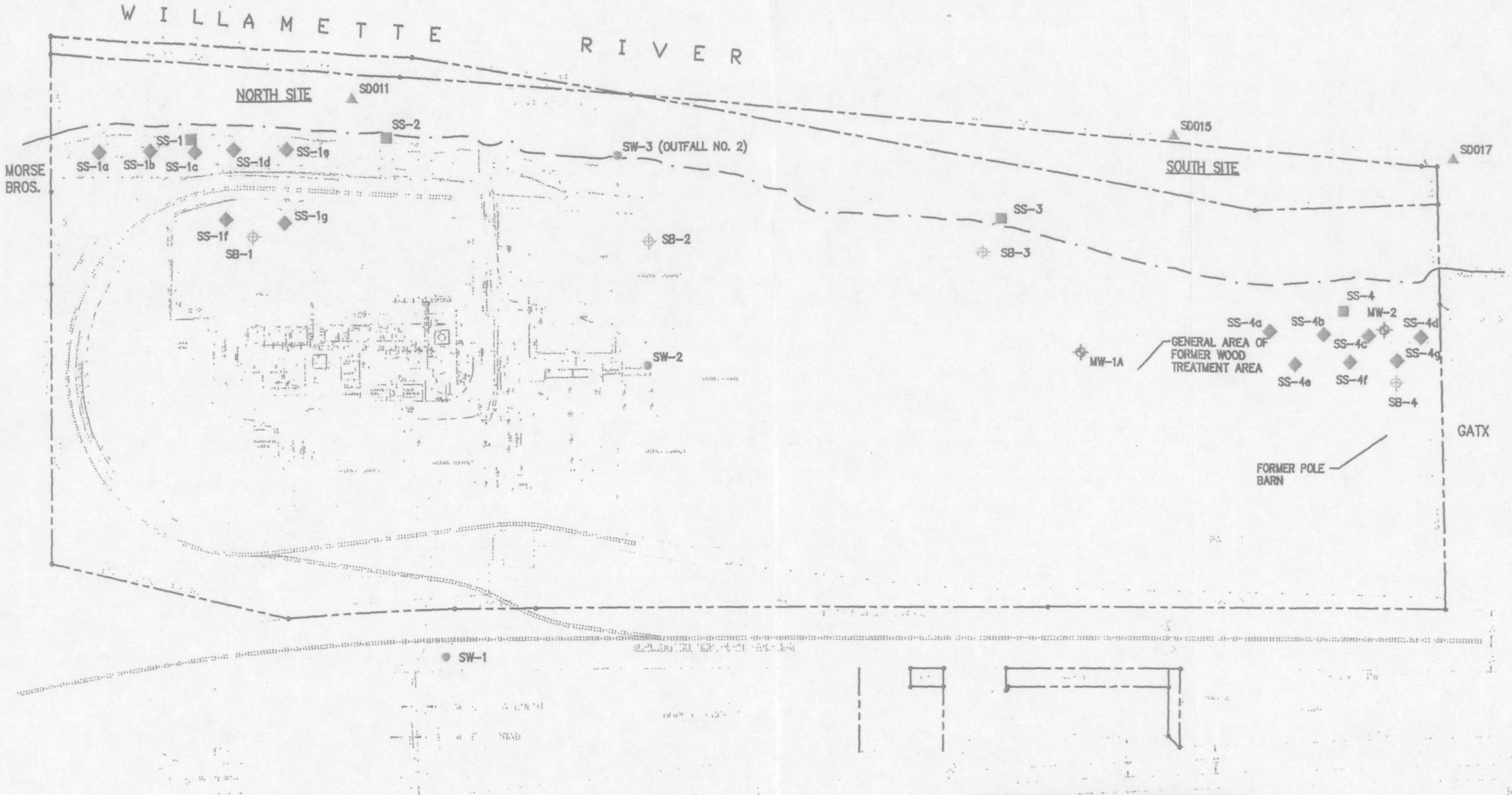
Kennedy/Jenks Consultants

OWENS CORNING LINNTON SITE
ST. HELENS ROAD
PORTLAND, OREGON

SOUTH SITE PLAN SHOWING PREVIOUS SAMPLING LOCATIONS

006027.00/A0SK004

FIGURE 4



LEGEND

- PROPERTY LINE
- SHORELINE
- GROUNDWATER MONITORING WELL
- SOIL BORING LOCATION (AUG. 2000)
- STORMWATER SAMPLING POINT
- WESTON SEDIMENT SAMPLE (1997)
- SHALLOW SOIL SAMPLE (FEB. 2001)
- SHALLOW SOIL SAMPLE (OCT. 2001)

0 80 160
APPROXIMATE SCALE IN FEET

Kennedy/Jenks Consultants

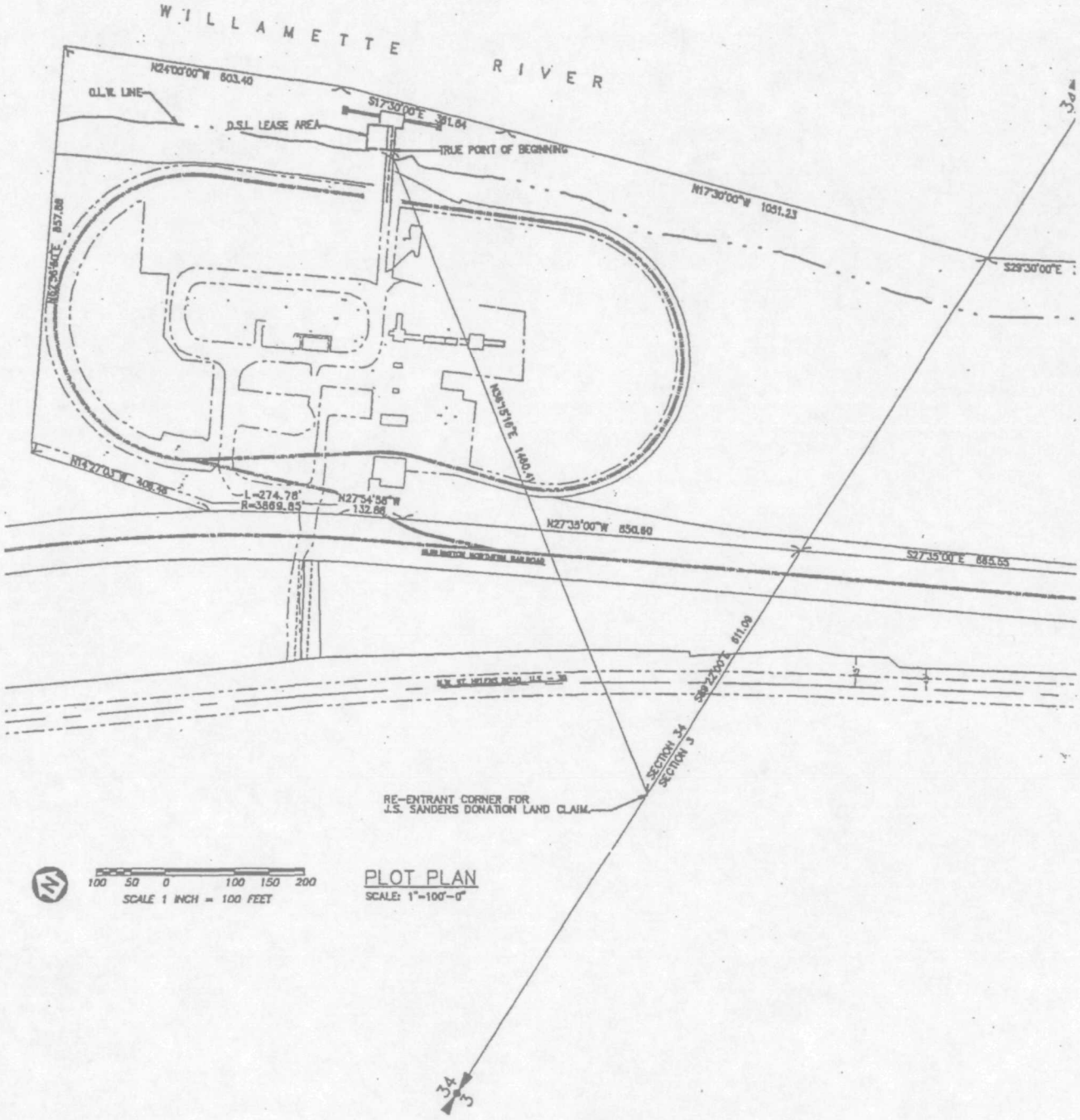
OWENS CORNING LINNTON SITE
ST. HELENS ROAD
PORTLAND, OREGON

SITE SAMPLE LOCATIONS

006027.10/P1SK001

FIGURE 1

ML10364
Exhibit 'A'



PLOT PLAN
SCALE: 1"=100'-0"

00104S.dwg 5-24-00 7:31:18 am

Port of Portland – Terminal 2

Portland Container Repair

PORTLAND CONTAINER REPAIR
CSM Site Summary

PORTLAND CONTAINER REPAIR

Oregon DEQ ECSI #: 2375

9449 N. Burgard Way
DEQ Site Mgr: Alicia Voss
Latitude: 45.6105°
Longitude: -122.7667°
Township/Range/Section: 2N/1W/35

River Mile: 4 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Portland Container site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

Portland Container Repair is located approximately 700 feet away from the International Terminals Slip and a mile from the main stem of the river; therefore, overland transport is not considered a pathway for contaminants from this landlocked area to reach the river (Figure 1).

1.2. Riverbank Erosion

Not applicable.

1.3. Groundwater

No preferential groundwater pathways have been identified during site investigations. Low concentrations of PCE were detected at one of seven groundwater sampling locations at the site; however, the source and extent of PCE impacted groundwater are unknown.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Stormwater from roof drains and paved areas is routed to a catch basin equipped with a crude oil/water separator and is discharged through private outfall 19 (WR-124?) to the slip under an NPDES permit via Schnitzer's storm sewer system (DEQ 2004; Century West 2001). There are no overwater activities associated with this site, as it is not located adjacent to the river.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

Not applicable.

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2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☒	Phase II and III ESA (Parcels 4-6; QGNW 1994)
RI	☒	Site included in the RI for the Burgard Industrial Park (Bridgewater 2002)
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 2

4. SITE OWNER HISTORY

Sources: Bridgewater 2001a, DEQ 2004

Owner/Occupant	Type of Operation	Years
Schnitzer Investment Corp. (owner)/ Portland Container Repair (lessee)	Storage and repair of intermodal containers	1995 - present
Schnitzer Investment Corp.	Storage	1972 - present
Schnitzer Steel Industries	Scrap metal storage	1970s
Oregon Shipbuilding Corp.	WWII shipyard	1940s - 1945

5. PROPERTY DESCRIPTION

The Portland Container Repair facility is located in the Burgard Industrial Park (Parcels 4-8) on the west bank of the Willamette River at approximately RM 4. The 18.5-acre site is surrounded by industrial properties. To the north is Romar Transportation, and to the east, south, and west are properties leased by Schnitzer Steel Industries. The property is located approximately 700 feet northwest of the International Terminals Slip and about one mile east of the main stem of the Willamette (Figure 1).

The site is flat and only 5% is paved. A 5,600-square-foot building is located in the western portion of the property, with limited pavement immediately surrounding the building (Bridgewater 2000a).

According to Portland Container's Storm Water Pollution Control Plan (SWPCP), stormwater originates from three drainages basins. Approximate sizes and impervious areas of these basins are shown below:

Basin	Total Area (Acres)	Impervious Area (Acres)
1	2.95	0.22
2	0.61	0.34
3	8.37	0.00

Stormwater is conveyed through catch basins to a subsurface drainage system that eventually connects to the Schnitzer storm drainage system, which ultimately discharges to the slip [see Figure 2 from Century West (2001)] under an NPDES permit. Basin 1 contains one infiltration trench and one manhole for the storm drain system. The catch basin for Basin 2 drains the main outdoor work area, and it is equipped with a crude oil/water separator and sediment basin. Basin 3 includes three infiltration trenches and is entirely unpaved. Stormwater in this area infiltrates the surface soil (Century West 2001).

6. CURRENT SITE USE

Activities at the Portland Container Repair facility include storage, maintenance, and cleaning of intermodal containers. Repair activities include riveting, welding, seam caulking, and limiting painting. Sometimes diesel refrigeration units found in some containers are also repaired on the property. All activities occur in the facility's main building except for washing, which occurs outside on a concrete pad.

Aerial photos show large areas of the property are used for container storage. A 1,000-gallon tanker truck is parked on the site to refuel forklifts and refrigeration units. The truck is parked on unpaved ground and has no containment (Bridgewater 2000b). New and used motor oil, hydraulic oil and spent oil filters are stored in an intermodal container in a graveled yard. No leaks or staining were observed by Bridgewater during their reconnaissance visit in 2000. A 200-foot concrete wash pad is located in the southwest portion of the site (Bridgewater 2000a). A curb around the wash pad was missing, and Bridgewater (2000a) observed light-colored soil staining adjacent to the pad, indicating that wash water may occasionally flow off the pad.

7. SITE USE HISTORY

During the WWII years, this property was likely part of the shipyard owned by the Oregon Shipbuilding Corporation. The International Terminals Slip was built during this time, and much of the Burgard Industrial Park's low-lying property was filled. From the 1960s into the early 1970s, shipways associated with the former shipyard were filled. Upland log storage likely occurred on portions of the property from 1963 to 1972. Schnitizer Steel stored large steel remnants on the site in the 1970s (Bridgewater 2000a).

The Portland Container Repair facility was constructed in 1995 to handle, store, and maintain large intermodal containers and container chassis. An aboveground diesel storage tank observed by CH2M HILL in 1996 was not located by Bridgewater in 2000 and is presumed to have been removed from the site (Bridgewater 2000a).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

The fuel tanker truck is parked on unpaved ground with no containment provided. Any spills from the truck could impact surface and subsurface soils. The wash pad was also missing curbed containment. Based on staining adjacent to the pad, wash water has impacted surface soils in this area (Bridgewater 2000a).

8.2. Overwater Activities

☐ Yes ☒ No

8.3. Spills

No known or documented spills at the Portland Container site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence.

9. PHYSICAL SITE SETTING

The Schnitzer Burgard Industrial Park is fairly level with ground surface elevations ranging between 20 and 30 feet above mean sea level. The topography of the industrial park gently slopes from east to west across the site, with the exception of a steep embankment along the Willamette River and the slip channel (DEQ 1999).

The Schnitzer Burgard Industrial Park lies along the northeastern bank of the Willamette River where deposits from high-energy Pleistocene floods formed a peninsular terrace at the convergence of the Willamette and Columbia Rivers. The southern two-thirds of the industrial park lie within the Willamette River's 100-year-flood zone (DEQ 1999). Portland Container is located in the northeast corner of the industrial park, outside of the 100-year-flood zone (see Figure 1).

Limited site-specific investigation information is available for the Portland Container site. According to Bridgewater's *Site History Review of the Burgard Industrial Park* (Bridgewater 2000a), Environmental Management Solutions (EMS) completed 10 tests pits at the Portland Container site in 1991 to investigate subsurface conditions and to screen for soil and groundwater for contamination. In March 1993, EMS completed 22 additional test pits and 1 borehole at the Portland Container site. The original EMS investigation reports documenting the exploration depth and detailed soil and groundwater results were not available for review. QGNW (1994) completed a soil investigation at two areas previously sampled by EMS. The maximum depth of exploration during the soil excavation was 32 inches (QGNW 1994).

9.1. Geology

The near-surface geology at the Schnitzer Burgard Industrial Park is dominated by the presence of dredge fill placed during the development of the industrial park in the late 1930s and during filling of the shipways in the later 1960s and early 1970s. The dredge fill, consisting of a mixture of brown sand and silty sand, varies in thickness across the Schnitzer Burgard Industrial Park from 25 to 35 feet along the river and thinning to 15 feet along the eastern edge of the site (Bridgewater 2001).

Based on the lithologic log from an industrial production well at Northwest Property Company (near the center of the Schnitzer Burgard Industrial Park), underlying the dredge fill to an approximate depth of 160 feet bgs are Quaternary deposits consisting of interbedded sands and silty clay. Below 160 to 220 feet bgs, the Quaternary deposits are predominantly composed of sand with gravel lenses (CH2M HILL 2000). The coarser-grained material may represent Pleistocene flood gravels (Quaternary deposit) and/or possibly the Troutdale Formation. Between 220 and 258 feet bgs, silty clay and clay with minor lenses of gravel were noted (CH2M HILL 2000). The latter unit may represent the Sandy River Mudstone. The total depth explored during installation of the onsite industrial production well was 258 feet bgs. The Oregon Water Resources Department well identification number for the onsite industrial production well is MULT 1824.

9.2. Hydrogeology

Localized zones of perched groundwater may be present within the dredge fill. Such perched zones have been encountered at a depth of about 15 to 20 feet on nearby properties. The presence and extent of the perched zones is expected to be variable and related to the presence of silt content within the dredge fill. The groundwater flow gradients in the perched zones are anticipated to be variable and relatively low; and discharge from the perched groundwater zones either discharges toward the river or infiltrates downward into the underlying dredge fill and alluvial deposits (Bridgewater 2001). A more continuous unconfined groundwater zone is anticipated within the upper portions of the alluvial deposits underlying the dredge fill (Bridgewater 2001) and potentially including the lower portions of the dredge fill itself. Seeps have been identified at the east end of the International Terminals Slip (GSI 2003). However, the relationship between the Portland Container site and the seeps is unknown since the groundwater flow direction and gradient at the site have not been assessed.

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

A Phase II and III Environmental Site Assessment were performed on Parcels 4-6 at the Portland Container Repair site in 1994. Soil sampling conducted on the site found concentrations of PCBs as high as 20 mg/kg (including Aroclors 1254 and 1260). The 20-mg/kg soil sample was later determined to be located on the property north of the Portland Container Repair site, currently occupied by Romar Transportation. Approximately 50 tons of PCB-contaminated soils (primarily within Parcels 5-6), with concentrations greater than 1 mg/kg, were removed and disposed of offsite in 1994. Confirmation samples revealed that cleanup was effective, and there was no further PCB contamination (QGNW 1994).

10.1.2. Riverbank Samples ☐ Yes ☒ No

10.1.3. Summary

Soil contaminated with PCBs has been removed from the site. Concentrations of other analytes were either non-detects or at background levels (QGNW 1994). As noted by Bridgewater (2000b), soil adjacent to the wash pad is stained and the tanker truck does not have containment; therefore, the potential exists for soil contamination on this site.

10.2. Groundwater

Limited site-specific groundwater data are available for the site.

10.2.1. Groundwater Investigations ☒ Yes ☐ No

In 1991, EMS completed 10 tests pits and collected groundwater samples from three of the tests pits for laboratory analysis of VOCs (Bridgewater 2000a). In March 1993, EMS completed 22 additional test pits and 1 borehole. Groundwater samples collected from three of the test pits and from the one borehole were analyzed for TPH, VOCs, metals, and PCBs (Bridgewater 2000a).

10.2.2. NAPL (Historic & Current) ☐ Yes ☒ No

No evidence of non-aqueous-phase liquids has been reported in available documents.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

With the exception PCE, no constituents were detected in the groundwater samples collected at Portland Container. PCE was detected in one groundwater sample at a concentration of 5.5 µg/L (Bridgewater 2000a).

Plume Characterization Status ☐ Complete ☒ Incomplete

VOC plume characterization is incomplete. Available documents do not include adequate information regarding sample locations and groundwater analytical results.

Plume Extent

Insufficient information is available to assess the extent of the PCE-impacted groundwater at the site.

Min/Max Detections (Current situation)

Available records indicate that groundwater sampling at the site was limited to the 1991 and 1993 site investigations (Bridgewater 2000a). The original site investigation reports documenting these groundwater results were not available for review. Based on available documentation, the minimum and maximum detections in groundwater are provided in the table below.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
Volatile Organic Compounds		
Tetrachloroethene (PCE)	ND	5.5

Current Plume Data

No current data are available to assess current plume conditions. However, based on Integral's review of the available data, it does not appear that the limited groundwater COIs and low concentrations constitute a groundwater pathway to the river.

Preferential Pathways

No preferential groundwater pathways have been identified at the site.

Downgradient Plume Monitoring Points (min/max detections)

Based on available information, downgradient monitoring points have not been established at the site.

Visual Seep Sample Data ☐ Yes ☒ No

Not applicable.

Nearshore Porewater Data

Portland Container does not occupy the shoreline along the Willamette River or the International Terminals Slip. The western edge of Portland Container is located approximately 1 mile east of the Willamette River and approximately 700 feet east of the International Terminals Slip. Nearshore porewater data were not collected as part of the site investigations.

Groundwater Plume Temporal Trend

Insufficient groundwater data are available to evaluate groundwater plume temporal trends.

10.2.4. Summary

The current groundwater chemistry data set is over 10 years old and consists of groundwater samples collected from six test pit excavations and one borehole. PCE was detected in one of the groundwater samples at a concentration of 5.5 µg/L (Bridgewater 2000a). Information regarding the groundwater sampling locations was not reported in available documents.

No preferential groundwater pathways have been identified. The source and extent of the PCE-impacted groundwater is unknown. Based on Integral's review of the available data, it does not appear that the limited groundwater COIs and low concentrations constitute a groundwater pathway to the river.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

Approximately 5% of the Portland Container facility is paved or covered. Stormwater originates in three basins, one of which is entirely unpaved. The other basins include four infiltration trenches, a catch basin, and a crude oil/water separator. The subsurface drainage system connects to the Schnitzer storm sewer system, which discharges to the slip through private outfall 19 (WR-124?).

Permit Type	File Number	Start Date	Outfalls	Parameters/Frequency
GEN12Z	111236	2/14/01	Unknown	Standard[1]/twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Stormwater within the Portland Container property originates in three drainage basins, containing four infiltration trenches, a catch basin, and a crude oil/water separator. One basin is entirely unpaved, and stormwater infiltrates surface soils. Stormwater is routed to a subsurface storm drain system and is discharged to the slip under an NPDES permit via Schnitzer's storm sewer system.

10.4. Sediment

10.4.1. River Sediment Data ☐ Yes ☒ No

Portland Container Repair is located 700 feet away from the International Terminals Slip and a mile from the main stem of the river.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Approximately 50 tons of PCB-contaminated soil was removed from the Portland Container site in 1994, prior to Portland Container's tenure. An aboveground diesel storage tank was removed from the site in the late 1990s.

11.2. Groundwater Cleanup/Source Control

There is no groundwater cleanup history at Portland Container.

11.3. Other

The Portland Container Repair facility currently has a Stormwater Pollution Prevention Plan to identify, reduce, and prevent the pollution of stormwater. The oil/water separator and catch basin are cleaned out several times a year (Century West 2001).

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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Other relevant references/information sources:

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Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment

Supplemental Figures:

Figure 2. Site Plan with Drainage Routes and Sampling Locations (Century West 2001)

FIGURES

Figure 1. Site Features

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integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)
Selected ECSI Site Property Boundary
35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 150 300 600 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Burgard Industrial Park
ECSI 2355

TABLES

Table 1. Potential Sources and Transport Pathways Assessment

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Portland Container Repair (#2375)
Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
A Fuel truck parking area	?	?					?																		
Stormwater outfalls				?				?																	
Unknown source			✓								✓											?			
Wash pad	✓	?					?	?					?												
Overwater Areas																									
B																									
Other Areas/Other Issues																									

Notes:
All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.
✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.
? = There is not enough information to determine if source or COI is present or if pathway is complete.
Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychorinated biphenols

SUPPLEMENTAL FIGURES

Figure 2. Site Plan with Drainage Routes and Sampling Locations (Century West 2001)

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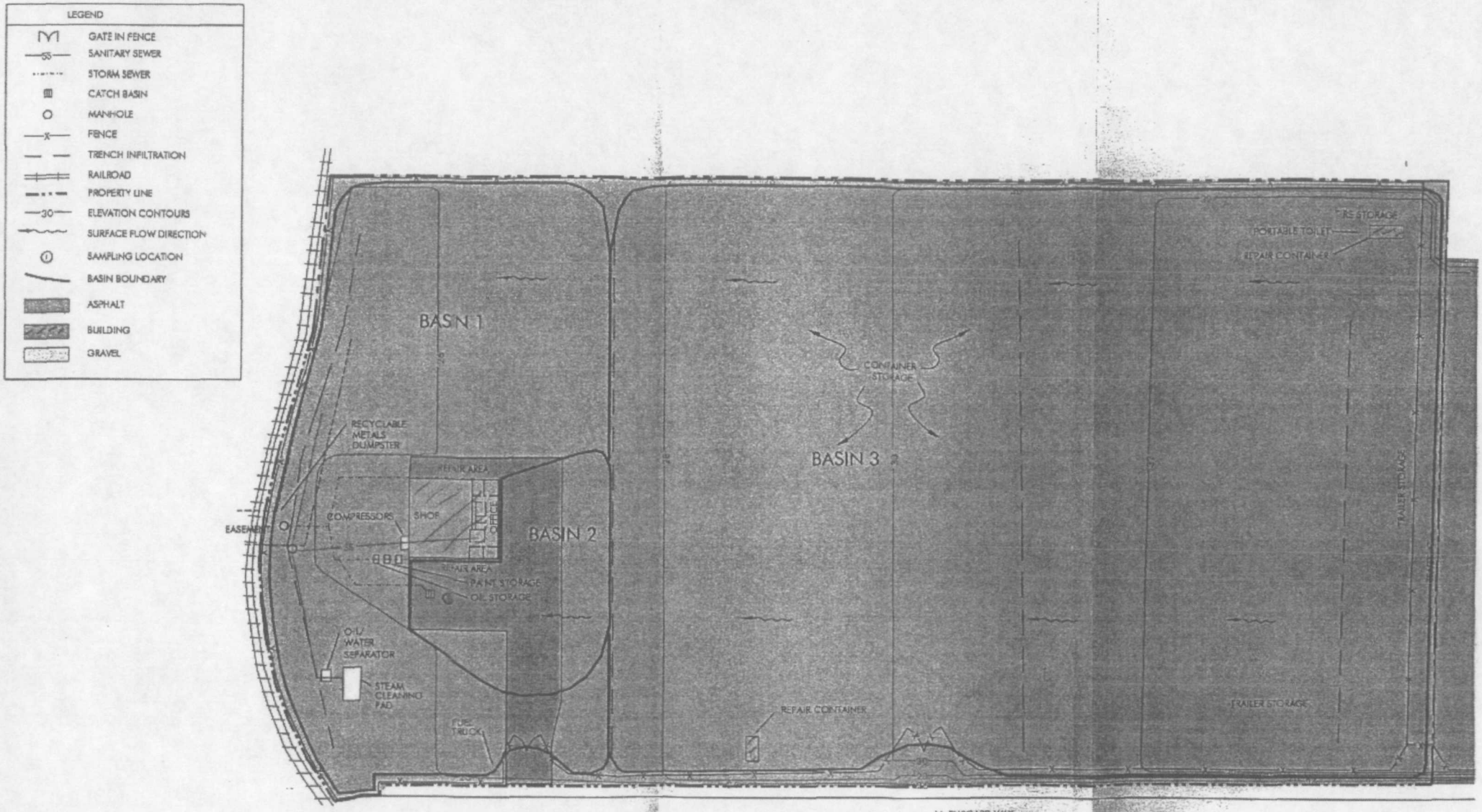

DATE:	07/03/01
DESIGNED BY:	Aaron Wieling
DRAWN BY:	Stacy Kelley
CHECKED BY:	Richard Roche'
FILE NAME:	41309002.01.7V1
SCALE:	Approximately 1"=85'

CENTURY WEST
ENGINEERING CORPORATION
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PORTLAND CONTAINER REPAIR

41309002.01

SITE PLAN
WITH DRAINAGE ROUTES
AND SAMPLING LOCATIONS
Portland, Oregon

FIGU

2

Schnitzer Steel Industries (and Calbag Metals)

SCHNITZER STEEL INDUSTRIES (AND CALBAG METALS)

Oregon DEQ ECSI # 2355

12005 N. Burgard Road
DEQ Site Mgr: Alicia Voss
Latitude: 45.6102°
Longitude: -122.7724°
Township/Range/Section: 2N/1W/35

River Mile: 4 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Schnitzer Steel/Calbag site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

Overland transport of contaminants from the uplands to the river is expected to be minimal at the Schnitzer Steel Industries' (SSI) site. Soils with low levels of PCBs, PAHs, and metals are limited to deeper areas that are not in contact with surface water runoff (most of the area is paved). The armored nature of the shoreline minimizes migration of this deep soil to the river.

1.2. Riverbank Erosion

The Willamette River shoreline is currently covered with concrete riprap and is lightly vegetated in the upper portions. Old timber pilings left over from the Oregon Shipbuilding Corporation are located offshore in this area. No seeps or evidence of erosion were observed by Bridgewater (2000a). The shoreline of the International Terminal Slip is covered with dock structures on its southern side, unclassified fill at the head, and natural bank along its northern side (Integral et al. 2004).

1.3. Groundwater

No preferential pathways for groundwater movement have been identified at Schnitzer Steel or Calbag Metals. Chlorinated solvent plumes have been identified in the area of the former Northwest Oil Company tanks and in the northwest portion of the site. Insufficient data are available to assess whether the relatively low concentration chlorinated solvent plumes are a current source of contamination to the Willamette River.

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Overwater activities have occurred all along the shoreline of SSI and within the slip throughout the history of operations on this site. Leakage of petroleum products from the tank farm, spills of fuel and releases of contaminated ballast waters from ship operations, groundwater seeps, as well as stormwater runoff may have contaminated sediment in these areas (DEQ 1999, 2004).

Stormwater from the former shipyard discharged directly to the river, which could have possibly included commingled hazardous materials. Currently, stormwater collected at the SSI property is recycled into the scrap metal shredder operation. Elsewhere on the SSI site, stormwater is routed to seven NPDES-permitted outfalls, each serving a specific drainage basin that encompasses several different land use operations [see Supplemental Figure 1 from SSI's (2003) Stormwater Pollution Control Plan (SWPCP)]. An analysis of stormwater data for each basin by Bridgewater (2003c) found overall downward trends in concentrations and occasional exceedances of permit benchmark values since extensive BMPs have been instituted in each of the drainage basins. However, DEQ (2003, pers. comm.) has noted "chronic" exceedances of 1200Z benchmarks for some of these basins.

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The Schnitzer and Calbag Metals properties are situated along the upstream side of the International Terminal Slip and along the main river stem from the slip to about RM 4.1. The channel area in this portion of the river is characterized as transitional/depositional in the Portland Harbor Work Plan (Integral et al. 2004). The Sediment Trend Analysis® (STA®) results suggest that the nearshore area along this site, both along the river frontage as well as into the slip, alternates episodically between net accretion and net erosion. The STA® results suggest that the channel offshore of the site is in dynamic equilibrium. Time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) for the area shows small-scale (mostly less than 1 foot) sediment accretion along the Schnitzer side of the International Slip. Along the river frontage, no bathymetric change data were obtained above the –10 foot NAVD88 contour due to the presence of in-water structures and moored vessels. From the –10 to the –30 foot NAVD88 contours, areas of net sediment erosion (up to 1 foot in extent) predominate. From the –30 foot NAVD88 contour out into the main channel, areas of no measurable change are dominant. Finally, in the channel offshore of the upstream end of the site, a borrow area previously dredged –60 foot NAVD88 shows sediment accumulations up to about 1 foot in extent.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☐	
RI	☐	Phase I and II RI for Burgard Industrial Park (Bridgewater 2002a, 2003b)
FS	☐	
Interim Action/Source Control	☐	Stormwater BMPs for Burgard Industrial Park (Bridgewater 2003c)
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 2

4. SITE OWNER HISTORY

Owner/Occupant	Type of Operation	Years
Schnitzer Investment Corporation - **owner**	Real estate	1972-present
Lessees		
Schnitzer Steel Industries - **lessee**	Metals recycling, truck maintenance and repair, warehousing,	1960s to present
Calbag Metals - **lessee**	Recycling of non-ferrous metals	? to present
Various owners and lessees including U.S. Surplus Properties Corp., Beall Pipe and Tank, William and Elizabeth Shenker, Port of Portland and Broadway Holding Co.	Upland log storage and log rafting (1963 onward), filling of shipways (early 1960s to 1972), grain storage, steel pipe and tank manufacturing	1945 to 1972
U.S. Government, City of Portland, Oregon Shipbuilding - **owner**	Ship construction and other shipyard activities. Site was filled and slip was dredged prior to construction of shipyard and associated shipways.	1941 to 1945
Gatton Family - **owner**	Site generally undeveloped except for some oil storage along what is now the southwest edge of the International Terminal (Northwest Oil, predecessor of Time Oil).	Prior to 1941
Northwest Oil - **owner**	Petroleum products bulk storage terminal	1938

5. PROPERTY DESCRIPTION

The Schnitzer Investment Corporation's (SIC) 200-acre Burgard Industrial Park property (the Park) is located on the east side of the Willamette River at approximately RM 4 (Figure 1). This site summary incorporates the 11-acre International Terminal Slip and a number of other contiguous properties owned by SSI, as well as Calbag Metals, which is located in the southwestern portion of the Park adjacent to SSI.

The current site and surrounding land use is industrial in nature. Site features include offices, warehouses, and other buildings; paved or graveled work surfaces, roadways, and parking lots; railroad tracks; utilities (water, sewage, stormwater, electrical); small, above-ground storage facilities for fuels and oils, and some undeveloped areas. The majority of the land in the southwest portion of the Park is paved.

The site was originally low-lying marsh and lagoons that were filled with dredged material as part of the construction of the shipyards that operated during WWII. The International Terminal that divides the Burgard Industrial Park was also dredged at that time.

SSI applied for a dredging permit from the U.S Army Corps of Engineers on July 31, 2003, to conduct maintenance dredging of Berths 4 and 5, which are located on SSI's Willamette River shoreline. The proposed dredging footprint covers about 6.6 acres, with a maximum length of 1,600 feet and a maximum width of 220 feet. The project dredging volume would be approximately 61,00 cubic yards (cy), with another 40,000 cy to be dredged, as needed, for ongoing maintenance over the remainder of the permit duration (5 years). As of November 2004, this dredging project is underway. On November 6, 2003, SSI applied for a renewal of their lease from the Oregon Department of State Lands (DSL) for their wharf structure located in the slip.

6. CURRENT SITE USE

Unless stated otherwise, information in this section was obtained from Bridgewater (2000a).

Schnitzer Steel Industries. The SSI facility encompasses the southwest portion of the Burgard Industrial Park and the International Terminal Slip. The Willamette River abuts the SSI property to the west, NW Pipe to the east, and Cargill's grain elevators to the south. Large areas of the property are paved, leaving only small areas in the southwest portion and along the railroad tracks, the Willamette, and slip unpaved. Two main buildings, Building B and the Mold Loft Building, are found onsite.

SSI receives materials such as automobiles, appliances, discarded steel members, and other ferrous products via ship, truck, or occasionally rail. They process the scrap metal using a shearer or portable acetylene torches. Since 1980, white goods such as home appliances and autos are shredded for metals recovery in the southwestern corner of the site.

Metals are separated from non-metal material after shredding. Non-metal material is disposed of at local landfills. SSI accepts no hazardous materials. Waste materials generated at the site include automobile shredder residue (historically contained PCBs), non-metallic debris, used oil and antifreeze, solvents, and other solid wastes. SSI is a conditionally exempt hazardous waste generator. Waste materials are either recycled or disposed of by offsite contractors or is recycled onsite.

The automobile shredder residue (ASR) process is fully enclosed in the former shipyard Plate Shop building and uses an enhanced metals recovery and waste minimization system. The ASR is used as an alternative daily cover at the Columbia Ridge landfill.

SSI operates a maintenance facility in the northern end of Building B to repair onsite equipment such as loaders, cranes, trucks and the shredder and shearer. They also receive and store bulk commodities at the site, which are unloaded by three rail-mounted cranes along the International Terminals Slip and stored in the northern portion of the site (either on pavement or in a building). A water-supply well (140 feet deep) for the shredder cooling system was drilled in the southwest part of the site in 1979. Occasionally, this water is also used for dust suppression.

Ten aboveground storage tanks holding waste oil, hydraulic oil, and other petroleum products are located on the site. All have secondary containment. Two 10,000-gallon underground tanks that stored diesel and gasoline were removed in 1988. A 270-gallon water tank is used to store water for the shredder's recycled cooling water system.

Schnitzer Investment Company has employed a series of operational and structural BMPs to facilitate compliance with their NPDES 1200Z permit. Stormwater at the SSI facility is either recycled in the shredder cooling water system or conveyed to 15 outfalls along the slip or river under a general NPDES stormwater permit. These outfalls are listed in Section 10.3.2 below. Effluent from two of the outfalls passes through oil/water separators before being discharged. Effluent from a third outfall is treated using a Vortech[tm] treatment system and sand filtration. Most catch basins have absorbent filters, and about 80 percent of the stormwater catch basins have an inverted outflow pipe to trap oil and grease. There are 14 oil/water separators on the SSI property alone.

Calbag Metals. Calbag Metals occupies approximately 2 acres in southwest corner of the Park where the facility receives, briefly stores, and transports non-ferrous metals offsite for recycling. Most scrap materials are obtained from private parties. Calbag does not accept batteries, fluorescent light fixtures, sealed electric motors, transformers, containers with residual products, and appliances. Accepted material is sorted and stored in steel drop boxes or totes for transport to Calbag's main facility on Nicolai Street in Portland. Aluminum, copper, and stainless steel are the primary materials handled at the facility. Generally, no cutting or processing of scrap metal is performed here. An outside vendor services forklifts and other equipment. A 250-gallon aboveground diesel storage tank is located in the northeast corner of the property.

Calbag Metals does not have a stormwater permit. Stormwater runoff is conveyed to catch basins and discharged to the Park's storm drain system. Oil stains were observed on pavement near a stormwater catch

basin located in the northern portion of property, suggesting that oily runoff has flowed to the catch basin (Bridgewater 2000a).

7. SITE USE HISTORY

Prior to 1941, the property was largely undeveloped except for bulk petroleum storage in six aboveground storage tanks near the river. During WWII, the site was the location of a large shipyard owned by the Oregon Shipbuilding Corporation. The deep draft International Terminals Slip was created during this period, and portions of the marshy, low-lying areas on the site were filled. Over 450 ships were built on this property from 1941 to late 1945. There were 11 identical shipways along the western edge of the site. Sewage and stormwater was conveyed to outfalls along the river. At the end of the war, activities onsite ended immediately. Between 1945 and 1972, industrial use was limited following dismantling of the shipyard, but activities included metals fabrication, filling of shipways associated with the former shipyard, log rafting, and upland log storage. Schnitzer purchased the property in 1972 for use as a metals scrap yard. SSI began their automobile shredding operation in 1980. A fire occurred in a stack of crushed automobile bodies on the site in 1997 and was extinguished by the Portland Fire Department using water pumped from the river. Catch basins were sealed off, and the ponded water was pumped into the shredder cooling tanks. All catch basins were clean of debris and all solid debris was removed from the fire area (Bridgewater 2000b).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion. The source of the following information is Bridgewater (2001a), unless otherwise noted.

8.1. Uplands

Historic:

- Documented releases of oil from the former aboveground tanks near southwest shoreline of slip prior to 1941.
- Discharges of shipyard sanitary sewer wastes and stormwater directly to the Willamette River. At one time Outfall 1/WR-184, along the southern edge of the site, was blocked and eventually breached, discharging stormwater to subsurface soils. This line has since been repaired.
- Assembly, blasting, and painting on the former shipways. Typical paints included anticorrosive and antifouling additives. This area was filled over a 10-year period in the 1960s and 1970s.
- Storage of auto shredder residue from the metal scrap yard. Historically, auto shredder residue has contained low levels of cadmium, lead, and PCBs (Bridgewater 2001a).

Current:

- Documented soil and groundwater contamination at some locations. Sampling has identified PCBs, TPH, PAHs, and lead in soils. Documented deep (greater than 100 feet bgs) groundwater contamination. Shallow and deeper groundwater impacted by chlorinated volatile organics. The plumes have the potential to impact adjacent river sediments.

- Stormwater that discharges directly to the slip and the Willamette has had elevated concentrations of oil and grease and metals (DEQ 2003, pers. comm.).

8.2. Overwater Activities

☒ Yes ☐ No

Historic:

After ships were assembled in the shipways, they were moored along the southern edge of the slip for outfitting. This included installing interior mechanical and electrical features and deck painting. Incidental spills of paint residue and fuels into the slip were possible during this time. In 1945, a fire destroyed the dock and shops along the south side of the dock. Several ships were damaged, and cranes fell into the slip as the dock collapsed (Bridgewater 2001a).

Current:

Scrap metal sometimes arrives at the SSI dock in the International Terminals Slip by barge. Bulk materials are loaded and off-loaded by using three dock-mounted cranes. Current uses of the dock may have resulted in inadvertent releases of diesel, motor oils, or other contaminants to the river, as described further below. The SSI dock and wharf structure are leased by SSI from Oregon DSL.

8.3. Spills

Known or documented spills at the SSI/Calbag site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

DEQ's ERIS database contains numerous incidents of oily sheens observed on the river surface in the International Terminals Slip, which are not listed below. Barge activities associated with Schnitzer Steel's operations are the suspected sources of these spills, but some could have originated from stormwater outfalls.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
5/22/00	Diesel	Unknown	Willamette River	Unknown
3/29/01	Oil/water ballast	Unknown	Willamette River	Unknown
9/02/03	Diesel	10	Deck of barge, 1 gallon to Willamette River	No

9. PHYSICAL SITE SETTING

The Schnitzer Burgard Industrial Park is fairly level with ground surface elevations ranging between 20 to 30 feet above msl. The topography gently slopes from east to west across the site, with the exception of a steep embankment along the Willamette River and the slip channel (DEQ 1999). The Park lies along the northeastern bank of the Willamette River where deposits from high-energy Pleistocene floods formed a peninsular terrace at the convergence of the Willamette and Columbia rivers. The southern two-thirds of the Schnitzer Burgard Industrial Park lie within the Willamette River's 100-year flood zone (DEQ 1999). Schnitzer Steel and Calbag Metals are located in the southwest corner of the Schnitzer Burgard Industrial Park (see Figure 1).

9.1. Geology

The near-surface geology at the Schnitzer Burgard Industrial Park is dominated by the presence of dredge fill placed during the development of the industrial park in the late 1930s and during filling of the shipways in the later 1960s and early 1970s (Bridgewater 2002a). The dredge fill,

consisting of a mixture of brown sand and silty sand, varies in thickness across the Schnitzer Burgard Industrial Park from 25 to 35 feet along the river and thinning to 15 feet along the eastern edge of the site (Bridgewater 2001b).

Six soil probe borings and six monitoring wells have been completed at SSI and Calbag Metals during site investigations (Bridgewater 2002a, 2003b). The maximum depth explored was 30 feet bgs. One industrial water supply well is present on the Schnitzer Steel property, located in the southern corner of the property [see Supplemental Figure 2-1 from Bridgewater (2002a)]. The industrial water supply well was completed to a depth of 142 feet bgs.

Based on the findings from the site investigations, the SSI and Calbag Metals properties are underlain by dredge sand fill to a depth of 10 to 25 feet. Quaternary silt, sandy silt, and silty sand are present beneath the fill to124 feet bgs. Below this, the Quaternary deposits consist of coarser material composed of sand and gravel and may represent the Pleistocene flood gravels. In an industrial water production well on an adjacent property to the east (Northwest Pipe Company), the coarser sand and gravel were present to a depth of 220 feet bgs (CH2M HILL 2000). The coarser-grained material in these areas may represent Pleistocene flood gravels and/or possibly the Troutdale Formation. Between 220 and 258 feet bgs, silty clay and clay with minor lenses of gravel were noted (CH2M HILL 2000). The latter unit may represent the Sandy River Mudstone.

9.2. Hydrogeology

Localized zones of perched groundwater may be present in the dredge fill (Bridgewater 2001b). Such perched zones have been encountered at a depth of about 15 to 20 feet on nearby properties. The presence and extent of the perched zones are expected to be variable and related to the presence of higher silt content in the dredge fill. The groundwater flow gradients in the perched zones are anticipated to be variable and relatively low; and discharge from the perched groundwater zones either discharges toward the river or infiltrates downward into the underlying dredge fill and alluvial deposits (Bridgewater 2001b). A more continuous unconfined groundwater zone is anticipated within the alluvial deposits underlying the dredge fill (Bridgewater 2001b) and potentially including the lower portion of the dredge fill itself. The groundwater flow direction in the alluvial groundwater zone is generally to the west, toward the Willamette River, with local variations in groundwater flow expected. The alluvial groundwater zone is anticipated to discharge to the river (Bridgewater 2001b).

Based on groundwater level measurements in the soil probe borings and monitoring wells completed at the site (Bridgewater 2002a, 2003b), the depth to groundwater ranged from 12 to 20 feet bgs. The groundwater sampled during the site investigations appears to be from the unconfined alluvial groundwater zone. Site-specific information related to groundwater gradient is not available.

Schnitzer Steel is bounded on the west by the Willamette River and on the north by the International Terminal Slip. Stormwater discharge lines from the site discharge at outfalls along the Willamette River and the International Terminal Slip (Bridgewater 2003c) [see Supplemental Figure 1 from SSI's Storm Water Pollution Control Plan (Bridgewater 2003c)]. No seeps were identified at the Schnitzer Steel or Calbag Metals sites (GSI 2003).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

During the Phase I RI, Bridgewater (2002a) collected soil samples from a push-probe exploration in the southwest area where ASR is temporarily staged [see Supplemental Figure 2-1 from Bridgewater (2002a)]. Minimum and maximum concentrations are provided below:

Analyte	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Total Petroleum Hydrocarbons (TPH)		
TPH-G	20 U	20 U
TPH-D	50 U	289
TPH-Dx (Heavy Oil Range)	100 U	415
Polycyclic Aromatic Hydrocarbons (PAHs)		
Anthracene	0.33 U	2.14
Benzo(a)pyrene	0.33 U	2.46
Benzo(b)fluoroanthene	0.33 U	2.2
Benzo(k)fluoroanthene	0.33 U	1.47
Chrysene	0.33 U	2.73
Fluoranthene	0.33 U	4.88
Pyrene	0.33 U	5.04
LPAH	0.33 U	3.71
HPAH	0.33 U	24.47
Volatile Organic Compounds (VOCs)		
Tetrachlorethene	0.1 U	0.111
Polychlorinated Biphenyls (PCBs)		
	0.67 U	0.922
Metals		
Antimony	0.5 U	3.6
Arsenic	2.44	7.59
Cadmium	0.5 U	0.808
Chromium	13.1	47.2
Copper	13.3	133
Lead	2.9	529
Mercury	0.1 U	0.232
Nickel	14.7	33.9
Zinc	35.6	995

mg/kg = milligrams per kilogram (ppm)
U = Not detected at reporting limit.

Samples were also collected by Bridgewater in the area of the former shipyard sanitary sewer and stormwater discharges as well as the shipways [see Supplemental Figure 2-1 from Bridgewater (2002a)]. Elevated concentrations of arsenic, cadmium, copper, lead, and zinc were detected in soil samples collected from 18 feet in MW-2, located in the far northwest corner of the SSI property. PCBs, diesel-range TPH, heavy-oil-range TPH, and total PAHs

were also detected in deep soil samples from MW-2. Bridgewater found low concentrations of heavy oil TPH and total PAH in soil samples collected from 7-12 feet bgs in MW-1 in the area of the former Northwest Oil Company tanks (see Supplemental Figure 2-1).

10.1.2. Riverbank Samples

☒ Yes ☐ No

During the Phase II RI, Bridgewater (2003b) collected soil and groundwater samples along the bank to determine if there were current pathways for site contaminants to reach the river. A series of push-probes were advanced 25-30 feet bgs in the northwest portion of SSI's property to delineate the extent of PAHs, PCBs, TPH, and metals in subsurface soils [see Supplemental Figure 3 from Bridgewater (2003b)]. Concentrations of these analytes were all lower than DEQ's soil matrix and applicable draft Generic Risk-based Concentrations (RBCs). Deep soil in this area is not in direct contact with the river due to the armored nature of the site shoreline (Bridgewater 2003b).

10.1.3. Summary

Soil contamination appears to be limited to low levels of PCBs, PAHs, and metals in deep soils in the area of the former oil tank farm. This soil is isolated from surface water runoff, and the armored nature of the shoreline minimizes migration of this deep soil to the river. Low levels of PAH, PCBs, TPH were detected from samples collected near the river bank, In the ASR staging area, arsenic, copper, lead, mercury, nickel, and zinc were detected at elevated levels in shallow soil samples.

10.2. Groundwater

The current groundwater chemistry data set consists of groundwater samples collected from six temporary well points, six monitoring wells, and one industrial water supply well. The industrial water supply well was sampled for one event. Five of the six monitoring wells have been monitored routinely by Bridgewater since installation in January 2002.

10.2.1. Groundwater Investigations

☒ Yes ☐ No

In December 2001 and January 2002, two soil probe borings and six monitoring wells were completed by Bridgewater [see Supplemental Figure 2-1 from Bridgewater (2002a)]. Groundwater samples were collected from a temporary well point installed in the one of the soil probe borings and from each of the six monitoring wells. The groundwater sample collected from the temporary well point was analyzed for VOCs, and the groundwater samples collected from the monitoring wells were analyzed for TPH, VOCs, SVOCs, and metals. Several of the groundwater samples also were analyzed for PCBs. A groundwater sample was collected from one onsite industrial water supply well (Well No. 6) [see Supplemental Figure 2-1 from Bridgewater (2002a)], which was analyzed for VOCs.

In April 2003, Bridgewater (2003b) completed four additional soil probe borings [see Supplemental Figure 3 from Bridgewater (2003b)]. Groundwater samples were collected from temporary well points in each of the four soil probe borings and were analyzed for VOCs.

The industrial water supply well (Well No. 6) was completed in 1979 to a depth of 142 feet bgs and is screened much deeper (132 to 142 feet bgs) in the Quaternary alluvium than the monitoring wells at the site. The Oregon Water Resources Department well identification number associated with this industrial water supply well is MULT 1825.

10.2.2. NAPL (Historic & Current)

☐ Yes ☒ No

No evidence of NAPL has been reported.

10.2.3. Dissolved Contaminant Plumes ☒ Yes ☐ No

Groundwater samples collected during past investigations have had detections of VOCs (chlorinated solvents), SVOCs, and dissolved metals. Specific constituents historically detected in groundwater at the site are detailed in the table below. The most recent groundwater detections are detailed in a subsequent section.

VOCs	SVOCs	Dissolved Metals
Tetrachloroethene (PCE)	3,4-Methylphenol	Arsenic
Trichloroethene (TCE)		Barium
cis-1,2-Dichloroethene (cis-1,2-DCE)		Chromium
Vinyl Chloride		Copper

The single SVOC detected in groundwater was 3,4-methylphenol. This SVOC was detected in one monitoring well one time, and was not detected again in subsequent groundwater samples collected from the monitoring well.

Low concentrations of dissolved metals detected in the alluvial aquifer zone include arsenic, barium, chromium, and copper. The measured concentrations of dissolved metals are similar to concentrations measured throughout the Portland area and could represent a naturally occurring groundwater concentration (Bridgewater 2002a).

Plume Characterization Status ☐ Complete ☒ Incomplete

VOCs have been detected in the northwest corner of the SSI property (see Figure 2). The VOC plume appears to be isolated to the shallow alluvium in this portion of the SSI property. The groundwater sample from the onsite industrial water supply well (deeper alluvium) was non-detect for VOCs. Insufficient data have been collected to determine the downgradient extent of the plume; however, concentrations of VOCs detected at the downgradient monitoring points are relatively low.

Plume Extent

Based on information reviewed, GSI identified a VOC plume in the area of the former Northwest Oil Company tanks and in the northern end of the former shipyard shipways. A historical release of oil from these tanks has been documented (Bridgewater 2001b); however, chlorinated solvents were not reportedly stored in the tanks or used in the area. The source of the chlorinated solvents in groundwater has not been determined.

Min/Max Detections (Current situation)

The most recently reported groundwater samples were collected in March and April 2003 (Bridgewater 2003b, 2003c). The minimum and maximum detections in groundwater are provided in the table below.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
VOCs		
Tetrachloroethene, (PCE)	< 1	32.7
Trichloroethene, (TCE)	< 1	20.1
cis-1,2-Dichloroethene (cis-1,2-DCE)	< 1	14.3
Vinyl Chloride	< 1	1.23
Dissolved Metals		
Arsenic	< 1	37.7
Barium	< 1	113
Chromium	< 1	1.1
Copper	< 1	1.06

Current Plume Data

The VOC groundwater plume was estimated by GSI using groundwater data collected from monitoring wells supplemented with data collected from temporary wells points. The estimated lateral extent of the chlorinated solvent plume identified at the site is shown in Figure 2.

Preferential Pathways

No preferential groundwater pathways have been identified at the site. No information on the relationship between subsurface utilities and shallow groundwater has been reviewed.

Downgradient Plume Monitoring Points (min/max detections)

Monitoring well MW-2 is located approximately 55 feet from the Willamette River in the downgradient portion of the identified chlorinated solvent plume. Minimum and maximum concentrations of VOC constituents detected in groundwater samples collected from this well are summarized in the following table.

Analyte	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)
VOCs		
Tetrachloroethene, (PCE)	< 1	7.76
Trichloroethene, (TCE)	< 1	8.90
cis-1,2-Dichloroethene (cis-1,2-DCE)	< 1	1.97

Visual Seep Sample Data

☐ Yes ☒ No

No seeps have been identified at the site (GSI 20

Nearshore Porewater Data

Nearshore porewater data have not been collected at the site.

Groundwater Plume Temporal Trend

Groundwater temporal trends have not been evaluated because the temporary well points were sampled only once and the monitoring wells have been sampled only twice for VOCs.

10.2.4. Summary

Groundwater investigations have included groundwater data collected from six temporary well points, six monitoring wells, and one industrial well. Five of the six monitoring wells have been monitored routinely since installation in January 2002. Chlorinated solvent plumes have been identified in the area of the former Northwest Oil Company tanks and in the northwest portion of the site. Insufficient data have been collected to determine the source and downgradient extent of the plume; however, concentrations of VOCs detected at the downgradient monitoring points are relatively low. No preferential groundwater pathways have been identified, so any potential plume movement likely will be in the general direction of groundwater flow.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

SSI has employed structural and operational BMPs from their Stormwater Pollution Control Plan at their properties in the Burgard Industrial Park. The stormwater drainage basins and discharge systems for this area of the park are shown in Supplemental Figure 1 from SSI (2003). There are 15 active, 3 abandoned, and 2 remnant outfalls in this portion of the Burgard Industrial Park, as listed below:

- **Outfall 1/WR-184** (Willamette River)
- **Outfall 2/WR-109** (Willamette River)
- **Outfalls 3A & 3B/WR-110** (Willamette River)
- **Outfalls 4A & 4B/WR-111** (Willamette River)
- **Outfalls 5A & 5B/ WR-#? (confirm)** (Willamette River)
- **Outfall 6A/WR-112** (Willamette River)
- **Outfall 7/WR-113** (Willamette River)
- **Outfall 8** (Willamette River): abandoned
- **Outfall 9** (Willamette River): abandoned
- **Outfall 10/WR-116** (International Terminals Slip)
- **Outfall 11/WR-118** (International Terminals Slip): remnant of historical shipyard, no longer discharges stormwater
- **Outfall 12** (International Terminals Slip): abandoned
- **Outfall 13/WR-#?(confirm)** (International Terminals Slip)
- **Outfall 14/WR-119?(confirm)** (International Terminals Slip)
- **Outfall 15/WR-120** (International Terminals Slip)
- **Outfall 16/WR-121** (International Terminals Slip)
- **Outfall 17/WR-122** (International Terminals Slip): remnant of historical shipyard, no longer discharges stormwater.

Calbag Metals does not have a stormwater permit. Stormwater runoff is conveyed to catch basins and discharged to the park's storm drain system.

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

Permit Holder	Permit Type	Permit Number	Start Date	Outfalls	Volumes	Parameters/Frequency
SSI	GEN12Z	108103	?	18/WR-123?	?	Standard[1]/twice yearly

[1] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☒ Yes ☐ No

A sediment sample was collected from a stormwater catch basin in 1997 and analyzed for TCLP metals. Only barium (1 mg/kg) and chromium (0.33 mg/kg) were detected at concentrations below characteristic waste levels (Bridgewater 2000b).

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Prior to the implementation of a Stormwater Pollution Control Plan and operational and structural stormwater BMPs for Burgard's drainage basins, stormwater was likely discharged directly to the river and slip. Currently, stormwater is either recycled into the shredder operation at SSI or discharged through 15 outfalls along the river and slip under an NPDES permit. According to DEQ (2003, pers. comm.), permit benchmarks for stormwater have been exceeded most often for stormwater from the SSI property. Low concentrations of barium and chromium were detected in a single catch basin sediment sample on SSI property in 1997 (Bridgewater 2000a,b).

Calbag Metals does not have a stormwater permit, and their stormwater runoff is conveyed to catch basins and discharged to the park's storm drain system.

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

Since 1997, sediment samples have been collected during four investigations within the Willamette River in the vicinity of SSI/Calbag (Figure 1). The largest data set was collected in 2003 by Floyd Snider McCarthy (FSM) during a sediment investigation of the International Terminals Slip (Survey WLCITC03). They collected six surface and subsurface sediment samples at several locations along the main stem of the river and within the slip (FSM 2003). SSI (1998) collected a single sediment sample at the mouth of the slip in 1998 (Survey WLCITH98). Weston (1998) collected surface and subsurface sediment from two locations along the main stem of the river offshore from SSI in 1997 (SurveyWR-WS198). Finally, two surface and subsurface sediment samples were collected during the Round 1 sediment investigation (Survey LWG01; Integral 2004). Sediment concentrations from all of these investigations are summarized in Table 2.

During Bridgewater's Phase I RI, a surface soil sample was collected beneath the discharge point for Outfall 7/WR-113, located in the northern portion of the site along the river in the area of the former Northwest Oil Company tanks. Arsenic, antimony, cadmium, chromium, copper, lead, mercury, nickel, and zinc all exceeded Portland Harbor sediment baseline concentrations. Copper was detected as high as 660 mg/kg.

A soil sample was also collected in the area of the suspected plugged storm drain line discussed in Section 8. Only one metal, chromium (47.2 mg/kg), was detected in a sample from a depth of 12 feet at a concentration slightly greater than the Portland Harbor sediment baseline value (Bridgewater 2002a).

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Schnitzer Investment Corporation has implemented a SWPCP at their properties in the Burgard Industrial Park. Bridgewater (2003c) performed a review and assessment of their BMPs and generally found that most operational BMPs are being properly implemented. Structural BMPs in 10 of the 13 basins onsite have either sand filters, oil/water separators, Storm Water Management ™ water treatment units, or Vortechnics ™ treatment units.

Two underground storage tanks (diesel and gasoline) were removed from the SSI property in

1988.

11.2. Groundwater Cleanup/Source Control

No groundwater source controls have been conducted at the site.

11.3. Other

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

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Figures:

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Figure 1. Stormwater Pollution Control Plan Site Map (SSI 2003)
Figure 2-1. Phase I Explorations-SW Area (Bridgewater 2002a)
Figure 3. Monitoring Well and Push Probe Locations - SSI Area (Bridgewater 2003b)

FIGURES

Figure 1. Site Features
Figure 2. Extent of Impacted Groundwater

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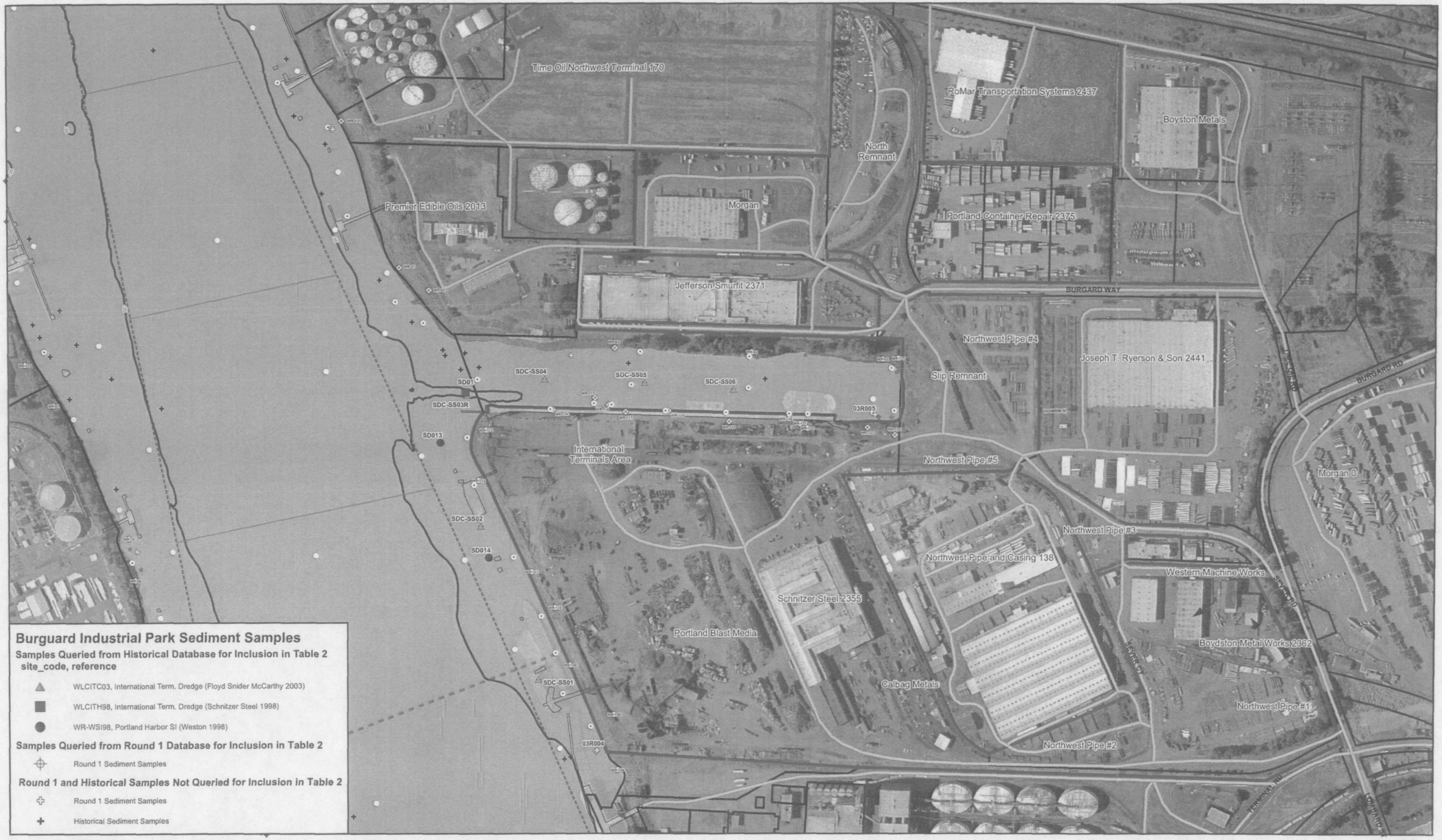

Burguard Industrial Park Sediment Samples

Samples Queried from Historical Database for Inclusion in Table 2
site_code, reference

- ▲ WLCITC03, International Term. Dredge (Floyd Snider McCarthy 2003)
- ■ WLCITH98, International Term. Dredge (Schnitzer Steel 1998)
- ● WR-WSI98, Portland Harbor SI (Weston 1998)

Samples Queried from Round 1 Database for Inclusion in Table 2

- Round 1 Sediment Samples

Round 1 and Historical Samples Not Queried for Inclusion in Table 2

- Round 1 Sediment Samples
- Historical Sediment Samples

integral

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)

Selected ECSI Site Property Boundary
35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 150 300 600 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Burgard Industrial Park
ECSI 2355

Groundwater Solutions Inc.

LWG
LOWER WILLAMETTE GROUP

0 250 500 Feet

FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS.
ECSI site locations were summarized in December, 2002
and January, 2003 from ODEQ ECSI files.

Map Creation Date: August 11, 2004

File Name: Fig2_BurgardSchnitzer_SummaryMap.mxd

LEGEND

Site Boundary

General Groundwater Flow

Maximum Detection Location

Contaminant Type

VOCs (HVOCs)

Extent of Impacted Groundwater

For details, refer to plume interpretation table in CSM document.

Single or isolated detection of COI's. Extent or continuity of impacted groundwater between sample points is uncertain. Color based on contaminant type.

Estimated extent of impacted groundwater area. Color based on contaminant type.

Figure 2
Portland Harbor RI/FS
Burgard Industrial Park - Schnitzer Steel
Upland Groundwater Quality Overview

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TABLES

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

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Schnitzer Steel Industries (and Calbag Metals) #2355
Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
A Location of former Northwest Oil Co. tanks	✓	✓	✓					✓	✓		✓						✓					?			
Former shipyard sanitary sewer and stormwater discharges				✓	?				?	?	?						?							✓	
Former shipyard shipways	✓	✓	?							?	✓						✓					?			
ASR on ground surface in SW area	✓	?															?	?						✓	
Stormwater outfalls					✓			✓								✓									
Overwater Areas																									
B Dock operations					✓			✓	✓														✓		
Other Areas/Other Issues																									

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	2	0	0						3.9 U	40 U	22	3.9 U	3.9 U
surface	Aroclor 1242 (ug/kg)	2	1	50	141	141	141	141	141	40 U	141	90.5	40 U	40 U
surface	Aroclor 1248 (ug/kg)	2	0	0						3.9 U	310 U	157	3.9 U	3.9 U
surface	Aroclor 1254 (ug/kg)	2	2	100	58.7	1500	779	58.7	58.7	58.7	1500	779	58.7	58.7
surface	Aroclor 1260 (ug/kg)	2	1	50	42.2	42.2	42.2	42.2	42.2	42.2	650 U	346	42.2	42.2
surface	Aroclor 1221 (ug/kg)	2	0	0						7.7 U	79 U	43.4	7.7 U	7.7 U
surface	Aroclor 1232 (ug/kg)	2	0	0						3.9 U	40 U	22	3.9 U	3.9 U
surface	Polychlorinated biphenyls (ug/kg)	2	2	100	242 A	1500 A	871	242 A	242 A	242 A	1500 A	871	242 A	242 A
surface	Butyltin ion (ug/kg)	1	1	100	8	8	8	8	8	8	8	8	8	8
surface	Dibutyltin ion (ug/kg)	1	0	0						5 U	5 U	5	5 U	5 U
surface	Tributyltin ion (ug/kg)	3	3	100	29.5	110	65.5	57	57	29.5	110	65.5	57	57
surface	Monobutyltin trichloride (ug/kg)	1	1	100	15.3 J	15.3 J	15.3	15.3 J	15.3 J	15.3 J	15.3 J	15.3	15.3 J	15.3 J
surface	Dibutyltin dichloride (ug/kg)	2	2	100	17 J	33.3 J	25.2	17 J	17 J	17 J	33.3 J	25.2	17 J	17 J
surface	Tributyltin chloride (ug/kg)	2	2	100	33.2	64	48.6	33.2	33.2	33.2	64	48.6	33.2	33.2
surface	Tetrabutyltin (ug/kg)	3	0	0						5 U	5.9 U	5.57	5.8 U	5.8 U
surface	Total solids (percent)	3	3	100	50.4	66	56.5	53	53	50.4	66	56.5	53	53
surface	Total organic carbon (percent)	5	5	100	1	2.4	1.48	1.38	1.41	1	2.4	1.48	1.38	1.41
surface	2,3,7,8-Tetrachlorodibenzo-p-dioxin (pg/g)	2	2	100	0.274 NJ	0.72 NJ	0.497	0.274 NJ	0.274 NJ	0.274 NJ	0.72 NJ	0.497	0.274 NJ	0.274 NJ
surface	Tetrachlorodibenzo-p-dioxin (pg/g)	2	2	100	3.32 NJ	13.2 NJ	8.26	3.32 NJ	3.32 NJ	3.32 NJ	13.2 NJ	8.26	3.32 NJ	3.32 NJ
surface	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (pg/g)	2	2	100	0.502 NJ	2.98 NJ	1.74	0.502 NJ	0.502 NJ	0.502 NJ	2.98 NJ	1.74	0.502 NJ	0.502 NJ
surface	Pentachlorodibenzo-p-dioxin (pg/g)	2	2	100	3.67 NJ	19.6 NJ	11.6	3.67 NJ	3.67 NJ	3.67 NJ	19.6 NJ	11.6	3.67 NJ	3.67 NJ
surface	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (pg/g)	2	2	100	0.811 NJ	3.98 NJ	2.4	0.811 NJ	0.811 NJ	0.811 NJ	3.98 NJ	2.4	0.811 NJ	0.811 NJ
surface	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (pg/g)	2	2	100	5.97 NJ	18.2 NJ	12.1	5.97 NJ	5.97 NJ	5.97 NJ	18.2 NJ	12.1	5.97 NJ	5.97 NJ
surface	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (pg/g)	2	2	100	2.53 NJ	10.5 NJ	6.52	2.53 NJ	2.53 NJ	2.53 NJ	10.5 NJ	6.52	2.53 NJ	2.53 NJ
surface	Hexachlorodibenzo-p-dioxin (pg/g)	2	2	100	32.1 NJ	124 NJ	78.1	32.1 NJ	32.1 NJ	32.1 NJ	124 NJ	78.1	32.1 NJ	32.1 NJ
surface	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (pg/g)	2	2	100	145 NJ	446 NJ	296	145 NJ	145 NJ	145 NJ	446 NJ	296	145 NJ	145 NJ
surface	Heptachlorodibenzo-p-dioxin (pg/g)	2	2	100	296 NJ	984 NJ	640	296 NJ	296 NJ	296 NJ	984 NJ	640	296 NJ	296 NJ
surface	Octachlorodibenzo-p-dioxin (pg/g)	2	2	100	1360 NJ	4220 NJ	2790	1360 NJ	1360 NJ	1360 NJ	4220 NJ	2790	1360 NJ	1360 NJ
surface	2,3,7,8-Tetrachlorodibenzofuran (pg/g)	2	2	100	1.05	8.74 D	4.9	1.05	1.05	1.05	8.74 D	4.9	1.05	1.05
surface	Tetrachlorodibenzofuran (pg/g)	2	2	100	10.2 NJ	96.3 NJ	53.3	10.2 NJ	10.2 NJ	10.2 NJ	96.3 NJ	53.3	10.2 NJ	10.2 NJ
surface	1,2,3,7,8-Pentachlorodibenzofuran (pg/g)	2	2	100	0.644 NJ	3.66 NJ	2.15	0.644 NJ	0.644 NJ	0.644 NJ	3.66 NJ	2.15	0.644 NJ	0.644 NJ
surface	2,3,4,7,8-Pentachlorodibenzofuran (pg/g)	2	2	100	0.981 NJ	5.56 NJ	3.27	0.981 NJ	0.981 NJ	0.981 NJ	5.56 NJ	3.27	0.981 NJ	0.981 NJ
surface	Pentachlorodibenzofuran (pg/g)	2	2	100	23.1 NJ	147 NJ	85.1	23.1 NJ	23.1 NJ	23.1 NJ	147 NJ	85.1	23.1 NJ	23.1 NJ
surface	1,2,3,4,7,8-Hexachlorodibenzofuran (pg/g)	2	2	100	3.15 NJ	12.6 NJ	7.88	3.15 NJ	3.15 NJ	3.15 NJ	12.6 NJ	7.88	3.15 NJ	3.15 NJ
surface	1,2,3,6,7,8-Hexachlorodibenzofuran (pg/g)	2	2	100	1.26 NJ	6.1 NJ	3.68	1.26 NJ	1.26 NJ	1.26 NJ	6.1 NJ	3.68	1.26 NJ	1.26 NJ
surface	1,2,3,7,8,9-Hexachlorodibenzofuran (pg/g)	2	1	50	0.335 NJ	0.335 NJ	0.335	0.335 NJ	0.335 NJ	0.08 U	0.335 NJ	0.208	0.08 U	0.08 U
surface	2,3,4,6,7,8-Hexachlorodibenzofuran (pg/g)	2	2	100	0.927 NJ	4.21 NJ	2.57	0.927 NJ	0.927 NJ	0.927 NJ	4.21 NJ	2.57	0.927 NJ	0.927 NJ
surface	Hexachlorodibenzofuran (pg/g)	2	2	100	41.2 NJ	184 NJ	113	41.2 NJ	41.2 NJ	41.2 NJ	184 NJ	113	41.2 NJ	41.2 NJ
surface	1,2,3,4,6,7,8-Heptachlorodibenzofuran (pg/g)	2	2	100	32.8 NJ	122 NJ	77.4	32.8 NJ	32.8 NJ	32.8 NJ	122 NJ	77.4	32.8 NJ	32.8 NJ
surface	1,2,3,4,7,8,9-Heptachlorodibenzofuran (pg/g)	2	2	100	2.7 NJ	6.35 NJ	4.53	2.7 NJ	2.7 NJ	2.7 NJ	6.35 NJ	4.53	2.7 NJ	2.7 NJ
surface	Heptachlorodibenzofuran (pg/g)	2	2	100	144 NJ	347 NJ	246	144 NJ	144 NJ	144 NJ	347 NJ	246	144 NJ	144 NJ
surface	Octachlorodibenzofuran (pg/g)	2	2	100	163 NJ	280 NJ	222	163 NJ	163 NJ	163 NJ	280 NJ	222	163 NJ	163 NJ
surface	Gravel (percent)	4	4	100	0.06	5.3	2.55	0.11	4.74	0.06	5.3	2.55	0.11	4.74
surface	Sand (percent)	2	2	100	27.46	30.93	29.2	27.46	27.46	27.46	30.93	29.2	27.46	27.46
surface	Very coarse sand (percent)	2	2	100	1.97	3.74	2.86	1.97	1.97	1.97	3.74	2.86	1.97	1.97
surface	Coarse sand (percent)	2	2	100	11.2	12.8	12	11.2	11.2	11.2	12.8	12	11.2	11.2

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Medium sand (percent)	2	2	100	32.2	39	35.6	32.2	32.2	32.2	39	35.6	32.2	32.2
surface	Fine sand (percent)	2	2	100	8.51	17.2	12.9	8.51	8.51	8.51	17.2	12.9	8.51	8.51
surface	Very fine sand (percent)	2	2	100	8.96	9.2	9.08	8.96	8.96	8.96	9.2	9.08	8.96	8.96
surface	Fines (percent)	2	2	100	69.01	72.43	70.7	69.01	69.01	69.01	72.43	70.7	69.01	69.01
surface	Silt (percent)	2	2	100	58.45	62.72	60.6	58.45	58.45	58.45	62.72	60.6	58.45	58.45
surface	Coarse silt (percent)	2	2	100	5.31	8.22	6.77	5.31	5.31	5.31	8.22	6.77	5.31	5.31
surface	Medium silt (percent)	2	2	100	4.3	5.72	5.01	4.3	4.3	4.3	5.72	5.01	4.3	4.3
surface	Fine silt (percent)	2	2	100	3.42	4.41	3.92	3.42	3.42	3.42	4.41	3.92	3.42	3.42
surface	Very fine silt (percent)	2	2	100	2.29	3.11	2.7	2.29	2.29	2.29	3.11	2.7	2.29	2.29
surface	Clay (percent)	2	2	100	9.71	10.56	10.1	9.71	9.71	9.71	10.56	10.1	9.71	9.71
surface	8-9 Phi clay (percent)	2	2	100	1.49	2	1.75	1.49	1.49	1.49	2	1.75	1.49	1.49
surface	9-10 Phi clay (percent)	2	2	100	1.23	1.33	1.28	1.23	1.23	1.23	1.33	1.28	1.23	1.23
surface	>10 Phi clay (percent)	2	2	100	0.87	1.46	1.17	0.87	0.87	0.87	1.46	1.17	0.87	0.87
surface	Dalapon (ug/kg)	2	0	0						16 U	450 U	233	16 U	16 U
surface	Dicamba (ug/kg)	2	0	0						3.1 U	3.2 U	3.15	3.1 U	3.1 U
surface	MCPA (ug/kg)	2	0	0						3100 U	3200 U	3150	3100 U	3100 U
surface	Dichloroprop (ug/kg)	2	0	0						6.2 U	6.4 UJ	6.3	6.2 U	6.2 U
surface	2,4-D (ug/kg)	2	0	0						6.2 U	6.4 U	6.3	6.2 U	6.2 U
surface	Silvex (ug/kg)	2	0	0						1.6 U	3 U	2.3	1.6 U	1.6 U
surface	2,4,5-T (ug/kg)	2	0	0						1.6 U	4.3 U	2.95	1.6 U	1.6 U
surface	2,4-DB (ug/kg)	2	0	0						31 U	71 U	51	31 U	31 U
surface	Dinoseb (ug/kg)	2	0	0						3.1 U	3.2 U	3.15	3.1 U	3.1 U
surface	MCPP (ug/kg)	2	0	0						3200 U	4300 U	3750	3200 U	3200 U
surface	Aluminum (mg/kg)	4	4	100	18200	40000	29100	20300	37800	18200	40000	29100	20300	37800
surface	Antimony (mg/kg)	3	3	100	1 J	11 J	7	9 J	9 J	1 J	11 J	7	9 J	9 J
surface	Arsenic (mg/kg)	4	3	75	3.32	7.8	5.37	5	5	3.32	7.8	5.28	5	5 U
surface	Cadmium (mg/kg)	4	4	100	0.318	0.9	0.505	0.4	0.4	0.318	0.9	0.505	0.4	0.4
surface	Chromium (mg/kg)	4	4	100	22.8	50	36.6	36.4	37	22.8	50	36.6	36.4	37
surface	Copper (mg/kg)	4	4	100	33.7	78.2	50.3	43.4	45.9	33.7	78.2	50.3	43.4	45.9
surface	Lead (mg/kg)	4	4	100	9	52 J	23.5	10	23	9	52 J	23.5	10	23
surface	Manganese (mg/kg)	2	2	100	663	671	667	663	663	663	671	667	663	663
surface	Mercury (mg/kg)	4	4	100	0.06	0.09 J	0.0688	0.06	0.065	0.06	0.09 J	0.0688	0.06	0.065
surface	Nickel (mg/kg)	4	4	100	21.5	29	26.7	27.9	28.4	21.5	29	26.7	27.9	28.4
surface	Selenium (mg/kg)	4	0	0						0.3 UJ	5 U	2.7	0.5 U	5 U
surface	Silver (mg/kg)	4	4	100	0.07 J	0.5	0.285	0.07	0.5	0.07 J	0.5	0.285	0.07	0.5
surface	Thallium (mg/kg)	2	2	100	9	11	10	9	9	9	11	10	9	9
surface	Zinc (mg/kg)	4	4	100	94.7	370	175	97.8	136	94.7	370	175	97.8	136
surface	Barium (mg/kg)	2	2	100	183	186	185	183	183	183	186	185	183	183
surface	Beryllium (mg/kg)	2	2	100	0.65	0.66	0.655	0.65	0.65	0.65	0.66	0.655	0.65	0.65
surface	Calcium (mg/kg)	2	2	100	8060	8420	8240	8060	8060	8060	8420	8240	8060	8060
surface	Cobalt (mg/kg)	2	2	100	17.9	18	18	17.9	17.9	17.9	18	18	17.9	17.9
surface	Iron (mg/kg)	2	2	100	40200	40800	40500	40200	40200	40200	40800	40500	40200	40200
surface	Magnesium (mg/kg)	2	2	100	6890	7000	6950	6890	6890	6890	7000	6950	6890	6890
surface	Potassium (mg/kg)	2	2	100	1270	1350	1310	1270	1270	1270	1350	1310	1270	1270
surface	Sodium (mg/kg)	2	2	100	1100	1240	1170	1100	1100	1100	1240	1170	1100	1100
surface	Vanadium (mg/kg)	2	2	100	98.5	103	101	98.5	98.5	98.5	103	101	98.5	98.5

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	2-Methylnaphthalene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Acenaphthene (ug/kg)	4	2	50	25.3	360 J	193	25.3	25.3	19 U	360 J	106	19 U	25.3
surface	Acenaphthylene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Anthracene (ug/kg)	4	2	50	37.2	4200	2120	37.2	37.2	19 U	4200	1070	19 U	37.2
surface	Fluorene (ug/kg)	4	2	50	21.2	830	426	21.2	21.2	19 U	830	222	19 U	21.2
surface	Naphthalene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Phenanthrene (ug/kg)	4	4	100	68	6900	1790	80	113	68	6900	1790	80	113
surface	Low Molecular Weight PAH (ug/kg)	4	4	100	68 A	12300 J	3160	80 A	197	68 A	12300 J	3160	80 A	197
surface	Dibenz(a,h)anthracene (ug/kg)	4	4	100	25	540 M	156	26.3 J	33	25	540 M	156	26.3 J	33
surface	Benz(a)anthracene (ug/kg)	4	4	100	72	6600 J	1710	89	94.7	72	6600 J	1710	89	94.7
surface	Benzo(a)pyrene (ug/kg)	4	4	100	100	5800 J	1540	110 J	130	100	5800 J	1540	110 J	130
surface	Benzo(b)fluoranthene (ug/kg)	4	4	100	84	4100 J	1100	107 J	110	84	4100 J	1100	107 J	110
surface	Benzo(g,h,i)perylene (ug/kg)	4	4	100	62 J	1700	484	80 J	94.7 J	62 J	1700	484	80 J	94.7 J
surface	Benzo(k)fluoranthene (ug/kg)	4	4	100	94.3 J	3300 J	909	100	140	94.3 J	3300 J	909	100	140
surface	Chrysene (ug/kg)	4	4	100	96	6300 J	1660	120	125	96	6300 J	1660	120	125
surface	Fluoranthene (ug/kg)	4	4	100	140	15000	3870	170	185	140	15000	3870	170	185
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	4	4	100	61	1900	529	74 J	82	61	1900	529	74 J	82
surface	Pyrene (ug/kg)	4	4	100	130	11000 J	2870	160	190	130	11000 J	2870	160	190
surface	Benzo(b+k)fluoranthene (ug/kg)	2	2	100	184 A	250 A	217	184 A	184 A	184 A	250 A	217	184 A	184 A
surface	High Molecular Weight PAH (ug/kg)	4	4	100	870 A	56200 J	14800	1100 J	1114 A	870 A	56200 J	14800	1100 J	1114 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	2	2	100	938 A	1194 A	1070	938 A	938 A	938 A	1194 A	1070	938 A	938 A
surface	2-Chlorobiphenyl (pg/g)	2	2	100	155 D	872	514	155 D	155 D	155 D	872	514	155 D	155 D
surface	3-Chlorobiphenyl (pg/g)	2	2	100	38.6 D	94.3	66.5	38.6 D	38.6 D	38.6 D	94.3	66.5	38.6 D	38.6 D
surface	4-Chlorobiphenyl (pg/g)	2	2	100	92 D	507	300	92 D	92 D	92 D	507	300	92 D	92 D
surface	2,2'-Dichlorobiphenyl (pg/g)	2	2	100	784 D	9070 D	4930	784 D	784 D	784 D	9070 D	4930	784 D	784 D
surface	2,3-Dichlorobiphenyl (pg/g)	2	2	100	33 D	520	277	33 D	33 D	33 D	520	277	33 D	33 D
surface	2,3'-Dichlorobiphenyl (pg/g)	2	2	100	410 D	5100 D	2760	410 D	410 D	410 D	5100 D	2760	410 D	410 D
surface	2,4-Dichlorobiphenyl (pg/g)	2	2	100	75.6 D	1040	558	75.6 D	75.6 D	75.6 D	1040	558	75.6 D	75.6 D
surface	2,4'-Dichlorobiphenyl (pg/g)	2	2	100	1780 D	22500 D	12100	1780 D	1780 D	1780 D	22500 D	12100	1780 D	1780 D
surface	2,5-Dichlorobiphenyl (pg/g)	2	2	100	123 D	1830	977	123 D	123 D	123 D	1830	977	123 D	123 D
surface	2,6-Dichlorobiphenyl (pg/g)	2	2	100	39.7 D	474	257	39.7 D	39.7 D	39.7 D	474	257	39.7 D	39.7 D
surface	3,3'-Dichlorobiphenyl (pg/g)	2	2	100	152	235 D	194	152	152	152	235 D	194	152	152
surface	3,4-Dichlorobiphenyl (pg/g)	2	2	100	224 CJ	1230 CJ	727	224 CJ	224 CJ	224 CJ	1230 CJ	727	224 CJ	224 CJ
surface	3,4'-Dichlorobiphenyl (pg/g)	2	0	0						C12	C12	C12	C12	C12
surface	3,5-Dichlorobiphenyl (pg/g)	2	0	0						0.409 U	3.95 UD	2.18	0.409 U	0.409 U
surface	4,4'-Dichlorobiphenyl (pg/g)	2	2	100	1480 D	10200 D	5840	1480 D	1480 D	1480 D	10200 D	5840	1480 D	1480 D
surface	2,2',3-Trichlorobiphenyl (pg/g)	2	2	100	1760 D	17100 D	9430	1760 D	1760 D	1760 D	17100 D	9430	1760 D	1760 D
surface	2,2',4-Trichlorobiphenyl (pg/g)	2	2	100	2160 D	17500 D	9830	2160 D	2160 D	2160 D	17500 D	9830	2160 D	2160 D
surface	2,2',5-Trichlorobiphenyl (pg/g)	2	2	100	4060 CJ	35500 CJ	19800	4060 CJ	4060 CJ	4060 CJ	35500 CJ	19800	4060 CJ	4060 CJ
surface	2,2',6-Trichlorobiphenyl (pg/g)	2	2	100	660 D	4660 D	2660	660 D	660 D	660 D	4660 D	2660	660 D	660 D
surface	2,3,3'-Trichlorobiphenyl (pg/g)	2	2	100	8790 CJ	38200 CJ	23500	8790 CJ	8790 CJ	8790 CJ	38200 CJ	23500	8790 CJ	8790 CJ
surface	2,3,4-Trichlorobiphenyl (pg/g)	2	2	100	3870 CJ	24900 CJ	14400	3870 CJ	3870 CJ	3870 CJ	24900 CJ	14400	3870 CJ	3870 CJ
surface	2,3,4'-Trichlorobiphenyl (pg/g)	1	1	100	2620 D	2620 D	2620	2620 D	2620 D	2620 D	2620 D	2620	2620 D	2620 D
surface	2,3,4'-Trichlorobiphenyl (pg/g)	1	1	100	2620 D	2620 D	2620	2620 D	2620 D	16500 D	16500 D	16500	16500 D	16500 D
surface	2,3,5-Trichlorobiphenyl (pg/g)	2	2	100	6.73 D	74.4	40.6	6.73 D	6.73 D	6.73 D	74.4	40.6	6.73 D	6.73 D
surface	2,3,6-Trichlorobiphenyl (pg/g)	2	2	100	80.9 D	599	340	80.9 D	80.9 D	80.9 D	599	340	80.9 D	80.9 D

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	2,3',4-Trichlorobiphenyl (pg/g)	2	2	100	1000 D	3490 D	2250	1000 D	1000 D	1000 D	3490 D	2250	1000 D	1000 D
surface	2,3',5-Trichlorobiphenyl (pg/g)	2	2	100	1760 CJ	8320 CJ	5040	1760 CJ	1760 CJ	1760 CJ	8320 CJ	5040	1760 CJ	1760 CJ
surface	2,3',6-Trichlorobiphenyl (pg/g)	2	2	100	418 D	2880	1650	418 D	418 D	418 D	2880	1650	418 D	418 D
surface	2,4,4'-Trichlorobiphenyl (pg/g)	2	0	0						C20	C20	C20	C20	C20
surface	2,4,5-Trichlorobiphenyl (pg/g)	2	0	0						C26	C26	C26	C26	C26
surface	2,4,6-Trichlorobiphenyl (pg/g)	2	0	0						C18	C18	C18	C18	C18
surface	2,4',5-Trichlorobiphenyl (pg/g)	2	2	100	7370 D	35400 J	21400	7370 D	7370 D	7370 D	35400 J	21400	7370 D	7370 D
surface	2,4',6-Trichlorobiphenyl (pg/g)	2	2	100	1840 D	10500 D	6170	1840 D	1840 D	1840 D	10500 D	6170	1840 D	1840 D
surface	2,3',4'-Trichlorobiphenyl (pg/g)	2	0	0						C21	C21	C21	C21	C21
surface	2,3',5'-Trichlorobiphenyl (pg/g)	2	2	100	27.6 D	183	105	27.6 D	27.6 D	27.6 D	183	105	27.6 D	27.6 D
surface	3,3',4-Trichlorobiphenyl (pg/g)	2	2	100	164 D	417	291	164 D	164 D	164 D	417	291	164 D	164 D
surface	3,3',5-Trichlorobiphenyl (pg/g)	2	0	0						0.765 U	4.64 UD	2.7	0.765 U	0.765 U
surface	3,4,4'-Trichlorobiphenyl (pg/g)	2	2	100	2300 D	9330 D	5820	2300 D	2300 D	2300 D	9330 D	5820	2300 D	2300 D
surface	3,4,5-Trichlorobiphenyl (pg/g)	2	2	100	8.22 KD	13.3 K	10.8	8.22 KD	8.22 KD	8.22 KD	13.3 K	10.8	8.22 KD	8.22 KD
surface	3,4',5-Trichlorobiphenyl (pg/g)	2	2	100	82.6 D	163	123	82.6 D	82.6 D	82.6 D	163	123	82.6 D	82.6 D
surface	2,2',3,3'-Tetrachlorobiphenyl (pg/g)	2	2	100	11100 CJ	19100 CJ	15100	11100 CJ	11100 CJ	11100 CJ	19100 CJ	15100	11100 CJ	11100 CJ
surface	2,2',3,4-Tetrachlorobiphenyl (pg/g)	2	0	0						C40	C40	C40	C40	C40
surface	2,2',3,4'-Tetrachlorobiphenyl (pg/g)	2	2	100	6350 D	8970 D	7660	6350 D	6350 D	6350 D	8970 D	7660	6350 D	6350 D
surface	2,2',3,5-Tetrachlorobiphenyl (pg/g)	2	2	100	975 D	1720	1350	975 D	975 D	975 D	1720	1350	975 D	975 D
surface	2,2',3,5'-Tetrachlorobiphenyl (pg/g)	2	2	100	30800 CJ	45900 CJ	38400	30800 CJ	30800 CJ	30800 CJ	45900 CJ	38400	30800 CJ	30800 CJ
surface	2,2',3,6-Tetrachlorobiphenyl (pg/g)	2	2	100	3010 CJ	7970 CJ	5490	3010 CJ	3010 CJ	3010 CJ	7970 CJ	5490	3010 CJ	3010 CJ
surface	2,2',3,6'-Tetrachlorobiphenyl (pg/g)	2	2	100	1280 D	2850	2070	1280 D	1280 D	1280 D	2850	2070	1280 D	1280 D
surface	2,2',4,4'-Tetrachlorobiphenyl (pg/g)	2	0	0						C44	C44	C44	C44	C44
surface	2,2',4,5-Tetrachlorobiphenyl (pg/g)	2	2	100	2690 D	8570 D	5630	2690 D	2690 D	2690 D	8570 D	5630	2690 D	2690 D
surface	2,2',4,5'-Tetrachlorobiphenyl (pg/g)	2	2	100	19000 CJ	28700 CJ	23900	19000 CJ	19000 CJ	19000 CJ	28700 CJ	23900	19000 CJ	19000 CJ
surface	2,2',4,6-Tetrachlorobiphenyl (pg/g)	2	2	100	4520 CJ	5430 CJ	4980	4520 CJ	4520 CJ	4520 CJ	5430 CJ	4980	4520 CJ	4520 CJ
surface	2,2',4,6'-Tetrachlorobiphenyl (pg/g)	2	0	0						C45	C45	C45	C45	C45
surface	2,2',5,5'-Tetrachlorobiphenyl (pg/g)	2	2	100	31700 D	112000 J	71900	31700 D	31700 D	31700 D	112000 J	71900	31700 D	31700 D
surface	2,2',5,6'-Tetrachlorobiphenyl (pg/g)	2	0	0						C50	C50	C50	C50	C50
surface	2,2',6,6'-Tetrachlorobiphenyl (pg/g)	2	2	100	54.2 D	104	79.1	54.2 D	54.2 D	54.2 D	104	79.1	54.2 D	54.2 D
surface	2,3,3',4-Tetrachlorobiphenyl (pg/g)	2	1	50	467	467	467	467	467	15.6 UD	467	241	15.6 UD	15.6 UD
surface	2,3,3',4'-Tetrachlorobiphenyl (pg/g)	2	2	100	7330 D	7570 D	7450	7330 D	7330 D	7330 D	7570 D	7450	7330 D	7330 D
surface	2,3,3',5-Tetrachlorobiphenyl (pg/g)	2	2	100	134	266 D	200	134	134	134	266 D	200	134	134
surface	2,3,3',5'-Tetrachlorobiphenyl (pg/g)	2	2	100	35.6	297 D	166	35.6	35.6	35.6	297 D	166	35.6	35.6
surface	2,3,3',6-Tetrachlorobiphenyl (pg/g)	2	2	100	1560 CJ	3260 CJ	2410	1560 CJ	1560 CJ	1560 CJ	3260 CJ	2410	1560 CJ	1560 CJ
surface	2,3,4,4'-Tetrachlorobiphenyl (pg/g)	2	2	100	3010 D	4230 D	3620	3010 D	3010 D	3010 D	4230 D	3620	3010 D	3010 D
surface	2,3,4,5-Tetrachlorobiphenyl (pg/g)	2	2	100	28300 CJ	76900 CJ	52600	28300 CJ	28300 CJ	28300 CJ	76900 CJ	52600	28300 CJ	28300 CJ
surface	2,3,4,6-Tetrachlorobiphenyl (pg/g)	2	0	0						C59	C59	C59	C59	C59
surface	2,3,4',5-Tetrachlorobiphenyl (pg/g)	2	2	100	918 D	933	926	918 D	918 D	918 D	933	926	918 D	918 D
surface	2,3,4',6-Tetrachlorobiphenyl (pg/g)	2	2	100	13600 D	13700 D	13700	13600 D	13600 D	13600 D	13700 D	13700	13600 D	13600 D
surface	2,3,5,6-Tetrachlorobiphenyl (pg/g)	2	0	0						C44	C44	C44	C44	C44
surface	2,3',4,4'-Tetrachlorobiphenyl (pg/g)	2	2	100	16000 D	22900 D	19500	16000 D	16000 D	16000 D	22900 D	19500	16000 D	16000 D
surface	2,3',4,5-Tetrachlorobiphenyl (pg/g)	2	2	100	632 D	897	765	632 D	632 D	632 D	897	765	632 D	632 D
surface	2,3',4,5'-Tetrachlorobiphenyl (pg/g)	2	2	100	54.3	280 D	167	54.3	54.3	54.3	280 D	167	54.3	54.3
surface	2,3',4,6-Tetrachlorobiphenyl (pg/g)	2	0	0						C49	C49	C49	C49	C49
surface	2,3',4',5-Tetrachlorobiphenyl (pg/g)	2	0	0						C61	C61	C61	C61	C61

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	2,3',4',6-Tetrachlorobiphenyl (pg/g)	2	0	0						C40	C40	C40	C40	C40
surface	2,3',5,5'-Tetrachlorobiphenyl (pg/g)	2	2	100	122	430 D	276	122	122	122	430 D	276	122	122
surface	2,3',5',6-Tetrachlorobiphenyl (pg/g)	2	0	0						0.93 U	14.7 UD	7.82	0.93 U	0.93 U
surface	2,4,4',5-Tetrachlorobiphenyl (pg/g)	2	0	0						C61	C61	C61	C61	C61
surface	2,4,4',6-Tetrachlorobiphenyl (pg/g)	2	0	0						C59	C59	C59	C59	C59
surface	2,3',4',5'-Tetrachlorobiphenyl (pg/g)	2	0	0						C61	C61	C61	C61	C61
surface	3,3',4,4'-Tetrachlorobiphenyl (pg/g)	2	2	100	1040 D	1330	1190	1040 D	1040 D	1040 D	1330	1190	1040 D	1040 D
surface	3,3',4,5-Tetrachlorobiphenyl (pg/g)	2	0	0						0.789 U	16.4 UD	8.59	0.789 U	0.789 U
surface	3,3',4,5'-Tetrachlorobiphenyl (pg/g)	2	2	100	80.4	3260 D	1670	80.4	80.4	80.4	3260 D	1670	80.4	80.4
surface	3,3',5,5'-Tetrachlorobiphenyl (pg/g)	2	0	0						0.878 U	14.6 UD	7.74	0.878 U	0.878 U
surface	3,4,4',5-Tetrachlorobiphenyl (pg/g)	2	2	100	46.2	63.9	55.1	46.2	46.2	46.2	63.9	55.1	46.2	46.2
surface	2,2',3,3',4-Pentachlorobiphenyl (pg/g)	2	2	100	1950	21800 D	11900	1950	1950	1950	21800 D	11900	1950	1950
surface	2,2',3,3',5-Pentachlorobiphenyl (pg/g)	2	2	100	7510 CJ	130000 CJ	68800	7510 CJ	7510 CJ	7510 CJ	130000 CJ	68800	7510 CJ	7510 CJ
surface	2,2',3,3',6-Pentachlorobiphenyl (pg/g)	2	2	100	4380 D	68600 D	36500	4380 D	4380 D	4380 D	68600 D	36500	4380 D	4380 D
surface	2,2',3,4,4'-Pentachlorobiphenyl (pg/g)	2	2	100	2690 CJ	29200 CJ	15900	2690 CJ	2690 CJ	2690 CJ	29200 CJ	15900	2690 CJ	2690 CJ
surface	2,2',3,4,5-Pentachlorobiphenyl (pg/g)	2	2	100	10000 CJ	159000 CJ	84500	10000 CJ	10000 CJ	10000 CJ	159000 CJ	84500	10000 CJ	10000 CJ
surface	2,2',3,4,5'-Pentachlorobiphenyl (pg/g)	2	0	0						C86	C86	C86	C86	C86
surface	2,2',3,4,6-Pentachlorobiphenyl (pg/g)	2	2	100	2570 CJ	32100 CJ	17300	2570 CJ	2570 CJ	2570 CJ	32100 CJ	17300	2570 CJ	2570 CJ
surface	2,2',3,4,6'-Pentachlorobiphenyl (pg/g)	2	2	100	273	1500 D	887	273	273	273	1500 D	887	273	273
surface	2,2',3,4',5-Pentachlorobiphenyl (pg/g)	1	2	200	13200 CJ	258000 CJ	136000	13200 CJ	13200 CJ	258000 CJ	258000 CJ	258000	258000 CJ	258000 CJ
surface	2,2',3,4',5-Pentachlorobiphenyl (pg/g)	1	2	200	13200 CJ	258000 CJ	136000	13200 CJ	13200 CJ	13200 CJ	13200 CJ	13200	13200 CJ	13200 CJ
surface	2,2',3,4',6-Pentachlorobiphenyl (pg/g)	2	0	0						C88	C88	C88	C88	C88
surface	2,2',3,5,5'-Pentachlorobiphenyl (pg/g)	2	2	100	2450	43900 D	23200	2450	2450	2450	43900 D	23200	2450	2450
surface	2,2',3,5,6-Pentachlorobiphenyl (pg/g)	2	2	100	13600 CJ	235000 CJ	124000	13600 CJ	13600 CJ	13600 CJ	235000 CJ	124000	13600 CJ	13600 CJ
surface	2,2',3,5,6'-Pentachlorobiphenyl (pg/g)	1	2	200	127	797 D	462	127	127	797 D	797 D	797	797 D	797 D
surface	2,2',3,5,6'-Pentachlorobiphenyl (pg/g)	1	2	200	127	797 D	462	127	127	127	127	127	127	127
surface	2,2',3,5',6-Pentachlorobiphenyl (pg/g)	2	0	0						C93	C93	C93	C93	C93
surface	2,2',3,6,6'-Pentachlorobiphenyl (pg/g)	2	2	100	263	1170 D	717	263	263	263	1170 D	717	263	263
surface	2,2',3,4',5'-Pentachlorobiphenyl (pg/g)	2	0	0						C86	C86	C86	C86	C86
surface	2,2',3,4',6'-Pentachlorobiphenyl (pg/g)	2	0	0						C93	C93	C93	C93	C93
surface	2,2',4,4',5-Pentachlorobiphenyl (pg/g)	2	0	0						C83	C83	C83	C83	C83
surface	2,2',4,4',6-Pentachlorobiphenyl (pg/g)	2	0	0						C93	C93	C93	C93	C93
surface	2,2',4,5,5'-Pentachlorobiphenyl (pg/g)	2	0	0						C90	C90	C90	C90	C90
surface	2,2',4,5,6'-Pentachlorobiphenyl (pg/g)	2	0	0						C93	C93	C93	C93	C93
surface	2,2',4,5',6-Pentachlorobiphenyl (pg/g)	2	2	100	115	1260 D	688	115	115	115	1260 D	688	115	115
surface	2,2',4,6,6'-Pentachlorobiphenyl (pg/g)	2	2	100	3.43	8.4 D	5.92	3.43	3.43	3.43	8.4 D	5.92	3.43	3.43
surface	2,3,3',4,4'-Pentachlorobiphenyl (pg/g)	2	2	100	5710 D	54500 D	30100	5710 D	5710 D	5710 D	54500 D	30100	5710 D	5710 D
surface	2,3,3',4,5-Pentachlorobiphenyl (pg/g)	2	0	0						0.66 U	15.7 UD	8.18	0.66 U	0.66 U
surface	2,3,3',4',5-Pentachlorobiphenyl (pg/g)	2	2	100	503 CJ	7110 CJ	3810	503 CJ	503 CJ	503 CJ	7110 CJ	3810	503 CJ	503 CJ
surface	2,3,3',4,5'-Pentachlorobiphenyl (pg/g)	2	0	0						C86	C86	C86	C86	C86
surface	2,3,3',4,6-Pentachlorobiphenyl (pg/g)	2	2	100	760	8920 D	4840	760	760	760	8920 D	4840	760	760
surface	2,3,3',4',6-Pentachlorobiphenyl (pg/g)	2	2	100	15900 CJ	302000 CJ	159000	15900 CJ	15900 CJ	15900 CJ	302000 CJ	159000	15900 CJ	15900 CJ
surface	2,3,3',5,5'-Pentachlorobiphenyl (pg/g)	2	1	50	15.6 D	15.6 D	15.6	15.6 D	15.6 D	0.584 U	15.6 D	8.09	0.584 U	0.584 U
surface	2,3,3',5,6-Pentachlorobiphenyl (pg/g)	2	0	0						0.558 U	11.1 UD	5.83	0.558 U	0.558 U
surface	2,3,3',5',6-Pentachlorobiphenyl (pg/g)	2	0	0						C90	C90	C90	C90	C90
surface	2,3,4,4',5-Pentachlorobiphenyl (pg/g)	2	2	100	350	3000 D	1680	350	350	350	3000 D	1680	350	350

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	2,3,4,4',6-Pentachlorobiphenyl (pg/g)	2	0	0						C110	C110	C110	C110	C110
surface	2,3,4,5,6-Pentachlorobiphenyl (pg/g)	2	0	0						C85	C85	C85	C85	C85
surface	2,3,4',5,6-Pentachlorobiphenyl (pg/g)	2	0	0						C85	C85	C85	C85	C85
surface	2,3',4,4',5-Pentachlorobiphenyl (pg/g)	2	2	100	11500 D	170000 J	90800	11500 D	11500 D	11500 D	170000 J	90800	11500 D	11500 D
surface	2,3',4,4',6-Pentachlorobiphenyl (pg/g)	2	0	0						C86	C86	C86	C86	C86
surface	2,3',4,5,5'-Pentachlorobiphenyl (pg/g)	2	2	100	6.82	185 D	95.9	6.82	6.82	6.82	185 D	95.9	6.82	6.82
surface	2,3',4,5',6-Pentachlorobiphenyl (pg/g)	2	1	50	0.759	0.759	0.759	0.759	0.759	0.759	11.5 UD	6.13	0.759	0.759
surface	2,3,3',4',5'-Pentachlorobiphenyl (pg/g)	2	2	100	194	2100 D	1150	194	194	194	2100 D	1150	194	194
surface	2,3',4,4',5'-Pentachlorobiphenyl (pg/g)	2	2	100	246	2900 D	1570	246	246	246	2900 D	1570	246	246
surface	2,3',4',5,5'-Pentachlorobiphenyl (pg/g)	2	0	0						C107	C107	C107	C107	C107
surface	2,3',4',5',6-Pentachlorobiphenyl (pg/g)	2	0	0						C86	C86	C86	C86	C86
surface	3,3',4,4',5-Pentachlorobiphenyl (pg/g)	2	2	100	25.8	225	125	25.8	25.8	25.8	225	125	25.8	25.8
surface	3,3',4,5,5'-Pentachlorobiphenyl (pg/g)	2	2	100	19.7	632 D	326	19.7	19.7	19.7	632 D	326	19.7	19.7
surface	2,2',3,3',4,4'-Hexachlorobiphenyl (pg/g)	2	2	100	2510 CJ	42000 CJ	22300	2510 CJ	2510 CJ	2510 CJ	42000 CJ	22300	2510 CJ	2510 CJ
surface	2,2',3,3',4,5-Hexachlorobiphenyl (pg/g)	2	2	100	15900 CJ	342000 CJ	179000	15900 CJ	15900 CJ	15900 CJ	342000 CJ	179000	15900 CJ	15900 CJ
surface	2,2',3,3',4,5'-Hexachlorobiphenyl (pg/g)	2	2	100	964	15700 D	8330	964	964	964	15700 D	8330	964	964
surface	2,2',3,3',4,6-Hexachlorobiphenyl (pg/g)	2	2	100	222	4280 D	2250	222	222	222	4280 D	2250	222	222
surface	2,2',3,3',4,6'-Hexachlorobiphenyl (pg/g)	2	2	100	4930	85600 D	45300	4930	4930	4930	85600 D	45300	4930	4930
surface	2,2',3,3',5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	168	2570 D	1370	168	168	168	2570 D	1370	168	168
surface	2,2',3,3',5,6-Hexachlorobiphenyl (pg/g)	2	2	100	858 CJ	13800 CJ	7330	858 CJ	858 CJ	858 CJ	13800 CJ	7330	858 CJ	858 CJ
surface	2,2',3,3',5,6'-Hexachlorobiphenyl (pg/g)	2	2	100	4650 CJ	60100 CJ	32400	4650 CJ	4650 CJ	4650 CJ	60100 CJ	32400	4650 CJ	4650 CJ
surface	2,2',3,3',6,6'-Hexachlorobiphenyl (pg/g)	2	2	100	1880	28600 D	15200	1880	1880	1880	28600 D	15200	1880	1880
surface	2,2',3,4,4',5-Hexachlorobiphenyl (pg/g)	2	2	100	752	16200 D	8480	752	752	752	16200 D	8480	752	752
surface	2,2',3,4,4',5'-Hexachlorobiphenyl (pg/g)	2	0	0						C129	C129	C129	C129	C129
surface	2,2',3,4,4',6-Hexachlorobiphenyl (pg/g)	2	2	100	252 CJ	5040 CJ	2650	252 CJ	252 CJ	252 CJ	5040 CJ	2650	252 CJ	252 CJ
surface	2,2',3,4,4',6'-Hexachlorobiphenyl (pg/g)	2	0	0						C139	C139	C139	C139	C139
surface	2,2',3,4,5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	2670	37200 D	19900	2670	2670	2670	37200 D	19900	2670	2670
surface	2,2',3,4,5,6-Hexachlorobiphenyl (pg/g)	2	0	0						0.75 U	8.5 UD	4.63	0.75 U	0.75 U
surface	2,2',3,4,5,6'-Hexachlorobiphenyl (pg/g)	2	0	0						C134	C134	C134	C134	C134
surface	2,2',3,4,5',6-Hexachlorobiphenyl (pg/g)	2	2	100	696 D	9720 D	5210	696 D	696 D	696 D	9720 D	5210	696 D	696 D
surface	2,2',3,4,6,6'-Hexachlorobiphenyl (pg/g)	2	2	100	6.54	127 D	66.8	6.54	6.54	6.54	127 D	66.8	6.54	6.54
surface	2,2',3,4',5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	1770	25100 D	13400	1770	1770	1770	25100 D	13400	1770	1770
surface	2,2',3,4',5,6-Hexachlorobiphenyl (pg/g)	2	2	100	12000 CJ	212000 CJ	112000	12000 CJ	12000 CJ	12000 CJ	212000 CJ	112000	12000 CJ	12000 CJ
surface	2,2',3,4',5,6'-Hexachlorobiphenyl (pg/g)	1	2	200	11.3	142 D	76.7	11.3	11.3	142 D	142 D	142	142 D	142 D
surface	2,2',3,4',5,6'-Hexachlorobiphenyl (pg/g)	1	2	200	11.3	142 D	76.7	11.3	11.3	11.3	11.3	11.3	11.3	11.3
surface	2,2',3,4',5',6-Hexachlorobiphenyl (pg/g)	2	0	0						C147	C147	C147	C147	C147
surface	2,2',3,4',6,6'-Hexachlorobiphenyl (pg/g)	2	2	100	14.4	246 D	130	14.4	14.4	14.4	246 D	130	14.4	14.4
surface	2,2',3,5,5',6-Hexachlorobiphenyl (pg/g)	2	0	0						C135	C135	C135	C135	C135
surface	2,2',3,5,6,6'-Hexachlorobiphenyl (pg/g)	2	2	100	13	279 D	146	13	13	13	279 D	146	13	13
surface	2,2',4,4',5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	10600 CJ	208000 CJ	109000	10600 CJ	10600 CJ	10600 CJ	208000 CJ	109000	10600 CJ	10600 CJ
surface	2,2',4,4',5,6'-Hexachlorobiphenyl (pg/g)	2	0	0						C135	C135	C135	C135	C135
surface	2,2',4,4',6,6'-Hexachlorobiphenyl (pg/g)	2	1	50	0.341	0.341	0.341	0.341	0.341	0.341	2.76 UD	1.55	0.341	0.341
surface	2,3,3',4,4',5-Hexachlorobiphenyl (pg/g)	2	2	100	1580	16300	8940	1580	1580	1580	16300	8940	1580	1580
surface	2,3,3',4,4',5'-Hexachlorobiphenyl (pg/g)	2	2	100	401	6800	3600	401	401	401	6800	3600	401	401
surface	2,3,3',4,4',6-Hexachlorobiphenyl (pg/g)	2	2	100	1660	25600 D	13600	1660	1660	1660	25600 D	13600	1660	1660
surface	2,3,3',4,5,5'-Hexachlorobiphenyl (pg/g)	2	1	50	1010 D	1010 D	1010	1010 D	1010 D	0.591 U	1010 D	505	0.591 U	0.591 U

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	2,3,3',4,5,6-Hexachlorobiphenyl (pg/g)	2	0	0						C129	C129	C129	C129	C129
surface	2,3,3',4,5',6-Hexachlorobiphenyl (pg/g)	2	0	0						0.647 U	10.2 UD	5.42	0.647 U	0.647 U
surface	2,3,3',4',5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	37.9	789 D	413	37.9	37.9	37.9	789 D	413	37.9	37.9
surface	2,3,3',4',5,6-Hexachlorobiphenyl (pg/g)	2	0	0						C129	C129	C129	C129	C129
surface	2,3,3',4',5',6-Hexachlorobiphenyl (pg/g)	2	2	100	1130	14700 D	7920	1130	1130	1130	14700 D	7920	1130	1130
surface	2,3,3',5,5',6-Hexachlorobiphenyl (pg/g)	2	2	100	2.13	27.2 D	14.7	2.13	2.13	2.13	27.2 D	14.7	2.13	2.13
surface	2,3,4,4',5,6-Hexachlorobiphenyl (pg/g)	2	0	0						C128	C128	C128	C128	C128
surface	2,3',4,4',5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	614	9110 D	4860	614	614	614	9110 D	4860	614	614
surface	2,3',4,4',5',6-Hexachlorobiphenyl (pg/g)	2	0	0						C153	C153	C153	C153	C153
surface	3,3',4,4',5,5'-Hexachlorobiphenyl (pg/g)	2	2	100	1.18	10.5	5.84	1.18	1.18	1.18	10.5	5.84	1.18	1.18
surface	2,2',3,3',4,4',5-Heptachlorobiphenyl (pg/g)	2	2	100	4440	28200 D	16300	4440	4440	4440	28200 D	16300	4440	4440
surface	2,2',3,3',4,4',6-Heptachlorobiphenyl (pg/g)	2	2	100	1340 CJ	9230 CJ	5290	1340 CJ	1340 CJ	1340 CJ	9230 CJ	5290	1340 CJ	1340 CJ
surface	2,2',3,3',4,5,5'-Heptachlorobiphenyl (pg/g)	2	2	100	737	4430 D	2580	737	737	737	4430 D	2580	737	737
surface	2,2',3,3',4,5,6-Heptachlorobiphenyl (pg/g)	2	0	0						C171	C171	C171	C171	C171
surface	2,2',3,3',4,5,6'-Heptachlorobiphenyl (pg/g)	2	2	100	4560	25000 D	14800	4560	4560	4560	25000 D	14800	4560	4560
surface	2,2',3,3',4,5',6-Heptachlorobiphenyl (pg/g)	2	2	100	184	1080 D	632	184	184	184	1080 D	632	184	184
surface	2,2',3,3',4,6,6'-Heptachlorobiphenyl (pg/g)	2	2	100	532	3110 D	1820	532	532	532	3110 D	1820	532	532
surface	2,2',3,3',4,5',6'-Heptachlorobiphenyl (pg/g)	2	2	100	2490	14200 D	8350	2490	2490	2490	14200 D	8350	2490	2490
surface	2,2',3,3',5,5',6-Heptachlorobiphenyl (pg/g)	2	2	100	835	4170 D	2500	835	835	835	4170 D	2500	835	835
surface	2,2',3,3',5,6,6'-Heptachlorobiphenyl (pg/g)	2	2	100	1660	8720 D	5190	1660	1660	1660	8720 D	5190	1660	1660
surface	2,2',3,4,4',5,5'-Heptachlorobiphenyl (pg/g)	2	2	100	8080 CJ	50300 CJ	29200	8080 CJ	8080 CJ	8080 CJ	50300 CJ	29200	8080 CJ	8080 CJ
surface	2,2',3,4,4',5,6-Heptachlorobiphenyl (pg/g)	2	2	100	40.8	550 D	295	40.8	40.8	40.8	550 D	295	40.8	40.8
surface	2,2',3,4,4',5,6'-Heptachlorobiphenyl (pg/g)	2	2	100	15.9	187 D	101	15.9	15.9	15.9	187 D	101	15.9	15.9
surface	2,2',3,4,4',5',6-Heptachlorobiphenyl (pg/g)	2	2	100	3070 CJ	16200 CJ	9640	3070 CJ	3070 CJ	3070 CJ	16200 CJ	9640	3070 CJ	3070 CJ
surface	2,2',3,4,4',6,6'-Heptachlorobiphenyl (pg/g)	2	2	100	1.57	20.1 D	10.8	1.57	1.57	1.57	20.1 D	10.8	1.57	1.57
surface	2,2',3,4,5,5',6-Heptachlorobiphenyl (pg/g)	2	0	0						C183	C183	C183	C183	C183
surface	2,2',3,4,5,6,6'-Heptachlorobiphenyl (pg/g)	2	1	50	12.8 D	12.8 D	12.8	12.8 D	12.8 D	0.444 U	12.8 D	6.62	0.444 U	0.444 U
surface	2,2',3,4',5,5',6-Heptachlorobiphenyl (pg/g)	2	2	100	4380 D	22900 D	13600	4380 D	4380 D	4380 D	22900 D	13600	4380 D	4380 D
surface	2,2',3,4',5,6,6'-Heptachlorobiphenyl (pg/g)	2	2	100	2.74	29.1 D	15.9	2.74	2.74	2.74	29.1 D	15.9	2.74	2.74
surface	2,3,3',4,4',5,5'-Heptachlorobiphenyl (pg/g)	2	2	100	147	959 D	553	147	147	147	959 D	553	147	147
surface	2,3,3',4,4',5,6-Heptachlorobiphenyl (pg/g)	2	2	100	916	5240 D	3080	916	916	916	5240 D	3080	916	916
surface	2,3,3',4,4',5',6-Heptachlorobiphenyl (pg/g)	2	2	100	191	1160 D	676	191	191	191	1160 D	676	191	191
surface	2,3,3',4,5,5',6-Heptachlorobiphenyl (pg/g)	2	0	0						0.416 U	6.56 UD	3.49	0.416 U	0.416 U
surface	2,3,3',4',5,5',6-Heptachlorobiphenyl (pg/g)	2	0	0						C180	C180	C180	C180	C180
surface	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (pg/g)	2	2	100	1820	5940 D	3880	1820	1820	1820	5940 D	3880	1820	1820
surface	2,2',3,3',4,4',5,6-Octachlorobiphenyl (pg/g)	2	2	100	775 D	2440 D	1610	775 D	775 D	775 D	2440 D	1610	775 D	775 D
surface	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (pg/g)	2	2	100	1320	3370 D	2350	1320	1320	1320	3370 D	2350	1320	1320
surface	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (pg/g)	2	2	100	417 CJ	1100 CJ	759	417 CJ	417 CJ	417 CJ	1100 CJ	759	417 CJ	417 CJ
surface	2,2',3,3',4,5,5',6-Octachlorobiphenyl (pg/g)	2	2	100	3020 CJ	7190 CJ	5110	3020 CJ	3020 CJ	3020 CJ	7190 CJ	5110	3020 CJ	3020 CJ
surface	2,2',3,3',4,5,5',6'-Octachlorobiphenyl (pg/g)	2	0	0						C198	C198	C198	C198	C198
surface	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (pg/g)	2	0	0						C197	C197	C197	C197	C197
surface	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (pg/g)	2	2	100	342	862 D	602	342	342	342	862 D	602	342	342
surface	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (pg/g)	2	2	100	448	1420 D	934	448	448	448	1420 D	934	448	448
surface	2,2',3,4,4',5,5',6-Octachlorobiphenyl (pg/g)	2	2	100	1850	4570 D	3210	1850	1850	1850	4570 D	3210	1850	1850
surface	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (pg/g)	2	1	50	0.689	0.689	0.689	0.689	0.689	0.689	6.36 UD	3.52	0.689	0.689
surface	2,3,3',4,4',5,5',6-Octachlorobiphenyl (pg/g)	2	2	100	99.3	306 D	203	99.3	99.3	99.3	306 D	203	99.3	99.3

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (pg/g)	2	2	100	1130	2860 D	2000	1130	1130	1130	2860 D	2000	1130	1130
surface	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (pg/g)	2	2	100	142 D	333 D	238	142 D	142 D	142 D	333 D	238	142 D	142 D
surface	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (pg/g)	2	2	100	328	880 D	604	328	328	328	880 D	604	328	328
surface	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (pg/g)	2	2	100	284	865 D	575	284	284	284	865 D	575	284	284
surface	2,4'-DDD (ug/kg)	2	0	0						0.54 UJ	13 UJ	6.77	0.54 UJ	0.54 UJ
surface	2,4'-DDE (ug/kg)	1	0	0						2.3 U	2.3 U	2.3	2.3 U	2.3 U
surface	2,4'-DDT (ug/kg)	2	0	0						0.39 U	20 UJ	10.2	0.39 U	0.39 U
surface	4,4'-DDD (ug/kg)	2	0	0						1.3 UJ	11 UJ	6.15	1.3 UJ	1.3 UJ
surface	4,4'-DDE (ug/kg)	1	0	0						2.1 UJ	2.1 UJ	2.1	2.1 UJ	2.1 UJ
surface	4,4'-DDT (ug/kg)	2	0	0						0.4 U	4.7 U	2.55	0.4 U	0.4 U
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	2	0	0						4.7 UJ	11 UJ	7.85	4.7 UJ	4.7 UJ
surface	Aldrin (ug/kg)	2	0	0						0.19 U	0.2 U	0.195	0.19 U	0.19 U
surface	alpha-Hexachlorocyclohexane (ug/kg)	2	0	0						0.19 U	0.33 U	0.26	0.19 U	0.19 U
surface	beta-Hexachlorocyclohexane (ug/kg)	2	0	0						1 U	2.8 U	1.9	1 U	1 U
surface	delta-Hexachlorocyclohexane (ug/kg)	2	0	0						0.19 U	0.2 U	0.195	0.19 U	0.19 U
surface	gamma-Hexachlorocyclohexane (ug/kg)	2	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	cis-Chlordane (ug/kg)	2	0	0						0.2 U	0.25 U	0.225	0.2 U	0.2 U
surface	trans-Chlordane (ug/kg)	2	0	0						0.2 U	0.2 U	0.2	0.2 U	0.2 U
surface	Oxychlordane (ug/kg)	2	0	0						1 U	21 U	11	1 U	1 U
surface	cis-Nonachlor (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	trans-Nonachlor (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Dieldrin (ug/kg)	2	0	0						0.4 U	1.2 U	0.8	0.4 U	0.4 U
surface	alpha-Endosulfan (ug/kg)	2	0	0						0.19 U	0.2 U	0.195	0.19 U	0.19 U
surface	beta-Endosulfan (ug/kg)	2	0	0						0.39 U	0.4 U	0.395	0.39 U	0.39 U
surface	Endosulfan sulfate (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Endrin (ug/kg)	2	0	0						0.39 U	1.9 U	1.15	0.39 U	0.39 U
surface	Endrin aldehyde (ug/kg)	2	0	0						0.39 U	15 U	7.7	0.39 U	0.39 U
surface	Endrin ketone (ug/kg)	2	0	0						0.39 UJ	15 U	7.7	0.39 UJ	0.39 UJ
surface	Heptachlor (ug/kg)	2	0	0						0.19 U	0.2 U	0.195	0.19 U	0.19 U
surface	Heptachlor epoxide (ug/kg)	2	0	0						0.19 U	0.2 U	0.195	0.19 U	0.19 U
surface	Methoxychlor (ug/kg)	2	0	0						1.9 U	14 U	7.95	1.9 U	1.9 U
surface	Mirex (ug/kg)	2	0	0						0.39 U	13 U	6.7	0.39 U	0.39 U
surface	Toxaphene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
surface	2,3,4,6-Tetrachlorophenol (ug/kg)	2	0	0						96 U	590 U	343	96 U	96 U
surface	2,4,5-Trichlorophenol (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 U
surface	2,4,6-Trichlorophenol (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 U
surface	2,4-Dichlorophenol (ug/kg)	4	0	0						58 U	350 U	131	58 U	58 U
surface	2,4-Dimethylphenol (ug/kg)	4	0	0						19 U	350 U	112	19 U	58 U
surface	2,4-Dinitrophenol (ug/kg)	4	0	0						190 UJ	1200 U	443	190 UJ	190 U
surface	2-Chlorophenol (ug/kg)	4	0	0						19 U	120 UJ	44.3	19 U	19 U
surface	2-Methylphenol (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	2-Nitrophenol (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	4	0	0						190 U	1200 U	443	190 U	190 U
surface	4-Chloro-3-methylphenol (ug/kg)	4	0	0						38 U	240 UJ	89	39 U	39 U
surface	4-Methylphenol (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	4-Nitrophenol (ug/kg)	4	0	0						96 U	590 UJ	220	96 U	96 UJ

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Pentachlorophenol (ug/kg)	4	1	25	47	47	47	47	47	47	98 UJ	84.3	96 UJ	96 UJ
surface	Phenol (ug/kg)	4	1	25	460 J	460 J	460	460 J	460 J	19 U	460 J	134	19 U	39 U
surface	2,3,4,5-Tetrachlorophenol (ug/kg)	2	0	0						96 U	590 U	343	96 U	96 U
surface	2,3,5,6-Tetrachlorophenol (ug/kg)	2	0	0						96 U	590 U	343	96 U	96 U
surface	Dimethyl phthalate (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Diethyl phthalate (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Dibutyl phthalate (ug/kg)	4	1	25	28	28	28	28	28	19 UJ	120 U	46.5	19 UJ	28
surface	Butylbenzyl phthalate (ug/kg)	4	1	25	183	183	183	183	183	19 U	183	85.3	19 U	120 U
surface	Di-n-octyl phthalate (ug/kg)	4	1	25	32	32	32	32	32	19 U	120 U	47.5	19 U	32
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	4	2	50	2200	8430	5320	2200	2200	110 UJ	8430	2990	1200 UJ	2200
surface	Azobenzene (ug/kg)	2	0	0						19 U	120 U	69.5	19 U	19 U
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	2,4-Dinitrotoluene (ug/kg)	4	0	0						96 U	590 UJ	220	96 U	96 U
surface	2,6-Dinitrotoluene (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 U
surface	2-Chloronaphthalene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	2-Nitroaniline (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 U
surface	3,3'-Dichlorobenzidine (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 UJ
surface	3-Nitroaniline (ug/kg)	4	0	0						120 U	710 U	268	120 U	120 U
surface	4-Bromophenyl phenyl ether (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	4-Chloroaniline (ug/kg)	4	0	0						58 U	350 U	131	58 U	58 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	4-Nitroaniline (ug/kg)	4	0	0						96 U	590 U	220	96 U	96 U
surface	Aniline (ug/kg)	2	0	0						19 U	120 U	69.5	19 U	19 U
surface	Benzoic acid (ug/kg)	4	0	0						190 U	1200 U	443	190 U	190 U
surface	Benzyl alcohol (ug/kg)	4	0	0						19 UJ	590 U	181	19 UJ	96 U
surface	Bis(2-chloroethoxy) methane (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Bis(2-chloroethyl) ether (ug/kg)	4	0	0						38 U	240 U	89	39 U	39 U
surface	Carbazole (ug/kg)	4	4	100	16.2	690	187	19 J	24 J	16.2	690	187	19 J	24 J
surface	Dibenzofuran (ug/kg)	4	2	50	7.77	300	154	7.77	7.77	7.77	300	86.4	19 U	19 U
surface	Hexachlorobenzene (ug/kg)	4	0	0						0.24 U	19 U	9.69	0.51 U	19 U
surface	Hexachlorobutadiene (ug/kg)	4	0	0						0.24 U	19 U	9.67	0.43 U	19 U
surface	Hexachlorocyclopentadiene (ug/kg)	4	0	0						96 UJ	590 U	220	96 UJ	96 U
surface	Hexachloroethane (ug/kg)	4	0	0						5.8 U	20 U	16	19 U	19 U
surface	Isophorone (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	Nitrobenzene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	N-Nitrosodimethylamine (ug/kg)	2	0	0						96 U	590 U	343	96 U	96 U
surface	N-Nitrosodipropylamine (ug/kg)	4	0	0						38 UJ	240 UJ	89	39 UJ	39 U
surface	N-Nitrosodiphenylamine (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	1,2-Dichlorobenzene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	1,3-Dichlorobenzene (ug/kg)	4	0	0						19 U	120 U	44.3	19 U	19 U
surface	1,4-Dichlorobenzene (ug/kg)	4	0	0						19 U	120 UJ	44.3	19 U	19 U
surface	1,2,4-Trichlorobenzene (ug/kg)	4	0	0						19 U	120 UJ	44.3	19 U	19 U
subsurface	Aroclor 1016 (ug/kg)	10	0	0						1.1 U	2.4 U	1.83	1.5 U	2.4 U
subsurface	Aroclor 1242 (ug/kg)	10	0	0						1.1 U	2.4 U	1.83	1.5 U	2.4 U
subsurface	Aroclor 1248 (ug/kg)	10	0	0						1.1 U	2.4 U	1.83	1.5 U	2.4 U
subsurface	Aroclor 1254 (ug/kg)	10	5	50	69	300	128	89	110 J	2.3 U	300	65.1	2.4 U	110 J

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Aroclor 1260 (ug/kg)	10	4	40	23	80	38.8	25	27	1.4 U	80	16.8	2.4 U	27
subsurface	Aroclor 1221 (ug/kg)	10	0	0						1.1 U	2.4 U	1.83	1.5 U	2.4 U
subsurface	Aroclor 1232 (ug/kg)	10	0	0						1.1 U	2.4 U	1.83	1.5 U	2.4 U
subsurface	Polychlorinated biphenyls (ug/kg)	10	5	50	94	300	159	114	190 J	2.3 U	300	80.6	2.4 U	190 J
subsurface	Butyltin ion (ug/kg)	9	3	33.3	0.82	5	2.61	2	2	0.6 UJ	5	1.28	0.63 U	2
subsurface	Dibutyltin ion (ug/kg)	9	5	55.6	1.1 J	25	11	2.4	24	0.93 UJ	25	6.51	1.1 J	24
subsurface	Tributyltin ion (ug/kg)	10	5	50	2.6	150	47.7	11	67	0.46 UJ	150	24.1	0.47 UJ	67
subsurface	Tetrabutyltin (ug/kg)	10	1	10	1.4	1.4	1.4	1.4	1.4	1.1 UJ	1.5 U	1.2	1.1 U	1.4 U
subsurface	Total organic carbon (percent)	11	11	100	0.04 J	2.4	0.756	0.3	2.06	0.04 J	2.4	0.756	0.3	2.06
subsurface	Gravel (percent)	11	11	100		1.8	0.376	0.07	1.47	0	1.8	0.376	0.07	1.47
subsurface	Sand (percent)	1	1	100	34.79	34.79	34.8	34.79	34.79	34.79	34.79	34.8	34.79	34.79
subsurface	Very coarse sand (percent)	10	10	100	0.3	13.3	4.16	1.97	9.32	0.3	13.3	4.16	1.97	9.32
subsurface	Coarse sand (percent)	10	10	100	0.81	12.7	5.94	4.98	10.8	0.81	12.7	5.94	4.98	10.8
subsurface	Medium sand (percent)	10	10	100	11	69.8	49.4	58.1	69.6	11	69.8	49.4	58.1	69.6
subsurface	Fine sand (percent)	10	10	100	6.44	25.1	17.3	15.4	25	6.44	25.1	17.3	15.4	25
subsurface	Very fine sand (percent)	10	10	100	0.07	13.1	1.67	0.19	1.96	0.07	13.1	1.67	0.19	1.96
subsurface	Fines (percent)	1	1	100	63.41	63.41	63.4	63.41	63.41	63.41	63.41	63.4	63.41	63.41
subsurface	Silt (percent)	11	11	100	0.71	47.6	19.2	8.86	47.3	0.71	47.6	19.2	8.86	47.3
subsurface	Clay (percent)	11	11	100	0.4	17.1	6.29	2.98	16.56	0.4	17.1	6.29	2.98	16.56
subsurface	Aluminum (mg/kg)	1	1	100	38300	38300	38300	38300	38300	38300	38300	38300	38300	38300
subsurface	Antimony (mg/kg)	11	9	81.8	0.05 J	0.392 J	0.211	0.262 J	0.371 J	0.05 UJ	4 UJ	0.541	0.262 J	0.392 J
subsurface	Arsenic (mg/kg)	11	10	90.9	1.1	3.18	2.08	1.9	2.98	1.1	4 U	2.25	1.98	3.18
subsurface	Cadmium (mg/kg)	11	11	100	0.04 J	0.8	0.232	0.096	0.48	0.04 J	0.8	0.232	0.096	0.48
subsurface	Chromium (mg/kg)	1	1	100	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8	37.8
subsurface	Copper (mg/kg)	11	11	100	11.8	57.5	21.2	13.6	29.3	11.8	57.5	21.2	13.6	29.3
subsurface	Lead (mg/kg)	11	11	100	2.28	41	13.7	7.87	30.5	2.28	41	13.7	7.87	30.5
subsurface	Manganese (mg/kg)	1	1	100	495	495	495	495	495	495	495	495	495	495
subsurface	Mercury (mg/kg)	11	8	72.7	0.01 J	0.27	0.106	0.06	0.25	0.01 J	0.27	0.08	0.04	0.25
subsurface	Nickel (mg/kg)	11	11	100	14	30	17.7	16.3	19.1	14	30	17.7	16.3	19.1
subsurface	Selenium (mg/kg)	1	1	100	8	8	8	8	8	8	8	8	8	8
subsurface	Silver (mg/kg)	11	11	100	0.02 J	1.5	0.258	0.091	0.442	0.02 J	1.5	0.258	0.091	0.442
subsurface	Thallium (mg/kg)	1	0	0						4 U	4 U	4	4 U	4 U
subsurface	Zinc (mg/kg)	11	11	100	33	255	74.8	51.1	107	33	255	74.8	51.1	107
subsurface	Barium (mg/kg)	1	1	100	175	175	175	175	175	175	175	175	175	175
subsurface	Beryllium (mg/kg)	1	1	100	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
subsurface	Calcium (mg/kg)	1	1	100	8240	8240	8240	8240	8240	8240	8240	8240	8240	8240
subsurface	Cobalt (mg/kg)	1	1	100	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
subsurface	Iron (mg/kg)	1	1	100	39900	39900	39900	39900	39900	39900	39900	39900	39900	39900
subsurface	Magnesium (mg/kg)	1	1	100	6630	6630	6630	6630	6630	6630	6630	6630	6630	6630
subsurface	Potassium (mg/kg)	1	1	100	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330
subsurface	Sodium (mg/kg)	1	1	100	1120 J	1120 J	1120	1120 J	1120 J	1120 J	1120 J	1120	1120 J	1120 J
subsurface	Vanadium (mg/kg)	1	1	100	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7	98.7
subsurface	2-Methylnaphthalene (ug/kg)	21	9	42.9	0.65 J	390	94	11	290	0.27 U	390	40.7	1.6 UJ	100
subsurface	Acenaphthene (ug/kg)	21	9	42.9	0.33 J	640	128	22	350	0.27 U	640	55.1	1.3 U	85
subsurface	Acenaphthylene (ug/kg)	21	9	42.9	1 J	130	40.2	25	94	0.21 U	130	17.7	1.8 U	42
subsurface	Anthracene (ug/kg)	21	11	52.4	0.39 J	550	108	21	340	0.25 U	550	56.9	1.9 U	95

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Fluorene (ug/kg)	21	9	42.9	0.76 J	520	106	19	290	0.22 U	520	46.1	2.2 U	76
subsurface	Naphthalene (ug/kg)	21	12	57.1	0.3 J	1000	190	19	740	0.28 U	1000	109	1.7 U	270
subsurface	Phenanthrene (ug/kg)	21	13	61.9	0.3 J	2700	397	45	1400	0.2 U	2700	246	2.4 J	380
subsurface	Low Molecular Weight PAH (ug/kg)	21	12	57.1	0.6 A	5504 A	959	100.1 J	3540	0.28 UA	5504 A	548	2.4 U	1028
subsurface	Dibenz(a,h)anthracene (ug/kg)	21	12	57.1	0.35 J	220	40.1	9.8 J	92 J	0.24 U	220	23.6	2.9 U	61
subsurface	Benz(a)anthracene (ug/kg)	21	12	57.1	1.3 J	890	186	48	560	0.17 U	890	107	2.4 J	230
subsurface	Benzo(a)pyrene (ug/kg)	21	12	57.1	1.4 J	930	248	72	790	0.19 U	930	143	6.6 J	420
subsurface	Benzo(b)fluoranthene (ug/kg)	21	11	52.4	1.3 J	790	211	160	510	0.19 U	790	111	3.3 U	270
subsurface	Benzo(g,h,i)perylene (ug/kg)	21	15	71.4	0.22 J	920	183	50	740	0.14 U	920	131	3 U	370
subsurface	Benzo(k)fluoranthene (ug/kg)	21	11	52.4	1.3 J	460	147	120	430	0.2 U	460	77.8	3.3 U	220
subsurface	Chrysene (ug/kg)	21	12	57.1	1.9 J	1100	239	58	710	0.2 U	1100	137	2.5 J	300
subsurface	Fluoranthene (ug/kg)	21	12	57.1	2.3 J	2100	423	49	1400	0.22 U	2100	242	3.9 J	660
subsurface	Indeno(1,2,3-cd)pyrene (ug/kg)	21	14	66.7	0.21 J	680	168	43	620	0.2 U	680	112	2.5 U	350
subsurface	Pyrene (ug/kg)	21	13	61.9	0.22 J	2600	539	97	2100	0.15 U	2600	334	5.6 J	950
subsurface	Benzo(b+k)fluoranthene (ug/kg)	11	7	63.6	18.4 J	1220 A	451	390	970	3.2 U	1220 A	288	73	970
subsurface	High Molecular Weight PAH (ug/kg)	21	16	76.2	0.31 A	10660 A	1850	113.88 A	7982 J	0.24 UA	10660 A	1410	16.8 J	3786 A
subsurface	Polycyclic Aromatic Hydrocarbons (ug/kg)	21	16	76.2	0.31 A	16164 A	2550	147.4 A	11232 A	0.28 UA	16164 A	1940	19.2 A	4540 A
subsurface	4,4'-DDD (ug/kg)	10	5	50	0.47 J	20	5.77	2.4	5.5	0.1 U	20	2.94	0.11 U	5.5
subsurface	4,4'-DDE (ug/kg)	10	3	30	4.1 J	17 J	8.6	4.7 J	4.7 J	0.13 U	17 J	2.77	0.13 U	4.7 J
subsurface	4,4'-DDT (ug/kg)	10	1	10	2.6	2.6	2.6	2.6	2.6	0.22 U	6.3 UM	2.27	0.23 U	5.2 UM
subsurface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	10	5	50	0.47 J	37 J	11.5	6.5 J	10.2 J	0.22 U	37 J	5.84	0.23 U	10.2 J
subsurface	Aldrin (ug/kg)	10	2	20	1.2 J	2.4 J	1.8	1.2 J	1.2 J	0.12 U	2.4 J	0.506	0.12 U	1.2 J
subsurface	gamma-Hexachlorocyclohexane (ug/kg)	10	1	10	0.63 J	0.63 J	0.63	0.63 J	0.63 J	0.22 U	1.6 UM	0.724	0.23 U	1.5 UM
subsurface	cis-Chlordane (ug/kg)	10	1	10	0.36 J	0.36 J	0.36	0.36 J	0.36 J	0.13 U	0.36 J	0.167	0.14 U	0.19 UM
subsurface	Dieldrin (ug/kg)	10	0	0						0.14 U	0.2 U	0.16	0.15 U	0.19 U
subsurface	Heptachlor (ug/kg)	10	0	0						0.21 U	0.29 U	0.231	0.22 U	0.28 U
subsurface	2,4,5-Trichlorophenol (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	2,4,6-Trichlorophenol (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	2,4-Dichlorophenol (ug/kg)	1	0	0						59 U	59 U	59	59 U	59 U
subsurface	2,4-Dimethylphenol (ug/kg)	11	0	0						7 U	95 U	16.8	7.4 U	20 U
subsurface	2,4-Dinitrophenol (ug/kg)	1	0	0						200 UJ	200 UJ	200	200 UJ	200 UJ
subsurface	2-Chlorophenol (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2-Methylphenol (ug/kg)	11	0	0						4.4 U	59 U	11.1	4.6 U	20 U
subsurface	2-Nitrophenol (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	4,6-Dinitro-2-methylphenol (ug/kg)	1	0	0						200 UJ	200 UJ	200	200 UJ	200 UJ
subsurface	4-Chloro-3-methylphenol (ug/kg)	1	0	0						39 U	39 U	39	39 U	39 U
subsurface	4-Methylphenol (ug/kg)	11	6	54.5	5.1 J	230	87.9	13	190	3.7 U	230	49.6	5.1 J	190
subsurface	4-Nitrophenol (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	Pentachlorophenol (ug/kg)	11	0	0						11 U	150 U	32.6	12 U	98 UJ
subsurface	Phenol (ug/kg)	11	5	45.5	2.5 J	11 J	7.04	6.2 J	10 J	2.5 J	33 U	8.93	5.5 J	20 U
subsurface	Dimethyl phthalate (ug/kg)	11	0	0						2.3 U	32 U	6.81	2.4 U	20 U
subsurface	Diethyl phthalate (ug/kg)	11	0	0						4.5 U	61 U	11.4	4.7 U	20 U
subsurface	Dibutyl phthalate (ug/kg)	11	2	18.2	7.8 J	23	15.4	7.8 J	7.8 J	3.3 U	45 U	10.9	3.5 U	23
subsurface	Butylbenzyl phthalate (ug/kg)	11	3	27.3	7.5 J	170	68.5	28	28	1.9 U	170	24	2.1 U	28
subsurface	Di-n-octyl phthalate (ug/kg)	11	0	0						1.6 U	21 U	5.15	1.6 U	20 U
subsurface	Bis(2-ethylhexyl) phthalate (ug/kg)	11	11	100	5 J	770 J	127	24 J	250	5 J	770 J	127	24 J	250

Table 2. Querried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2,4-Dinitrotoluene (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	2,6-Dinitrotoluene (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	2-Chloronaphthalene (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	2-Nitroaniline (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	3,3'-Dichlorobenzidine (ug/kg)	1	0	0						98 U	98 U	98	98 U	98 U
subsurface	3-Nitroaniline (ug/kg)	1	0	0						120 UJ	120 UJ	120	120 UJ	120 UJ
subsurface	4-Bromophenyl phenyl ether (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	4-Chloroaniline (ug/kg)	1	0	0						59 U	59 U	59	59 U	59 U
subsurface	4-Chlorophenyl phenyl ether (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	4-Nitroaniline (ug/kg)	1	0	0						98 UJ	98 UJ	98	98 UJ	98 UJ
subsurface	Benzoic acid (ug/kg)	11	0	0						130 U	1700 U	286	130 U	200 U
subsurface	Benzyl alcohol (ug/kg)	11	1	9.09	7.9 J	7.9 J	7.9	7.9 J	7.9 J	4.7 U	64 U	12	5 U	20 UJ
subsurface	Bis(2-chloroethoxy) methane (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Bis(2-chloroethyl) ether (ug/kg)	1	0	0						39 U	39 U	39	39 U	39 U
subsurface	Carbazole (ug/kg)	1	1	100	93 J	93 J	93	93 J	93 J	93 J	93 J	93	93 J	93 J
subsurface	Dibenzofuran (ug/kg)	21	9	42.9	0.32 J	240	46.7	9.2 J	110	0.26 U	240	20.5	1.7 UJ	40
subsurface	Hexachlorobenzene (ug/kg)	11	0	0						2.7 U	37 U	7.62	2.8 U	20 U
subsurface	Hexachlorobutadiene (ug/kg)	11	0	0						1.8 U	25 U	5.72	1.9 U	20 U
subsurface	Hexachlorocyclopentadiene (ug/kg)	1	0	0						98 UJ	98 UJ	98	98 UJ	98 UJ
subsurface	Hexachloroethane (ug/kg)	11	0	0						2.8 U	38 U	7.81	3 U	20 U
subsurface	Isophorone (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Nitrobenzene (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	N-Nitrosodipropylamine (ug/kg)	1	0	0						39 U	39 U	39	39 U	39 U
subsurface	N-Nitrosodiphenylamine (ug/kg)	11	0	0						2.8 U	38 U	7.81	3 U	20 UJ
subsurface	1,2-Dichlorobenzene (ug/kg)	11	0	0						1.7 U	23 U	5.42	1.8 U	20 U
subsurface	1,3-Dichlorobenzene (ug/kg)	11	0	0						2.1 U	28 U	6.23	2.2 U	20 U
subsurface	1,4-Dichlorobenzene (ug/kg)	11	0	0						2.5 U	33 U	7.03	2.6 U	20 U
subsurface	1,2,4-Trichlorobenzene (ug/kg)	11	0	0						1.9 U	26 U	5.94	2 U	20 U

SUPPLEMENTAL FIGURES

Figure 1. Stormwater Pollution Control Plan Site Map (SSI 2003)
Figure 2-1. Phase I Explorations-SW Area (Bridgewater 2002a)
Figure 3. Monitoring Well and Push Probe Locations - SSI Area (Bridgewater 2003b)

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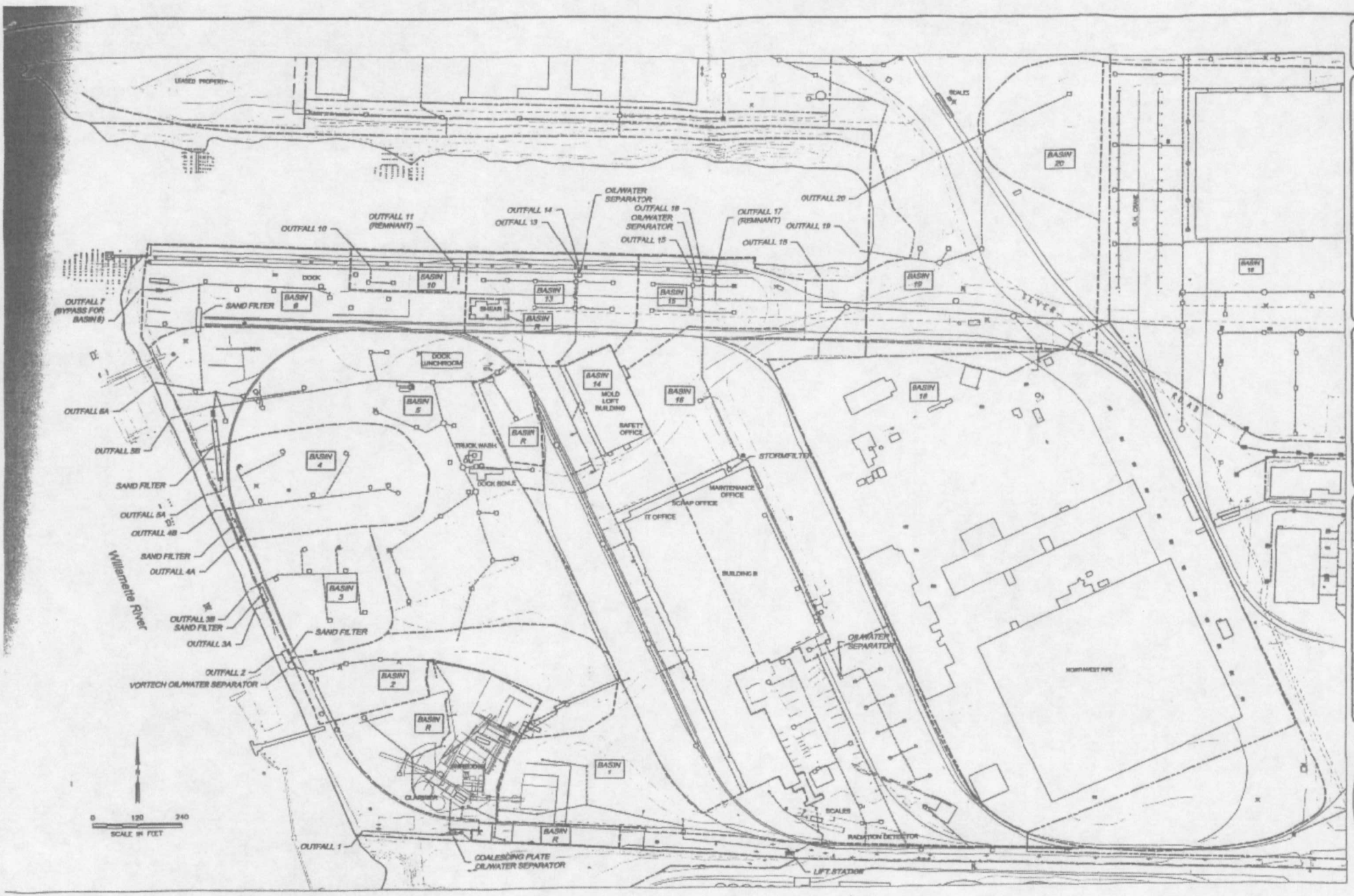
This document is currently under review by US EPA and its federal, state, and Tribal partners, and is subject to change in whole or in part



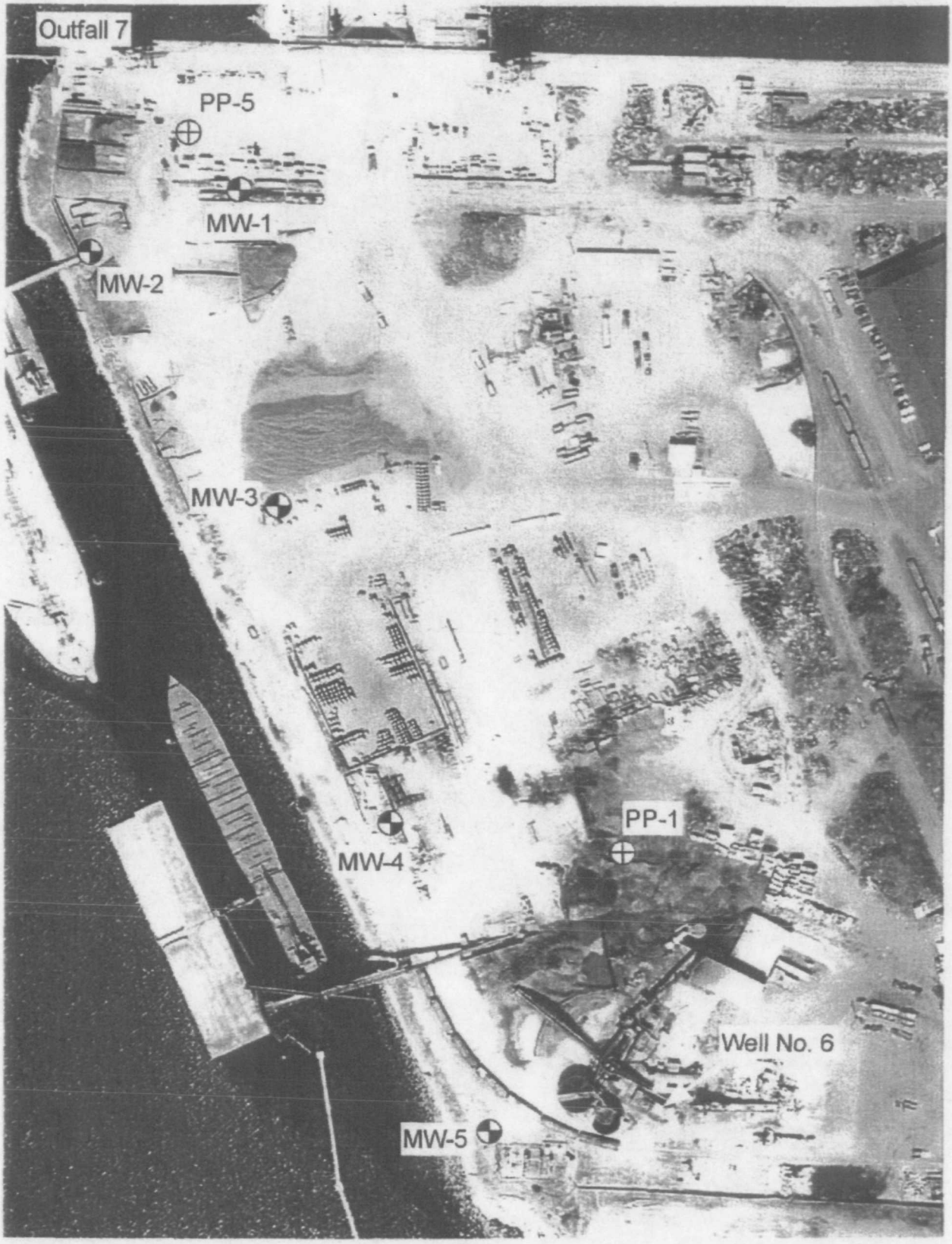
DRAWING NO. 1

PROJECT NO.

SCHNITZER STEEL INDUSTRIES INC.
BURGARD YARD
PORTLAND, OREGON
STORMWATER POLLUTION CONTROL PLAN
MARCH 2003
SITE MAP

IRT ENGINEERING, INC.
2930 S.E. MARKET STREET
PORTLAND, OREGON 97214
PHONE (503) 236-7982
FAX (503) 236-7983

NO.	DATE	REVISION	DWN BY	CHK BY	APP BY



Monitoring Well

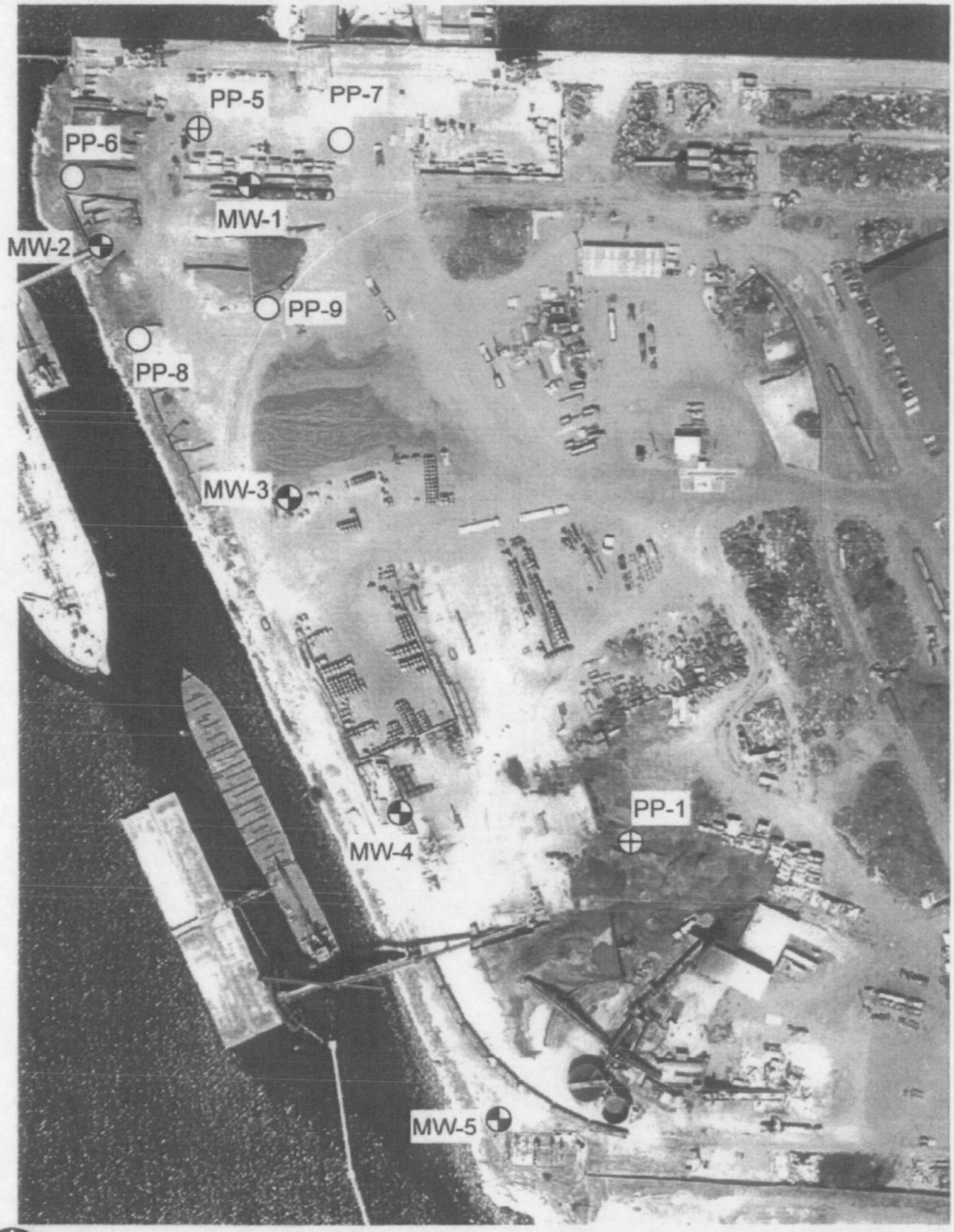
Push Probe

Approximate Scale

220 feet

Figure 2-1
Phase I Explorations-SW Area
Burgard Industrial Park

BRIDGEWATER GROUP, INC.



N

Approximate Scale

220 feet

Monitoring Well

Phase I Push Probe

Phase II Push Probe

Figure 3
Monitoring Well and Push Probe Locations - SSI Area
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

U.S. Army Corps of Engineers
U.S. Government Moorings Facility

U.S. ARMY CORPS OF ENGINEERS U.S. GOVERNMENT MOORINGS FACILITY
CSM Site Summary

U.S. MOORINGS

Oregon DEQ ECSI #: 1641

8010 NW St. Helens Rd.
DEQ Site Mgr: Tom Roick
Latitude: 45.5808°
Longitude: -122:7632°
Township/Range/Section: 1N/1W/12

River Mile: 6.2 West bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the USACE – Portland Moorings (U.S. Moorings) site to the river is summarized in this section and Table 1, and supported in the following sections.

1.1. Overland Transport

According to USACE (1994a), the usable land surface at U.S. Moorings is flat with only a few feet change in elevation. Approximately half of the site is unpaved. Overland transport of sheet runoff from the eastern half of the upland site to the river is minimal because water is generally transported through a stormwater collection system. Surficial soils in the western half of the site have some detected metals. Stormwater sheet runoff in this area is a potential but unknown transport pathway for metals to reach the river.

1.2. Riverbank Erosion

The sloping shoreline is armored with riprap to minimize bank erosion. Soil erosion and deposition at the site is believed to be low (USACE 1994a).

1.3. Groundwater

Groundwater samples have not been collected to assess water quality at the site (USACE 1994a). Therefore, insufficient data are available to evaluate this potential contaminant transport pathway. In addition, no information was available in the DEQ files suggesting that groundwater-related preferential transport pathways have been evaluated at the site.

1.4 Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Current operations at U.S. Moorings facility include providing docking facilities, maintenance, and overhaul to support the dredge fleet and the hydrographic survey vessels. Operations that are no longer carried out include fueling of the dredges, sandblasting, and vehicle maintenance (USACE 1994a). Occasional minor oil spills from overwater activities have been recorded as recent as 2000 (see Section 8.3). Rainwater from five separate drainage areas at the site is funneled into 500-gallon oil/water separators and then through collection culverts that discharge to the Willamette River (see Section 10.3.2).

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The U.S. Moorings facility is located on the west side of the river at RM 6.2 in the center of a narrow river reach (RM 5-7) that is characterized as a transport/non-depositional zone based on the site physical information compiled in the Programmatic Work Plan (Integral et al. 2004). The Sediment Trend Analysis® results indicate that sediment movement along this side of the river alternates between net accretion and net deposition and is in dynamic equilibrium along the far side of the river. The measured bathymetric changes over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) reveal a relatively contiguous area of net sediment erosion (up to 2 ft in extent) along channel slope in front of the property between the –10 and –30 ft NAVD88 contours. Shoreward of the –10 ft contour, the area predominately shows no riverbed elevation change, although net sediment accretion (up to 1 ft in extent) is evident in the downstream lee of the dock structure located at the upstream end of the property. A few other small patches of sediment accretion are scattered throughout this protected inshore area. No-change area is for the inner portion of the Portland Moorings cove that is above the 0 ft NAVD88 contour and could not be accessed by the hydro-survey vessel. The main channel offshore of the Portland Moorings facility is dominated by areas of relatively small-scale (< 1 ft in extent) sediment scour interspersed with areas of no change. An exception to this is sediment accretion evident in a deep mid-channel hole (-60 ft NAVD88) situated offshore of the upstream edge of the property.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: March 4, 2005

3. PROJECT STATUS

Source: DEQ 2004a, Gross 2004, pers. comm.

Activity		Date(s)/Comments
PA/XPA	☒	June 20 1990 (GRI 1990), April 1994 (USACE 1994a)
RI	☐	RI Work Plan in progress - sent to EPA for review mid-2004 (Gross 2004, pers. comm.).
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

Site sediment investigations were performed at the following times: October 12, 1989 (USACE 1990), June 14, 1994 (USACE 1994b), December 20, 1994 (USACE 1994c), and May 1995 (USACE 1996). Soil samples were also collected at the site in December 1994.

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 1

4. SITE OWNER HISTORY

Sources: Multnomah County Taxation records, Polk City of Portland directories, Sanborn fire insurance maps, USACE Port Series reports, USACE 1994a.

Owner/Occupant	Type of Operation	Years
U.S. Army Corps of Engineers-Portland Moorings (a.k.a. COE Civil Portland Moorings, U.S. Government Moorings, U.S. Moorings)	Government port, supply, repair facilities for dredge and other support vessels, warehousing facilities, fuel storage, motor pool garage and parking.	1904 - present
Misc. private owners	Unknown, possibly undeveloped	1850 - 1904

5. PROPERTY DESCRIPTION

The U.S. Moorings facility is located at 8010 NW St. Helens Road on the Willamette River at approximately RM 6.2 and 0.25 mile south of the St. John's Bridge (USACE 1994a). The region around the site is characterized by heavy industry along the river and a mix of residential, commercial, industrial, and recreational properties west of St. Helens Road. Figure 1 shows the U.S. Moorings property flanked on the east side by the Willamette River and on the west side by the railroad and St. Helens Road. Downstream from the site, on the northwest side of the parcel line is the Hendren Tow Boats property. Upstream from the site, on the southeast side of the parcel line is the Northwest Natural Gas Company property. The breakdown of the site area usage includes a large water parcel as described in the table below.

Feature	Area (square feet)	Area (acre)
Building Footprint	43,008	0.99
Dock Area	26,700	0.61
Paved/Rock Area	240,929	5.53
Landscape Area	61,400	1.41
Water	336,287	7.72

The usable land surface is flat with only a few feet change in elevation. Approximately one-half of the site's 13.14-acre area is covered by asphalt pavement. A storm drain system funnels rainwater into an oil/water separator and through collection culverts that drain into the Willamette River. Figure 1 shows 12 private outfalls along the eastern side of the property. A brief history of the site's drainage system is given in Section 10.3.2. The sloping shoreline is armored with riprap protection to mitigate bank erosion of the nearshore soils.

The site contains 13 buildings, three trailers, and several storage sheds, as shown in Supplemental Figure 2 from USACE (1994a). The dock area is split into Dock "A" and Dock "B." Dock "A" contains the crane and crane house. A small boat floating dock is connected to the land by a ramp near the north corner of the carpentry and electrical shop (building #3). A June 11, 1991, aerial photograph [see Supplemental Figure 1 from USACE (1994a)] shows that the floating dock used to be farther into the cove and connected to the land by a ramp situated between building #3 and building #17. A large open unpaved storage area for oversized and heavy materials and supplies is situated on the northeast part of the property where sand blasting used to be done. Most of the automobile parking areas are located on the south end of the site. Security at the site includes one perimeter fence surrounding the entire land area. For the western area [Logistics Management Office (LMO) warehouse] there is a gated perimeter fence around the storage and warehouse area, which faces the Willamette River side. There are no drinking water wells at the site.

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Department of State Lands files. River channel lands in and around Dock A are not owned by the Corps, but are being used by the Corps under the Federal Navigation Servitude Law (USACE 1994a).

6. CURRENT SITE USE

According to MacKenzie/Saito & Associates (MSA 1990), the Operations Division Navigation Branch, which controls the entire U.S. Moorings site, is divided into three distinct organizations that operate at the site.

1. The Plant Section is responsible for the buildings and grounds, in addition to the engineering and repair of all floating stock operated by the other two sections.
2. The Dredge Operations Section is responsible for planning, supporting, and operating the floating stock of dredging vessels.
3. The Hydrographic Surveys Sub-Section is responsible for planning, supporting, and operating the floating stock of survey vessels.

Current operations at U.S. Moorings include vessel moorage at docking facilities, vessel maintenance, and vessel overhaul in support of the dredge fleet and hydrographic survey vessels. Operations that are no longer carried out include fueling of the dredges, sandblasting, and vehicle maintenance. The U.S. government is a small-quantity hazardous waste generator at this site. The use of hazardous materials on vessels is minimized, and all waste disposal is handled appropriately (USACE 1994a).

7. SITE USE HISTORY

The first inhabitants to use the site were members of the Chinook tribe (MSA 1990). Chief Cazeno or Cassino sold the site, which was then part of a larger parcel, to (b) (6) [redacted] in 1850. Property ownership was transferred four times before the U.S. Army Corps of Engineers acquired it in 1903 (see Section 4). The site remained undeveloped until 1904 when construction began on the southern bulkhead, quarters for an overseer, a large storehouse, and an 8,000-gallon water tank. In February 1904, the District's "fleet" was transferred to the site.

An additional tract of land was purchased in 1905. The bulkhead was completed in 1914, and dredged material from the Willamette was used for fill, which provided an additional 4.6 acres of ground space. Significant expansion of repair facilities occurred with the construction of the lumber and steel storage warehouse in 1917, and the relocation and expansion of the sales store building and the garage in 1937. In 1938 and 1939, a new office, locker, soils laboratory and pattern storage buildings were built. In 1940, a 5.8-acre tract was acquired, and in 1945 partial filling of the new parcel with dredged material added an additional 1.7 acres of usable land. Three warehouses and a machine shop were added to the new land between 1940 and 1945. Between 1961 and 1967, the following buildings were removed: the lumber and sheet warehouse, the overseer's quarters, the carpenter shop, and the sales store building. Based on a comparison of aerial photos, the site has remained unchanged since 1967. The Supplemental Site Map from MSA (1990) shows the buildings locations and their numbers, which are referenced in the table below.

Building Number	Building Name	Building Date	Activities
1	Plant section office	1938	
2	Plant section engineering office	Before 1924	Pattern storage (1924-1940), commissary (1940-1950)
3	Locker	1938	Heating plant and wash room
4	Welding shop	Before 1924	Machine and blacksmith shop
5a	Storage shed	Before 1933	Storage
5b	Automobile and storage shed	1935	Storage

5c	Dock office	Before 1924	Locker room and utility storage
5d	Dock office added onto 5c	1939	Office
6	Machine shop	1944-45	
7	Oil and paint storage	1928-1940	Storage
8a	Carpenter and electrical shop	1939	Soils laboratory
8b	Carpenter and electrical shop	1943	
9	Former lumber and steel warehouse	1928, moved 1937, demolished 1967	Storage
10a	Garage	1937	Warehouse and garage
10b	Garage	Before 1911, moved 1937	Converted from blacksmith shop to warehouse and garage in 1924
11	District warehouse	1943	
12	Pattern storage	1938	
13	Material storage	1940	
14	Storage warehouse	1940-1945	
15	Dock derrick house	1940	
16	Former overseer's quarters	1904	Demolished between 1963-1965
17	Former carpenter shop	Before 1925 at site 6, moved 1943	Demolished between 1961-1963
18	Former sales store	Before 1911, moved 1937, demolished 1961-1963	Pattern room, modified after move to shipping and receiving warehouse
19	Former flood control storehouse	Before 1936, demolished 1950	

The facility was originally constructed to provide port, supply, and repair facilities for the Districts' dredges, hydrosurvey vessels, and other support vessels. Past operations associated with the repair and maintenance of vessels included sandblasting, paint removal, painting, overhaul of equipment, steam cleaning, welding and cutting, stockpiling and storage of fittings, and storage of dredge equipment and other materials for use on board the dredges. The Portland District also maintained a garage facility for motor vehicles at the LMO beginning in 1986. Servicing and maintenance of motor vehicles at the site ceased in 1988. Since 1986, the LMO has used the western half of the site for warehousing and storage of primarily large dredge parts and used surplus materials (USACE 1994a).

The Phase I PA indicated that various petroleum products, solvents, paints, and wood preservatives were historically used at the site. From interviews with personnel, it was noted that there was no knowledge of spills or releases before 1960. Spills since 1960 are listed in Section 8.3. There was no knowledge of on-site disposal of waste materials. Third-party recyclers collected waste oils and solvents. Inman Oil Company (Portland, OR) collected waste and spent oil between 1973 and 1993. In 1994, Spencer Environmental Services, Inc. (Oregon City, OR) began handling waste materials and spent oil for this site. The Phase I PA also noted that many controls were in place to store materials and prevent spills (i.e., use of spill pallets, waste tanks and barrels, and storage lockers). One 5,000-gallon fuel UST was located beneath a concrete slab at the west end of the garage. The tank passed all tightness testing requirements in 1990, and there was no history of leaking (USACE 1994a). This tank was removed and decommissioned in 1994 (USACE 2002).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. Uplands

The PA (USACE 1994a) identified three upland areas of concern at the west end of the U.S. Moorings site based on past sandblasting and maintenance activities and subsequent soil chemistry data:

- Two distinct areas used for sandblasting with visible grit located near the LMO warehouse. COPCs include metals and butyltins.
- One area with visible oil staining adjacent to the river. COPCs include PAHs and possibly diesel-range or heavier-range oils.

A fourth smaller area was identified in the storage yard that was impacted by a 2-3-gallon spill of hydraulic oil.

In 1993, all impacted soil, including the small area impacted by the hydraulic oil spill, was removed. Sandblasting is no longer performed onsite (USACE 1994a). Table 1 shows all media impacted and COPCs associated with the historical and current activities.

8.2. Overwater Activities

☒ Yes ☐ No

The U.S. Moorings site includes a fixed dock (Docks A and B) for moorage of large vessels and ships and a floating dock (Dock C) for smaller vessels. While site uses include vessel maintenance and overhaul, the documents reviewed for this site indicate that the docks have been used primarily for moorage.

8.3. Spills

Known or documented spills at the U.S. Moorings site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes/no)
12/29/90	Sinking of anchor barge *Raggy* at its moorings - diesel / motor oil	350 (diesel)/ unknown (motor oil)	Overwater	yes
3/9/96	Unknown oil	unknown	Overwater	no
11/24/96	Oil slick of black fuel oil	unknown	Overwater	no
9/26/97	Propane	50 pounds	unknown	unknown
10/22/97	Sheen coming from underground source, bubbling up from sediments possibly due to disturbance by core sampling and subsequent prop wash	unknown	Overwater	no

9/30/99	Oil?	0.25	Overwater	Yes -booms/pads in place
3/16/00	Heavy oil being blown up river by wind - unknown source - very small amount - subsequently USACE determined one of their staff had spilled oil (tiny bit) while carrying a drain pan over a dock - will submit report	unknown	Overwater	no
1/24/03	Unknown	sheen	Overwater	unknown
6/27/03	Anonymous complaint – business mismanaging waste materials	-	-	-
10/7/03	Hydraulic oil	trace	Overwater	No – product dispersed
1/15/04	Hydraulic fluid (dredge)	10	Overwater	Yes – booms/ pads in place
2/6/04	Hydraulic oil (*Yaquina*)	<0.25	Overwater	Yes - pads

9. PHYSICAL SITE SETTING

Information regarding the geology and hydrogeology of the site was available in the PA report completed for the site (USACE 1994a). The PA report indicates that approximately eight borings were completed at the site as part of a geotechnical and "hazardous waste and toxic waste" investigation.

9.1. Geology

According to the PA report, recent alluvial soils cover the underlying Columbia River Basalt (CRB) at the site. The soils consist of predominantly discontinuous, interbedded sand and silty sand with lesser units of silty, sandy gravels, and sandy silts. At the southwestern corner of the site, CRB is estimated to be present at a depth of approximately 20 feet below ground surface. At the southeastern corner of the property, near the dock area shoreline, the CRB is estimated to be present at a depth of approximately 80 feet below ground surface. Near the northeastern corner of the property, CRB is estimated to be present at depths ranging from 60 to 70 feet below ground surface (USACE 1994a).

9.2. Hydrogeology

During the 1992 investigation, groundwater levels measured in geotechnical borings were approximately 2 feet higher than the Willamette River stage at the time of the measurements. The groundwater flow direction is likely toward the Willamette River (USACE 1994a).

10. NATURE AND EXTENT (*Current Understanding*)

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations

☒ Yes ☐ No

On December 20, 1994, soil samples were collected north of the sandblasting areas, which were previously remediated in 1993 as part of a site evaluation requested by EPA (USACE 1994c). Eighteen soil samples (4 QA/QC samples included) were analyzed for 13 metals. Four samples were collected south of the sandblasting areas as background samples [see Supplemental Map 1 from USACE (1994c)]. Soil chemistry data are summarized in the table below.

Metal (mg/kg dry weight)	#1	#2	Duplicate #3	Duplicate #4 (Dup of #3)	#7	Background #5	Background #6 (QA of #5)	Background #8	Background #9 (QA of #8)
Antimony	ND	ND	ND	ND	ND	1.4	ND	ND	ND
Arsenic	ND	0.8	9	ND	1.7	2	1.6	3	1
Berilium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	5.6	ND	2.3	ND	2.3	<5	ND	4.5
Chromium	7.0	5.3	51	ND	15	20	13	14	13
Copper	12	3	66	46	37	24	17	16	14
Lead	2.8	ND	62	2.2	110	20	17	26	17
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	8.5	ND	26	ND	28	19	14	15	19
Selenium	ND	ND	ND	ND	ND	NA	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	52	43	209	43	73	82	84	50	55

Notes:
NA = Not available
ND = Not detected

10.1.2. Riverbank Samples

☐ Yes ☒ No

10.1.3. Summary

Metals (As, Cd, Cr, Cu, Pb, Ni and Zn) were detected within the top 6 inches of surface soil at both the remediated former sandblasting areas and background locations. Metals concentrations in the former sandblasting areas were generally detected at or above those measured in background locations.

10.2. Groundwater

10.2.1. Groundwater Investigations

☐ Yes ☒ No

The 1992 site investigation apparently included an assessment of groundwater levels and flow direction, but did not include any groundwater sampling (USACE 1994a).

10.2.2. NAPL (Historic & Current)

☐ Yes ☐ No

Groundwater impacts at the site, including the presence or absence of NAPL, are unknown.

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☐ No

Groundwater impacts at the site are unknown.

Plume Characterization Status ☐ Complete ☐ Incomplete

Not applicable (N/A).

Plume Extent

N/A

Min/Max Detections (Current situation)

N/A

Current Plume Data

N/A

Preferential Pathways

No information has been presented regarding the depths of the utilities at the facility relative to the groundwater table, or if the utility and associated backfill may be a preferential groundwater flow pathway at the site.

Downgradient Plume Monitoring Points (min/max detections)

N/A

Visual Seep Sample Data ☐ Yes ☒ No

Available records indicate that no seeps have been identified at the site (GSI 2003).

Nearshore Porewater Data

Available records indicate that porewater data have not been collected at the site.

Groundwater Plume Temporal Trend

N/A

10.2.4. Summary

Groundwater samples have not been collected at the site to assess water quality. An RI work plan has been submitted to the EPA for review (Gross 2004, pers. comm.). The LWG has not been provided access to the work plan. The work plan may address data collection necessary to address the potential for a complete groundwater pathway based on known paints, solvents and oils used on site and based on the known former sandblasting activities (i.e., VOCs, TPH, SVOCs, metals).

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past) ☒ Yes ☐ No

The eastern half of the site's 13.14-acre area is covered by asphalt pavement and consists of five drainage areas as shown in Supplemental Drainage Map from USACE (2002). Drainage Areas 1 and 4 discharge to a 6-inch outfall (Outfall A) near Dock C. Drainage Areas 2 and 5 discharge through a 6-inch outfall (Outfall B) located near Dock B. It is not

clear from the map how stormwater drains from Drainage Area 3. Stormwater associated with drainage areas 1, 2, 4, and 5; drains within some buildings; and the parking lot drains pass through 500-gallon oil/water separators before being discharged through Outfalls A and B into the river. No malfunction or overload of the oil/water separator system has occurred according to site personnel, and the system is maintained on an annual basis. All stormwater runoff from the U.S. Moorings is discharged into the Willamette River (DEQ 2004b). Other outfalls exist along the site's shoreline, as shown in Figure 1; however, it is not clear which outfalls correspond with Outfalls A and B shown in Supplemental Drainage Map from USACE (2002) (i.e., City of Portland outfall nomenclature can not be corroborated with the USACE nomenclature). In addition, some outfalls noted in Figure 1 may be associated with highway drains, as described in the Supplemental Drainage Map from USACE (2002).

Permit Type	File Number	Start Date	Outfalls[1]	Parameters/Frequency
1200Z	108394	10/2/02	Outfalls "A" and "B"	standard[2] /pH and TSS during storm events[3]
1200L	108394	8/1/94-9/30/96	Unknown	Unknown, permit is expired

[1] Outfalls are not labeled in the Storm Water Pollution Control Plan (USACE 2002).
[2] Standard GEN12Z permit requirements include pH, oil and grease, total suspended solids, copper, lead, and zinc. *E. coli* may also be required.
[3] A representative storm event is defined as an event that results in the accumulation of more than 0.1 inch of rainfall per day, and is preceded by at least 72 hours of dry weather.

Do other non-stormwater wastes discharge to the system? ☐ Yes ☒ No

10.3.3. Stormwater Data ☐ Yes ☒ No

10.3.4. Catch Basin Solids Data ☐ Yes ☒ No

10.3.5. Wastewater Permit ☐ Yes ☒ No

10.3.6. Wastewater Data ☐ Yes ☒ No

10.3.7. Summary

Stormwater infiltrates the ground in the western half of the site or is collected in catch basins distributed in five drainage basins in the eastern half of the site. Three outfalls receive stormwater from the five drainage areas and discharge directly into the Willamette River as shown in Supplemental Drainage Map from USACE (2002).

10.4. Sediment

10.4.1. River Sediment Data ☒ Yes ☐ No

Sediment data were collected off of the U.S. Moorings site as part of the following investigations:

- 1989 US Moorings Sediment Investigation (USACE 1990a)
- 1990 Columbia & Willamette Rivers Dioxin/Furan Eval. (USACE 1990b)
- 1994 US Moorings Sediment Investigation, June 14 (USACE 1994b)
- 1994 US Moorings Preliminary Assessment, December 20 (USACE 1994c)
- 1995 US Moorings Sediment Investigation, May 16 (USACE 1996)
- 1997 Portland Harbor Sediment Investigation (Weston 1998)

- 2000 Marine Financing XPA (Jacobs 2000)
- 2002 Lower Willamette Group Portland Harbor RI/FS Round 1 Site Characterization Report (Integral 2004).

Additional stations are proposed for LWG Round 2 sampling. Existing and proposed station locations are shown in Figure 1. Over 41surface samples and 18 subsurface samples have been collected, although not all samples were analyzed for all compounds. The data from all eight sampling investigations are summarized in Table 2.

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

Soil Cleanup: Oil-stained soil from leaking equipment and barrels previously stored on the ground were removed in August 1993. At the same time, soil impacted by sandblasting in the storage yard was also removed (USACE 1994a). Approximately 200 tons of contaminated soil were removed and disposed of offsite (USACE 2002).

Source Control: Wastes generated from the site include both non-regulated and regulated materials and are characterized into spent oils, waste paint, paint/thinner, solvent/cleaners, water/others, antifreeze/water, and unknown/flammables. Inman Oil Co. of Portland Oregon, picked up waste and spent oil for 20 or more years prior to 1993 (USACE 1994a). Spencer Environmental Services, Inc. of Oregon City, Oregon, currently picks up and recycles oil from the site. The site is presently operating at a level comparable to a small quantity generator of hazardous waste. Spill containment pallets are currently being used under all liquids in storage. All stored waste is currently contained in DOT-approved 55-gallon drums, and those are placed on top of spill containment pallets. There is one building at the site that has a concrete slab floor with raised curb that is used as an oil products holding area. Oil booms are routinely placed around the dredges while they are in port. Environmental response equipment for the Corps is stored onsite in containers (USACE 1994a).

11.2. Groundwater Cleanup/Source Control

Available records indicate that no groundwater cleanup or source control activities have been conducted at the site.

11.3. Other

A 5,000-gallon steel UST for unleaded gasoline located on the west end of the garage building [see Supplemental Site Map from MSA (1990)] was decommissioned and removed in 1994 (DEQ 2004c). No evidence of releases from the UST was detected in the soil underneath the tank (DEQ 2004a). One reported oil and diesel fuel spill involving the sinking of a barge (*Raggy*) was cleaned up. No other documented spills or releases were found (USACE 1994a).

11.4. Potential for Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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Other relevant references/information sources:

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Figures:

Figure 1. Site Features

Tables:

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Site Map (MSA 1990)
Figure 1. Aerial photograph of US Moorings (June 11, 1991) (USACE 1994a)
Figure 2. US Moorings Site Map and Building Designations (USACE 1994a)
Drainage Map (USACE 2002)
Map 1. Aerial Photograph with Sample Locations (December 20, 1994) (USACE 1994c)

FIGURES

Figure 1. Site Features

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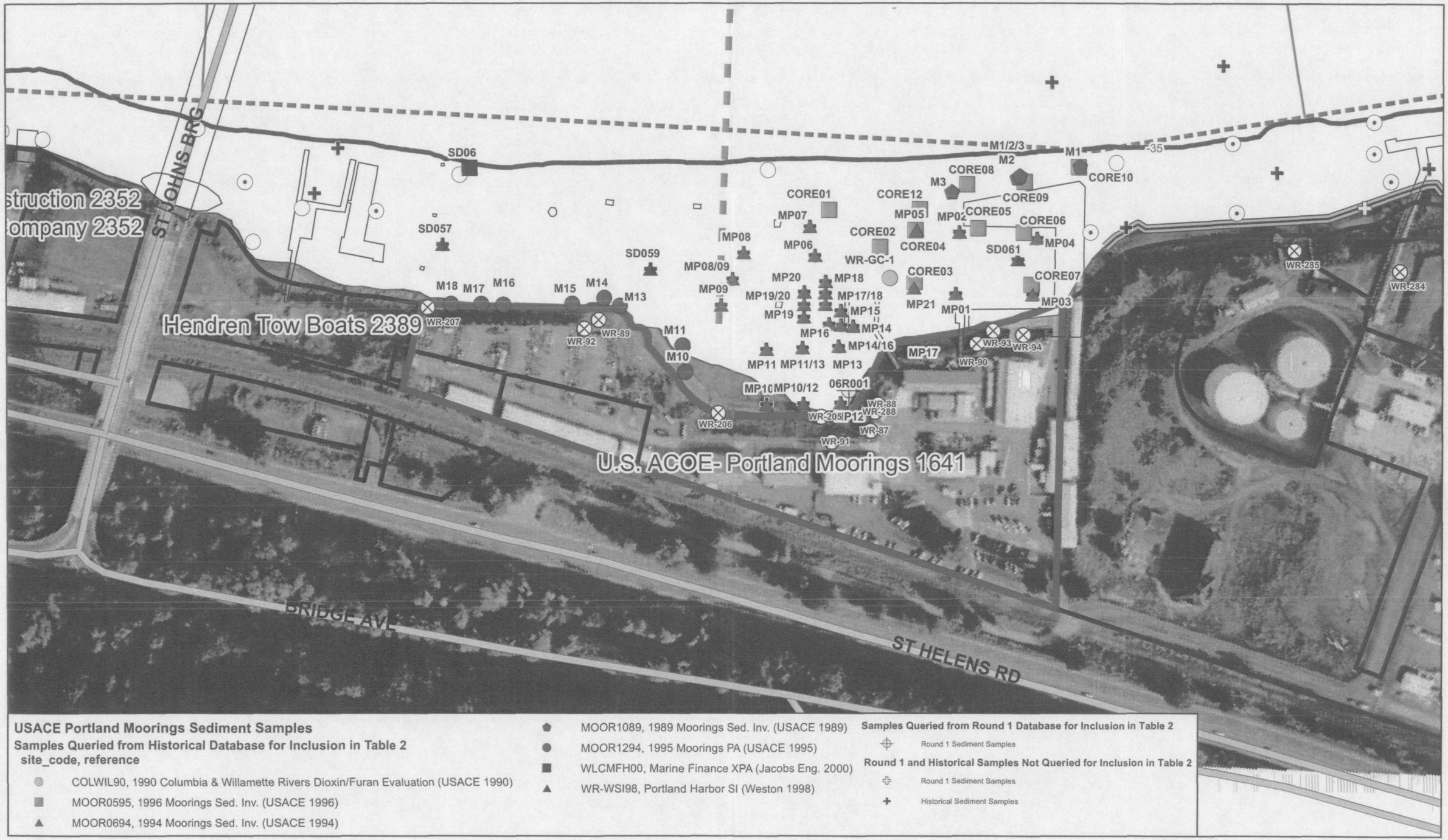

USACE Portland Moorings Sediment Samples

Samples Queried from Historical Database for Inclusion in Table 2

site_code, reference

- COLWIL90, 1990 Columbia & Willamette Rivers Dioxin/Furan Evaluation (USACE 1990)
- MOOR0595, 1996 Moorings Sed. Inv. (USACE 1996)
- MOOR0694, 1994 Moorings Sed. Inv. (USACE 1994)
- MOOR1089, 1989 Moorings Sed. Inv. (USACE 1989)
- MOOR1294, 1995 Moorings PA (USACE 1995)
- WLCMFH00, Marine Finance XPA (Jacobs Eng. 2000)
- WR-WSI98, Portland Harbor SI (Weston 1998)

Samples Queried from Round 1 Database for Inclusion in Table 2

- Round 1 Sediment Samples

Round 1 and Historical Samples Not Queried for Inclusion in Table 2

- Round 1 Sediment Samples
- Historical Sediment Samples

integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/08/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

The City of Portland Outfall mapping information is based on available records; no warranty, expressed or implied, is provided as to the completeness or accuracy of the information. Current layer updated June 2004.

City Outfalls
City Outfalls (Abandoned)
Non-City Outfalls
Seep Photo Location (Not location of actual Seep)

Selected ECSI Site Property Boundary
-35ft. Contour (NAVD 88)
River Miles
Docks & In-water Structures
Navigation Channel

Human Use Areas
Dockside Worker
Recreational Beach Use
Transient

LWG Round 2 Proposed Sediment Samples
Surface Sample Only
Core & Surface Sample

0 100 200 400 Feet

DRAFT

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
USACE- Portland Moorings
ECSI 1641

TABLES

Table 1. Potential Sources and Transport Pathways Assessment
Table 2. Queried Sediment Chemistry Data

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US Moorings #1641

Table 1. Potential Sources and Transport Pathways Assessment

Last Updated: March 4, 2005

Potential Sources	Media Impacted					COIs															Potential Complete Pathway				
						TPH			VOCs																
Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	Riverbank Erosion
Upland Areas																									
Sandblasting areas near LMO warehouses	✓															✓				✓	?			?	
Oil-stained soil in west end of property	✓						?	?					✓								?			?	
Overwater Areas																									
Historical sunken barge (removed)					✓		✓	✓															✓		
Other Areas/Other Issues																									

Notes:
[1] All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.
✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.
? = There is not enough information to determine if source or COI is present or if pathway is complete.
Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST Underground storage tank
AST Above-ground storage tank
TPH Total petroleum hydrocarbons
VOCs Volatile organic compounds
SVOCs Semivolatile organic compounds
PAHs Polycyclic aromatic hydrocarbons
BTEX Benzene, toluene, ethylbenzene, and xylenes
PCBs Polychorinated biphenols

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	20	0	0						3.9 U	40 UH	33.5	40 UH	40 UH
surface	Aroclor 1242 (ug/kg)	20	0	0						3.9 U	80 UH	39	40 UH	80 UH
surface	Aroclor 1248 (ug/kg)	20	1	5	13 J	13 J	13	13 J	13 J	10 U	80 UH	39.5	40 UH	80 UH
surface	Aroclor 1254 (ug/kg)	20	1	5	14 J	14 J	14	14 J	14 J	10 U	90 UH	60.2	70 UH	80 UH
surface	Aroclor 1260 (ug/kg)	20	1	5	8 J	8 J	8	8 J	8 J	3.9 U	90 UH	46.9	40 UH	80 UH
surface	Aroclor 1221 (ug/kg)	20	0	0						7.9 U	300 UH	86.6	40 UH	300 UH
surface	Aroclor 1232 (ug/kg)	20	0	0						3.9 U	90 UH	45.5	40 UH	80 UH
surface	Polychlorinated biphenyls (ug/kg)	20	2	10	8 A	27 J	17.5	8 A	8 A	8 A	300 UA	96	80 UA	300 UA
surface	Butyltin ion (ug/kg)	19	16	84.2	2	39 G	15.1	12 G	26 G	2	39 G	13.6	12 G	26 G
surface	Dibutyltin ion (ug/kg)	19	16	84.2	5	120 G	41.9	36 G	80 G	5	120 G	36.2	30 G	80 G
surface	Dibutyltin ion (ug/l)	1	0	0						0.06 U	0.06 U	0.06	0.06 U	0.06 U
surface	Tributyltin ion (ug/kg)	19	19	100	12 J	410 G	118	94 G	240 G	12 J	410 G	118	94 G	240 G
surface	Tributyltin ion (ug/l)	1	0	0						0.02 UJ	0.02 UJ	0.02	0.02 UJ	0.02 UJ
surface	Tetrabutyltin (ug/kg)	4	0	0						3 U	5.8 U	5.03	5.6 U	5.7 U
surface	Tetrabutyltin (ug/l)	1	0	0						0.02 U	0.02 U	0.02	0.02 U	0.02 U
surface	Total solids (percent)	27	27	100	38	78.4	45.2	42.2	54.9	38	78.4	45.2	42.2	54.9
surface	Total organic carbon (percent)	20	20	100	1.2	3.53 J	2.79	3.09 J	3.48 J	1.2	3.53 J	2.79	3.09 J	3.48 J
surface	Acid Volatile Sulfides (mg/kg)	15	15	100	20 X	1100 X	135	46 X	250 X	20 X	1100 X	135	46 X	250 X
surface	Total sulfides (mg/kg)	15	15	100	16 G	720 G	86.9	29 G	170 G	16 G	720 G	86.9	29 G	170 G
surface	Total volatile solids (percent)	22	22	100	6.8 J	12.3	9.34	9.3 J	10.1 J	6.8 J	12.3	9.34	9.3 J	10.1 J
surface	2,3,7,8-Tetrachlorodibenzo-p-dioxin (ng/kg)	4	4	100	0.82	2	1.43	1.4	1.5	0.82	2	1.43	1.4	1.5
surface	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (ng/kg)	4	4	100	1.3	3	2.03	1.7	2.1	1.3	3	2.03	1.7	2.1
surface	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (ng/kg)	4	4	100	2.2	5.2	3.53	3.2	3.5	2.2	5.2	3.53	3.2	3.5
surface	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (ng/kg)	4	4	100	8.4	21	14.9	14	16	8.4	21	14.9	14	16
surface	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (ng/kg)	4	4	100	4.7	10	6.9	6.1	6.8	4.7	10	6.9	6.1	6.8
surface	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (ng/kg)	4	4	100	170	400	298	260	360	170	400	298	260	360
surface	Octachlorodibenzo-p-dioxin (ng/kg)	4	4	100	1500	7500	3450	2300	2500	1500	7500	3450	2300	2500
surface	2,3,7,8-Tetrachlorodibenzofuran (ng/kg)	4	4	100	10	17	14.5	15	16	10	17	14.5	15	16
surface	1,2,3,7,8-Pentachlorodibenzofuran (ng/kg)	4	4	100	13	33	21.5	17	23	13	33	21.5	17	23
surface	2,3,4,7,8-Pentachlorodibenzofuran (ng/kg)	4	4	100	9.1	19	13.8	12	15	9.1	19	13.8	12	15
surface	1,2,3,4,7,8-Hexachlorodibenzofuran (ng/kg)	4	4	100	20	45	33.8	34	36	20	45	33.8	34	36
surface	1,2,3,6,7,8-Hexachlorodibenzofuran (ng/kg)	4	4	100	6.4	15	10.9	10	12	6.4	15	10.9	10	12
surface	1,2,3,7,8,9-Hexachlorodibenzofuran (ng/kg)	4	4	100	3.3	7.3	5.48	5.5	5.8	3.3	7.3	5.48	5.5	5.8
surface	2,3,4,6,7,8-Hexachlorodibenzofuran (ng/kg)	4	4	100	3.6	6.8	5.53	5	6.7	3.6	6.8	5.53	5	6.7
surface	1,2,3,4,6,7,8-Heptachlorodibenzofuran (ng/kg)	4	4	100	33	90	59.8	58	58	33	90	59.8	58	58
surface	1,2,3,4,7,8,9-Heptachlorodibenzofuran (ng/kg)	4	4	100	5.6	9.8	8.28	8.7	9	5.6	9.8	8.28	8.7	9
surface	Octachlorodibenzofuran (ng/kg)	4	4	100	87	280	157	130	130	87	280	157	130	130
surface	Gravel (percent)	4	4	100	0.01	2.7	0.855	0.03	0.68	0.01	2.7	0.855	0.03	0.68
surface	Sand (percent)	25	25	100	6.6 J	49.3 J	16.3	12.2 J	27.9	6.6 J	49.3 J	16.3	12.2 J	27.9
surface	Very coarse sand (percent)	1	1	100	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
surface	Coarse sand (percent)	1	1	100	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
surface	Medium sand (percent)	1	1	100	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
surface	Fine sand (percent)	1	1	100	9.02	9.02	9.02	9.02	9.02	9.02	9.02	9.02	9.02	9.02
surface	Very fine sand (percent)	1	1	100	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7
surface	Fines (percent)	25	25	100	50.7 J	93.4 J	83.7	87.8 J	92.1 J	50.7 J	93.4 J	83.7	87.8 J	92.1 J
surface	Silt (percent)	25	25	100	45.5 J	80.7 J	72.3	74.8 J	79.2 J	45.5 J	80.7 J	72.3	74.8 J	79.2 J

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Coarse silt (percent)	1	1	100	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1	33.1
surface	Medium silt (percent)	1	1	100	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9	13.9
surface	Fine silt (percent)	1	1	100	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75
surface	Very fine silt (percent)	1	1	100	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59	3.59
surface	Clay (percent)	25	25	100	4	15.8 J	11.3	12 J	13.7 J	4	15.8 J	11.3	12 J	13.7 J
surface	8-9 Phi clay (percent)	1	1	100	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
surface	9-10 Phi clay (percent)	1	0	0						0.01 U	0.01 U	0.01	0.01 U	0.01 U
surface	>10 Phi clay (percent)	1	1	100	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59
surface	Mean grain size (mm)	21	21	100	0.02	0.096	0.0331	0.027	0.044	0.02	0.096	0.0331	0.027	0.044
surface	Mean grain size (percent)	1	1	100	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
surface	Median grain size (mm)	21	21	100	0.016	0.062	0.0227	0.021	0.025	0.016	0.062	0.0227	0.021	0.025
surface	Median grain size (percent)	1	1	100	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
surface	Dalapon (ug/kg)	1	0	0						59 U	59 U	59	59 U	59 U
surface	Dicamba (ug/kg)	1	0	0						3.3 U	3.3 U	3.3	3.3 U	3.3 U
surface	MCPA (ug/kg)	1	0	0						3300 U	3300 U	3300	3300 U	3300 U
surface	Dichloroprop (ug/kg)	1	0	0						6.5 UJ	6.5 UJ	6.5	6.5 UJ	6.5 UJ
surface	2,4-D (ug/kg)	1	0	0						6.5 U	6.5 U	6.5	6.5 U	6.5 U
surface	Silvex (ug/kg)	1	0	0						1.6 UJ	1.6 UJ	1.6	1.6 UJ	1.6 UJ
surface	2,4,5-T (ug/kg)	1	0	0						1.6 UJ	1.6 UJ	1.6	1.6 UJ	1.6 UJ
surface	2,4-DB (ug/kg)	1	0	0						33 U	33 U	33	33 U	33 U
surface	Dinoseb (ug/kg)	1	0	0						3.3 UJ	3.3 UJ	3.3	3.3 UJ	3.3 UJ
surface	MCPP (ug/kg)	1	0	0						3300 U	3300 U	3300	3300 U	3300 U
surface	Aluminum (mg/kg)	4	4	100	26700	41500	36700	37500	40900	26700	41500	36700	37500	40900
surface	Aluminum (mg/l)	1	1	100	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
surface	Antimony (mg/kg)	12	1	8.33	0.14	0.14	0.14	0.14	0.14	0.14	24 U	14.5	17 U	24 U
surface	Antimony (mg/l)	1	0	0						0.05 U	0.05 U	0.05	0.05 U	0.05 U
surface	Arsenic (mg/kg)	29	26	89.7	1.5	60	5.87	3.5	6	1.5	60	5.81	3.6	6 U
surface	Arsenic (mg/l)	1	1	100	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
surface	Cadmium (mg/kg)	29	21	72.4	0.21	4.8	0.541	0.32	0.43	0.21	4.8 U	1.51	0.33	4.8
surface	Cadmium (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U
surface	Chromium (mg/kg)	29	29	100	23	130	37.5	30	56.4	23	130	37.5	30	56.4
surface	Chromium (mg/l)	1	0	0						0.005 U	0.005 U	0.005	0.005 U	0.005 U
surface	Copper (mg/kg)	29	29	100	29	140	49.5	46.2	58.9	29	140	49.5	46.2	58.9
surface	Copper (mg/l)	1	0	0						0.002 U	0.002 U	0.002	0.002 U	0.002 U
surface	Lead (mg/kg)	30	30	100	9	100	34.4	29.2	68	9	100	34.4	29.2	68
surface	Lead (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Manganese (mg/kg)	3	3	100	588	668	625	619	619	588	668	625	619	619
surface	Manganese (mg/l)	1	1	100	7.57	7.57	7.57	7.57	7.57	7.57	7.57	7.57	7.57	7.57
surface	Mercury (mg/kg)	29	19	65.5	0.04	0.13	0.0921	0.1	0.11	0.04	0.2 U	0.118	0.1	0.2 U
surface	Mercury (mg/l)	1	0	0						0.0001 U	0.0001 U	0.0001	0.0001 U	0.0001 U
surface	Nickel (mg/kg)	29	29	100	18	50	25.3	22.9	33	18	50	25.3	22.9	33
surface	Nickel (mg/l)	1	0	0						0.01 U	0.01 U	0.01	0.01 U	0.01 U
surface	Selenium (mg/kg)	14	3	21.4	11	14	12.7	13	13	0.33 U	14	3.43	1 U	13
surface	Selenium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Silver (mg/kg)	29	20	69	0.07	1	0.443	0.39	0.9	0.07	4.8 U	1.48	0.43	4.5 U
surface	Silver (mg/l)	1	0	0						0.0002 U	0.0002 U	0.0002	0.0002 U	0.0002 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Thallium (mg/kg)	13	2	15.4	0.1	6	3.05	0.1	0.1	0.1	48 U	26.2	33 U	48 U
surface	Thallium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Zinc (mg/kg)	29	29	100	86	638	132	110	147	86	638	132	110	147
surface	Zinc (mg/l)	1	1	100	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
surface	Barium (mg/kg)	3	3	100	171	177	174	174	174	171	177	174	174	174
surface	Barium (mg/l)	1	1	100	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
surface	Beryllium (mg/kg)	13	4	30.8	0.55	0.7	0.645	0.63	0.7	0.55	4.8 U	2.74	3.3 U	4.8 U
surface	Beryllium (mg/l)	1	0	0						0.001 U	0.001 U	0.001	0.001 U	0.001 U
surface	Calcium (mg/kg)	3	3	100	8210 J	8670 J	8500	8610 J	8610 J	8210 J	8670 J	8500	8610 J	8610 J
surface	Calcium (mg/l)	1	1	100	84.3	84.3	84.3	84.3	84.3	84.3	84.3	84.3	84.3	84.3
surface	Cobalt (mg/kg)	3	3	100	17.7	18.6	18.2	18.4	18.4	17.7	18.6	18.2	18.4	18.4
surface	Cobalt (mg/l)	1	1	100	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
surface	Iron (mg/kg)	3	3	100	39900	43200	41600	41700	41700	39900	43200	41600	41700	41700
surface	Iron (mg/l)	1	1	100	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
surface	Magnesium (mg/kg)	3	3	100	6700	7000	6890	6980	6980	6700	7000	6890	6980	6980
surface	Magnesium (mg/l)	1	1	100	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
surface	Potassium (mg/kg)	3	3	100	1190	1360	1300	1350	1350	1190	1360	1300	1350	1350
surface	Potassium (mg/l)	1	1	100	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
surface	Sodium (mg/kg)	3	3	100	1100	1220	1170	1190	1190	1100	1220	1170	1190	1190
surface	Sodium (mg/l)	1	1	100	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
surface	Titanium (mg/kg)	3	3	100	1910	2110	2000	1980	1980	1910	2110	2000	1980	1980
surface	Vanadium (mg/kg)	3	3	100	100	110	105	105	105	100	110	105	105	105
surface	Vanadium (mg/l)	1	0	0						0.003 U	0.003 U	0.003	0.003 U	0.003 U
surface	2-Methylnaphthalene (ug/kg)	21	16	76.2	10 J	9750	708	99	330 G	10 J	9750	551	60	230
surface	Acenaphthene (ug/kg)	21	21	100	63	1300	381	270	750	63	1300	381	270	750
surface	Acenaphthylene (ug/kg)	21	16	76.2	24	350	110	88	190	19 U	350	105	77 G	190
surface	Anthracene (ug/kg)	21	21	100	46 J	9900	899	420	920	46 J	9900	899	420	920
surface	Fluorene (ug/kg)	21	21	100	35	10300	749	160	640	35	10300	749	160	640
surface	Naphthalene (ug/kg)	21	21	100	19 J	7940	492	100	280	19 J	7940	492	100	280
surface	Phenanthrene (ug/kg)	21	21	100	150 J	61700	4770	1200	5100	150 J	61700	4770	1200	5100
surface	Low Molecular Weight PAH (ug/kg)	21	21	100	375 A	90970 A	7370	2089 A	8360 A	375 A	90970 A	7370	2089 A	8360 A
surface	Dibenz(a,h)anthracene (ug/kg)	21	21	100	20 J	880	274	234	500	20 J	880	274	234	500
surface	Benz(a)anthracene (ug/kg)	21	21	100	100	9710	1850	1300	3300	100	9710	1850	1300	3300
surface	Benzo(a)pyrene (ug/kg)	21	21	100	120	7790	1970	1800	3000	120	7790	1970	1800	3000
surface	Benzo(b)fluoranthene (ug/kg)	6	6	100	95	6470	1560	170	2200 J	95	6470	1560	170	2200 J
surface	Benzo(g,h,i)perylene (ug/kg)	21	21	100	97	6570	1190	930	1800	97	6570	1190	930	1800
surface	Benzo(k)fluoranthene (ug/kg)	6	6	100	44	5930	1380	170	1800 J	44	5930	1380	170	1800 J
surface	Chrysene (ug/kg)	21	21	100	130	11200	2100	1500	3500	130	11200	2100	1500	3500
surface	Fluoranthene (ug/kg)	21	21	100	210 J	37600	5190	2800	11000	210 J	37600	5190	2800	11000
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	21	21	100	79	9900	2180	1600	4900	79	9900	2180	1600	4900
surface	Pyrene (ug/kg)	21	21	100	240 J	43400	5250	2600	9200	240 J	43400	5250	2600	9200
surface	Benzo(b+k)fluoranthene (ug/kg)	20	20	100	174 A	12400 A	3120	2400	7600	174 A	12400 A	3120	2400	7600
surface	High Molecular Weight PAH (ug/kg)	21	21	100	1101 A	135920 A	23200	16464 A	37090 A	1101 A	135920 A	23200	16464 A	37090 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	20	20	100	1589 A	226890 A	31100	17960 A	60090 A	1589 A	226890 A	31100	17960 A	60090 A
surface	2,4'-DDD (ug/kg)	1	0	0						1.8 U	1.8 U	1.8	1.8 U	1.8 U
surface	2,4'-DDE (ug/kg)	1	0	0						4.4 U	4.4 U	4.4	4.4 U	4.4 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	2,4'-DDT (ug/kg)	1	0	0						0.88 UJ	0.88 UJ	0.88	0.88 UJ	0.88 UJ
surface	4,4'-DDD (ug/kg)	18	18	100	4.1	1200	88.9	20 H	40 H	4.1	1200	88.9	20 H	40 H
surface	4,4'-DDE (ug/kg)	18	18	100	2.4	100	9.82	5 H	6 H	2.4	100	9.82	5 H	6 H
surface	4,4'-DDT (ug/kg)	18	18	100	4 HJ	2500	171	20 HJ	200 HJ	4 HJ	2500	171	20 HJ	200 HJ
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	18	18	100	17.5 A	3800 A	270	55 A	235 A	17.5 A	3800 A	270	55 A	235 A
surface	Aldrin (ug/kg)	18	1	5.56	60	60	60	60	60	0.2 U	60	6.68	4 UH	7 UH
surface	alpha-Hexachlorocyclohexane (ug/kg)	18	0	0						0.2 U	60 U	5.06	2 UH	2 UH
surface	beta-Hexachlorocyclohexane (ug/kg)	18	0	0						0.95 U	60 U	7.63	5 UH	5 UH
surface	delta-Hexachlorocyclohexane (ug/kg)	18	0	0						0.2 U	60 U	5.06	2 UH	2 UH
surface	gamma-Hexachlorocyclohexane (ug/kg)	18	1	5.56	540	540	540	540	540	0.2 U	540	33.5	2 UH	20 UH
surface	cis-Chlordane (ug/kg)	2	0	0						0.58 U	0.95 U	0.765	0.58 U	0.58 U
surface	trans-Chlordane (ug/kg)	1	0	0						1.9 U	1.9 U	1.9	1.9 U	1.9 U
surface	Oxychlordane (ug/kg)	1	0	0						0.42 U	0.42 U	0.42	0.42 U	0.42 U
surface	cis-Nonachlor (ug/kg)	1	0	0						0.54 U	0.54 U	0.54	0.54 U	0.54 U
surface	trans-Nonachlor (ug/kg)	1	0	0						0.39 U	0.39 U	0.39	0.39 U	0.39 U
surface	Dieldrin (ug/kg)	18	0	0						0.68 U	60 U	5.25	2 UH	4 UH
surface	alpha-Endosulfan (ug/kg)	18	0	0						0.33 U	60 U	5.07	2 UH	2 UH
surface	beta-Endosulfan (ug/kg)	18	0	0						0.39 U	60 U	5.57	2 UH	5 UH
surface	Endosulfan sulfate (ug/kg)	18	0	0						0.39 UJ	60 U	6.18	2 UH	7 UH
surface	Endrin (ug/kg)	18	0	0						0.39 U	60 U	5.35	2 UH	5 UH
surface	Endrin aldehyde (ug/kg)	18	0	0						0.39 U	60 U	5.35	2 UH	5 UH
surface	Endrin ketone (ug/kg)	2	0	0						0.39 U	1.9 U	1.15	0.39 U	0.39 U
surface	Heptachlor (ug/kg)	18	0	0						0.2 U	60 U	5.06	2 UH	2 UH
surface	Heptachlor epoxide (ug/kg)	18	0	0						0.2 U	60 U	5.06	2 UH	2 UH
surface	Methoxychlor (ug/kg)	18	0	0						2 U	300 U	36.9	20 UH	50 UH
surface	Mirex (ug/kg)	1	0	0						3.3 U	3.3 U	3.3	3.3 U	3.3 U
surface	Toxaphene (ug/kg)	18	0	0						20 U	12000 U	823	200 UH	200 UH
surface	gamma-Chlordane (ug/kg)	1	0	0						0.95 U	0.95 U	0.95	0.95 U	0.95 U
surface	Chlordane (cis & trans) (ug/kg)	16	0	0						50 UH	1000 U	123	70 UH	70 UH
surface	Diesel fuels (mg/kg)	1	0	0						110 U	110 U	110	110 U	110 U
surface	Gasoline (mg/kg)	1	0	0						40 U	40 U	40	40 U	40 U
surface	Residual Range Organics (mg/kg)	1	0	0						450 U	450 U	450	450 U	450 U
surface	2,3,4,6-Tetrachlorophenol (ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
surface	2,4,5-Trichlorophenol (ug/kg)	5	0	0						73 U	100 U	92.6	96 U	100 U
surface	2,4,6-Trichlorophenol (ug/kg)	5	0	0						73 U	100 U	92.6	96 U	100 U
surface	2,4-Dichlorophenol (ug/kg)	5	0	0						57 U	150 U	77	60 U	60 U
surface	2,4-Dimethylphenol (ug/kg)	20	0	0						19 U	290 U	95.4	100 U	100 U
surface	2,4-Dinitrophenol (ug/kg)	5	0	0						190 UJ	440 U	244	200 UJ	200 U
surface	2-Chlorophenol (ug/kg)	5	0	0						19 U	73 U	30.2	20 U	20 UJ
surface	2-Methylphenol (ug/kg)	20	0	0						19 U	290 U	93.4	100 U	100 U
surface	2-Nitrophenol (ug/kg)	5	0	0						73 U	100 U	92.6	96 U	100 U
surface	4,6-Dinitro-2-methylphenol (ug/kg)	5	0	0						190 U	290 U	214	200 U	200 U
surface	4-Chloro-3-methylphenol (ug/kg)	5	0	0						38 U	73 U	45.8	40 U	40 UJ
surface	4-Methylphenol (ug/kg)	19	3	15.8	190	300	257	280	280	20 U	300	121	100 U	280
surface	4-Nitrophenol (ug/kg)	5	0	0						94 U	150 U	108	100 U	100 UJ
surface	Pentachlorophenol (ug/kg)	20	0	0						50 UJ	440 U	227	250 U	250 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Phenol (ug/kg)	20	1	5	6 J	6 J	6	6 J	6 J	6 J	100 U	80.2	100 U	100 U
surface	2,3,4,5-Tetrachlorophenol (ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
surface	2,3,5,6-Tetrachlorophenol (ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
surface	3- and 4-Methylphenol Coelution (ug/kg)	1	0	0						290 U	290 U	290	290 U	290 U
surface	Dimethyl phthalate (ug/kg)	20	0	0						15 U	50 U	42.2	50 U	50 U
surface	Diethyl phthalate (ug/kg)	20	1	5	2 J	2 J	2	2 J	2 J	2 J	50 U	41.5	50 U	50 U
surface	Dibutyl phthalate (ug/kg)	20	0	0						19 U	50 U	43.2	50 U	50 U
surface	Butylbenzyl phthalate (ug/kg)	20	2	10	4 J	58	31	4 J	4 J	4 J	58	43.5	50 U	50 U
surface	Di-n-octyl phthalate (ug/kg)	20	0	0						19 U	290 U	55.9	50 U	50 U
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	20	17	85	90 J	740	379	360 G	520	90 J	740	341	340	520
surface	Azobenzene (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	4	0	0						19 UJ	20 U	19.5	19 UJ	20 UJ
surface	2,4-Dinitrotoluene (ug/kg)	5	0	0						73 U	100 UJ	92.6	96 U	100 U
surface	2,6-Dinitrotoluene (ug/kg)	5	0	0						29 U	100 U	83.8	96 U	100 U
surface	2-Chloronaphthalene (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	2-Nitroaniline (ug/kg)	5	0	0						29 U	100 U	83.8	96 U	100 U
surface	3,3'-Dichlorobenzidine (ug/kg)	5	0	0						94 UJ	200 U	118	100 UJ	100 U
surface	3-Nitroaniline (ug/kg)	5	0	0						110 UJ	290 U	152	120 UJ	120 U
surface	4-Bromophenyl phenyl ether (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	4-Chloroaniline (ug/kg)	5	0	0						57 UJ	73 U	61.6	60 UJ	60 U
surface	4-Chlorophenyl phenyl ether (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	4-Nitroaniline (ug/kg)	5	0	0						94 UJ	150 U	108	100 UJ	100 U
surface	Aniline (ug/kg)	1	0	0						20 U	20 U	20	20 U	20 U
surface	Benzoic acid (ug/kg)	5	2	40	80 J	220	150	80 J	80 J	80 J	220	176	190 U	200 U
surface	Benzyl alcohol (ug/kg)	5	0	0						19 UJ	100 U	46.2	20 UJ	73 U
surface	Bis(2-chloroethoxy) methane (ug/kg)	5	0	0						19 U	29 U	21.4	20 U	20 U
surface	Bis(2-chloroethyl) ether (ug/kg)	5	0	0						15 U	40 U	34.2	38 U	40 U
surface	Carbazole (ug/kg)	5	5	100	9 J	220	111	77 J	210 J	9 J	220	111	77 J	210 J
surface	Dibenzofuran (ug/kg)	21	15	71.4	6 J	13900	998	72	180	6 J	13900	727	52	120
surface	Hexachlorobenzene (ug/kg)	5	0	0						0.31 U	20 U	14.7	19 U	19 U
surface	Hexachlorobutadiene (ug/kg)	5	0	0						0.2 UJ	20 U	14.6	19 U	19 U
surface	Hexachlorocyclopentadiene (ug/kg)	5	0	0						94 UJ	290 U	136	100 UJ	100 UJ
surface	Hexachloroethane (ug/kg)	5	0	0						10 U	59 U	25.4	19 U	20 U
surface	Isophorone (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	Nitrobenzene (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	N-Nitrosodimethylamine (ug/kg)	1	0	0						100 U	100 U	100	100 U	100 U
surface	N-Nitrosodipropylamine (ug/kg)	5	0	0						15 U	40 UJ	34.2	38 U	40 U
surface	N-Nitrosodiphenylamine (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	Bis(2-chloroisopropyl) ether (ug/kg)	1	0	0						15 U	15 U	15	15 U	15 U
surface	1,2-Dichlorobenzene (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	1,3-Dichlorobenzene (ug/kg)	5	0	0						15 U	20 U	18.6	19 U	20 U
surface	1,4-Dichlorobenzene (ug/kg)	5	0	0						15 U	20 UJ	18.6	19 U	20 U
surface	1,2,4-Trichlorobenzene (ug/kg)	5	0	0						15 U	20 UJ	18.6	19 U	20 U
subsurface	Aroclor 1016 (ug/kg)	2	0	0						10 U	20 U	15	10 U	10 U
subsurface	Aroclor 1242 (ug/kg)	5	0	0						10 U	60 U	42	60 U	60 U
subsurface	Aroclor 1248 (ug/kg)	5	0	0						10 U	60 U	42	60 U	60 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Aroclor 1254 (ug/kg)	5	0	0						10 U	60 U	42	60 U	60 U
subsurface	Aroclor 1260 (ug/kg)	5	0	0						10 U	60 U	42	60 U	60 U
subsurface	Aroclor 1221 (ug/kg)	2	0	0						20 U	40 U	30	20 U	20 U
subsurface	Aroclor 1232 (ug/kg)	2	0	0						10 U	20 U	15	10 U	10 U
subsurface	Polychlorinated biphenyls (ug/kg)	5	0	0						20 UA	60 UA	48	60 UA	60 UA
subsurface	Butyltin ion (ug/kg)	9	0	0						1 U	6 UJ	3.11	3 UGH	3 UGH
subsurface	Dibutyltin ion (ug/kg)	9	0	0						1 U	6 UJ	3.11	3 UH	3 UH
subsurface	Tributyltin ion (ug/kg)	9	0	0						1 U	6 U	3.11	3 UH	3 UH
subsurface	Tetrabutyltin (ug/kg)	2	0	0						3 U	6 U	4.5	3 U	3 U
subsurface	Total solids (percent)	42	42	100	45.9	64.7	54.9	54.8	61.1	45.9	64.7	54.9	54.8	61.1
subsurface	Total organic carbon (percent)	6	6	100	1.2	3.15	2.32	2.5	3.03	1.2	3.15	2.32	2.5	3.03
subsurface	Total sulfides (ug/g)	4	4	100	30.5	220.2	97	35.9	101.5	30.5	220.2	97	35.9	101.5
subsurface	Total volatile solids (percent)	16	16	100	7.5	18.3	9.32	8.6	11	7.5	18.3	9.32	8.6	11
subsurface	2,3,7,8-Tetrachlorodibenzo-p-dioxin (ng/kg)	8	2	25	0.96	1.2	1.08	0.96	0.96	0.64 U	1.2	0.904	0.8 U	1.2 UI
subsurface	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (ng/kg)	8	5	62.5	0.79 T	1.9 T	1.32	1.1 T	1.7 T	0.79 T	1.9 T	1.41	1.3 U	1.9 UI
subsurface	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (ng/kg)	8	7	87.5	0.9 T	4.7	2.67	2.4	3.6 T	0.9 T	4.7	2.69	2.4	3.6 T
subsurface	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (ng/kg)	8	7	87.5	9	21	14.6	14	17	9	21	14.5	14	17
subsurface	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (ng/kg)	8	7	87.5	1.5 T	6.7	4.51	4.8	6.3	1.5 T	13 U	5.58	4.8	6.7
subsurface	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (ng/kg)	8	8	100	220	420	300	270	380	220	420	300	270	380
subsurface	Octachlorodibenzo-p-dioxin (ng/kg)	8	8	100	2300 B	6900 B	4150	3400	5700 B	2300 B	6900 B	4150	3400	5700 B
subsurface	2,3,7,8-Tetrachlorodibenzofuran (ng/kg)	8	8	100	2	62	34	27	57	2	62	34	27	57
subsurface	1,2,3,7,8-Pentachlorodibenzofuran (ng/kg)	8	8	100	2.6	150	55.6	34	90	2.6	150	55.6	34	90
subsurface	2,3,4,7,8-Pentachlorodibenzofuran (ng/kg)	8	8	100	9.3	62	31.8	23	52	9.3	62	31.8	23	52
subsurface	1,2,3,4,7,8-Hexachlorodibenzofuran (ng/kg)	8	8	100	13	270	100	78	140	13	270	100	78	140
subsurface	1,2,3,6,7,8-Hexachlorodibenzofuran (ng/kg)	8	8	100	11	65	28.3	22	36	11	65	28.3	22	36
subsurface	1,2,3,7,8,9-Hexachlorodibenzofuran (ng/kg)	8	8	100	2.5	48	15	10	17	2.5	48	15	10	17
subsurface	2,3,4,6,7,8-Hexachlorodibenzofuran (ng/kg)	8	7	87.5	3.2 J	16 J	9.71	9.5 J	15 J	1.9 U	16 J	8.74	9.1 J	15 J
subsurface	1,2,3,4,6,7,8-Heptachlorodibenzofuran (ng/kg)	8	8	100	74 J	370 J	155	130 J	160 J	74 J	370 J	155	130 J	160 J
subsurface	1,2,3,4,7,8,9-Heptachlorodibenzofuran (ng/kg)	8	8	100	3.4	40	19.8	21	30	3.4	40	19.8	21	30
subsurface	Octachlorodibenzofuran (ng/kg)	8	8	100	130	570	326	300	530	130	570	326	300	530
subsurface	Gravel (percent)	2	2	100	0.01	0.1	0.055	0.01	0.01	0.01	0.1	0.055	0.01	0.01
subsurface	Sand (percent)	17	17	100	4.2	81.1	20.1	12	37	4.2	81.1	20.1	12	37
subsurface	Fines (percent)	17	17	100	62.9	95.8	83.9	88	94.1	62.9	95.8	83.9	88	94.1
subsurface	Silt (percent)	17	17	100	48.6	79.1	68.1	70.1	78.3	48.6	79.1	68.1	70.1	78.3
subsurface	Clay (percent)	17	17	100	5.7	19.4	15.8	16.1	19.4	5.7	19.4	15.8	16.1	19.4
subsurface	Mean grain size (mm)	3	3	100	0.035	0.0684	0.0533	0.0564	0.0564	0.035	0.0684	0.0533	0.0564	0.0564
subsurface	Mean grain size (percent)	13	13	100	0.0197	0.06	0.0267	0.0233	0.0333	0.0197	0.06	0.0267	0.0233	0.0333
subsurface	Median grain size (mm)	3	3	100	0.021	0.03	0.025	0.024	0.024	0.021	0.03	0.025	0.024	0.024
subsurface	Median grain size (percent)	13	13	100	0.013	0.021	0.0175	0.017	0.02	0.013	0.021	0.0175	0.017	0.02
subsurface	Aluminum (mg/kg)	1	1	100	35400	35400	35400	35400	35400	35400	35400	35400	35400	35400
subsurface	Antimony (mg/kg)	1	1	100	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
subsurface	Arsenic (mg/kg)	6	5	83.3	3.66	5.28	4.35	4.41	4.7	3.66	5.28	4.29	4 U	4.7
subsurface	Cadmium (mg/kg)	6	6	100	0.15	0.44	0.358	0.39	0.44	0.15	0.44	0.358	0.39	0.44
subsurface	Chromium (mg/kg)	6	6	100	22.9	37	31.5	32	34	22.9	37	31.5	32	34
subsurface	Copper (mg/kg)	6	6	100	29.4	67	46.2	38	54	29.4	67	46.2	38	54
subsurface	Lead (mg/kg)	47	47	100	15.1	618	79.2	39	331	15.1	618	79.2	39	331

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	Manganese (mg/kg)	1	1	100	524	524	524	524	524	524	524	524	524	524
subsurface	Mercury (mg/kg)	6	6	100	0.14	0.429	0.234	0.15	0.312	0.14	0.429	0.234	0.15	0.312
subsurface	Nickel (mg/kg)	6	6	100	20.5	39	30.4	29	37	20.5	39	30.4	29	37
subsurface	Selenium (mg/kg)	2	1	50	11	11	11	11	11	2.21 U	11	6.61	2.21 U	2.21 U
subsurface	Silver (mg/kg)	6	5	83.3	0.01	1.1	0.276	0.01	0.25	0.01 U	1.1	0.232	0.01	0.25
subsurface	Thallium (mg/kg)	2	2	100	0.06	7	3.53	0.06	0.06	0.06	7	3.53	0.06	0.06
subsurface	Zinc (mg/kg)	6	6	100	65.1	183	111	91.3	158	65.1	183	111	91.3	158
subsurface	Barium (mg/kg)	1	1	100	175	175	175	175	175	175	175	175	175	175
subsurface	Beryllium (mg/kg)	2	2	100	0.45	0.62	0.535	0.45	0.45	0.45	0.62	0.535	0.45	0.45
subsurface	Calcium (mg/kg)	1	1	100	7890	7890	7890	7890	7890	7890	7890	7890	7890	7890
subsurface	Cobalt (mg/kg)	1	1	100	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
subsurface	Iron (mg/kg)	1	1	100	38900	38900	38900	38900	38900	38900	38900	38900	38900	38900
subsurface	Magnesium (mg/kg)	1	1	100	6700	6700	6700	6700	6700	6700	6700	6700	6700	6700
subsurface	Potassium (mg/kg)	1	1	100	1190	1190	1190	1190	1190	1190	1190	1190	1190	1190
subsurface	Sodium (mg/kg)	1	1	100	1040	1040	1040	1040	1040	1040	1040	1040	1040	1040
subsurface	Titanium (mg/kg)	1	1	100	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
subsurface	Vanadium (mg/kg)	1	1	100	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
subsurface	2-Methylnaphthalene (ug/kg)	46	40	87	3 J	47600	6830	3700	21600	3 J	47600	5980	3050	19600
subsurface	Acenaphthene (ug/kg)	46	46	100	10 J	70800	7710	3880	22800	10 J	70800	7710	3880	22800
subsurface	Acenaphthylene (ug/kg)	46	17	37	10 J	3220	696	550	1390	10 J	3220	456	300 U	840
subsurface	Anthracene (ug/kg)	46	45	97.8	10 J	45600	6540	5100	15800	10 J	45600	6400	4980	15800
subsurface	Fluorene (ug/kg)	46	44	95.7	8 J	43600	5750	3610	13900	8 J	43600	5510	3450	13900
subsurface	Naphthalene (ug/kg)	46	45	97.8	10 J	57700	5630	2270	21000	10 J	57700	5520	2270	21000
subsurface	Phenanthrene (ug/kg)	46	46	100	82 J	284000	37700	21000	89800	82 J	284000	37700	21000	89800
subsurface	Low Molecular Weight PAH (ug/kg)	46	46	100	130 A	456000 A	63100	35940 A	158650 A	130 A	456000 A	63100	35940 A	158650 A
subsurface	Dibenz(a,h)anthracene (ug/kg)	46	37	80.4	200	7070	1190	840	2970	200	7070	1020	600	2600
subsurface	Benz(a)anthracene (ug/kg)	46	46	100	100	44200	7870	4700	22400	100	44200	7870	4700	22400
subsurface	Benzo(a)pyrene (ug/kg)	46	45	97.8	100 J	39100	7350	4600	17300	100 J	39100	7230	4330	17300
subsurface	Benzo(b)fluoranthene (ug/kg)	43	43	100	100 J	40300	6210	3570	17500	100 J	40300	6210	3570	17500
subsurface	Benzo(g,h,i)perylene (ug/kg)	46	46	100	200 J	39000	6400	3830	18300	200 J	39000	6400	3830	18300
subsurface	Benzo(k)fluoranthene (ug/kg)	43	43	100	60 J	30000	4910	3130	15300	60 J	30000	4910	3130	15300
subsurface	Chrysene (ug/kg)	46	46	100	100	46000	8540	5610	25700	100	46000	8540	5610	25700
subsurface	Fluoranthene (ug/kg)	46	46	100	360 J	148000	25500	15900	81600	360 J	148000	25500	15900	81600
subsurface	Indeno(1,2,3-cd)pyrene (ug/kg)	46	46	100	100 J	40900	6030	3230	17500	100 J	40900	6030	3230	17500
subsurface	Pyrene (ug/kg)	46	46	100	450 J	175000	30600	19600	90300	450 J	175000	30600	19600	90300
subsurface	Benzo(b+k)fluoranthene (ug/kg)	46	46	100	160 A	70300 A	10800	6410 A	32800 A	160 A	70300 A	10800	6410 A	32800 A
subsurface	High Molecular Weight PAH (ug/kg)	46	46	100	1570 A	549570 A	104000	64040 A	307240 A	1570 A	549570 A	104000	64040 A	307240 A
subsurface	Polycyclic Aromatic Hydrocarbons (ug/kg)	46	46	100	1700 A	981620 A	167000	96870 A	467400 A	1700 A	981620 A	167000	96870 A	467400 A
subsurface	4,4'-DDD (ug/kg)	45	40	88.9	20	2000	290	80	1200	2 U	2000	263	80	760
subsurface	4,4'-DDE (ug/kg)	45	31	68.9	2 J	70	20.8	9 J	40	2 J	80 U	22.7	9 J	60
subsurface	4,4'-DDT (ug/kg)	45	20	44.4	5 J	690	93.7	40	200	1 U	690	66.3	40	200 U
subsurface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	45	42	93.3	5 A	2190 A	336	110 A	800 A	5 A	2190 A	321	110 A	800 A
subsurface	Aldrin (ug/kg)	45	13	28.9	4 J	20	7.08	6 J	9 J	0.99 U	100 U	13.5	4 J	40 U
subsurface	alpha-Hexachlorocyclohexane (ug/kg)	45	25	55.6	1 J	30	6.16	4 J	10	0.99 U	80 U	6.6	3 J	20
subsurface	beta-Hexachlorocyclohexane (ug/kg)	45	0	0						0.99 U	80 U	3.78	2 U	3 U
subsurface	delta-Hexachlorocyclohexane (ug/kg)	45	6	13.3	2 J	8 J	4.33	3 J	6 J	0.99 UJ	80 U	4.82	2 U	6 J

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	gamma-Hexachlorocyclohexane (ug/kg)	45	17	37.8	2 J	360	75.9	20	300	0.99 U	360	33.9	1 U	200 U
subsurface	cis-Chlordane (ug/kg)	4	0	0						0.99 U	5 U	4	5 U	5 U
subsurface	Dieldrin (ug/kg)	45	7	15.6	0.003 J	29	9.43	7 J	11	0.003 J	80 U	10	2 U	60 U
subsurface	alpha-Endosulfan (ug/kg)	45	1	2.22	6 J	6 J	6	6 J	6 J	0.99 U	80 U	6.93	1 U	60 U
subsurface	beta-Endosulfan (ug/kg)	45	3	6.67	6 J	30	14.3	7 J	7 J	1 U	80 U	12.5	1 U	60 U
subsurface	Endosulfan sulfate (ug/kg)	45	0	0						2 U	80 U	12.8	2 U	60 U
subsurface	Endrin (ug/kg)	45	4	8.89	4 J	10	7	5	9 J	2 U	80 U	10.7	2 U	60 U
subsurface	Endrin aldehyde (ug/kg)	42	2	4.76	2 J	5 J	3.5	2 J	2 J	1 U	80 U	12.1	1 U	60 U
subsurface	Endrin ketone (ug/kg)	4	0	0						2 U	9 U	7.25	9 U	9 U
subsurface	Heptachlor (ug/kg)	45	4	8.89	2 J	6 J	4.5	5 J	5 J	0.99 U	80 U	4.07	1 U	5 J
subsurface	Heptachlor epoxide (ug/kg)	45	8	17.8	2 J	10	6.63	7 J	10	0.99 U	80 U	12.6	2 U	60 U
subsurface	Methoxychlor (ug/kg)	45	0	0						5 U	300 U	49.4	5 U	300 U
subsurface	Toxaphene (ug/kg)	45	0	0						51 U	20000 U	2550	2000 U	4000 U
subsurface	gamma-Chlordane (ug/kg)	4	0	0						0.99 U	5 U	4	5 U	5 U
subsurface	Chlordane (cis & trans) (ug/kg)	41	0	0						21 U	3000 U	294	21 U	900 U
subsurface	Diesel fuels (mg/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	Gasoline (mg/kg)	1	0	0						20 U	20 U	20	20 U	20 U
subsurface	Residual Range Organics (mg/kg)	1	0	0						390 U	390 U	390	390 U	390 U
subsurface	2,4,5-Trichlorophenol (ug/kg)	5	0	0						74 U	2600 U	1490	2200 U	2500 U
subsurface	2,4,6-Trichlorophenol (ug/kg)	5	0	0						74 U	2600 U	1490	2200 U	2500 U
subsurface	2,4-Dichlorophenol (ug/kg)	5	0	0						60 U	1600 U	922	1300 U	1500 U
subsurface	2,4-Dimethylphenol (ug/kg)	5	0	0						20 U	1000 U	634	860 U	990 U
subsurface	2,4-Dinitrophenol (ug/kg)	5	0	0						200 UJ	5200 U	3030	4300 U	5000 U
subsurface	2-Chlorophenol (ug/kg)	5	0	0						20 U	520 U	309	430 U	500 U
subsurface	2-Methylphenol (ug/kg)	5	0	0						20 U	520 U	354	430 U	500 U
subsurface	2-Nitrophenol (ug/kg)	5	0	0						74 U	2600 U	1490	2200 U	2500 U
subsurface	4,6-Dinitro-2-methylphenol (ug/kg)	5	0	0						200 UJ	5200 U	3000	4300 U	5000 U
subsurface	4-Chloro-3-methylphenol (ug/kg)	5	0	0						40 U	1000 U	593	860 U	990 U
subsurface	4-Methylphenol (ug/kg)	4	1	25	85	85	85	85	85	85	520 U	384	430 U	500 U
subsurface	4-Nitrophenol (ug/kg)	5	0	0						99 U	2600 U	1510	2200 U	2500 U
subsurface	Pentachlorophenol (ug/kg)	5	0	0						99 U	2600 U	1570	2200 U	2500 U
subsurface	Phenol (ug/kg)	5	0	0						20 U	1000 U	589	860 U	990 U
subsurface	3- and 4-Methylphenol Coelution (ug/kg)	1	0	0						300 U	300 U	300	300 U	300 U
subsurface	Dimethyl phthalate (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	Diethyl phthalate (ug/kg)	5	1	20	3 J	3 J	3	3 J	3 J	3 J	520 U	295	430 U	500 U
subsurface	Dibutyl phthalate (ug/kg)	5	0	0						20 U	520 U	300	430 U	500 U
subsurface	Butylbenzyl phthalate (ug/kg)	5	0	0						20 U	520 U	300	430 U	500 U
subsurface	Di-n-octyl phthalate (ug/kg)	5	0	0						20 U	520 U	354	430 U	500 U
subsurface	Bis(2-ethylhexyl) phthalate (ug/kg)	5	0	0						31 U	3000 U	896	500 U	520 U
subsurface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	4	0	0						20 U	520 U	368	430 U	500 U
subsurface	2,4-Dinitrotoluene (ug/kg)	5	0	0						74 U	2600 U	1490	2200 U	2500 U
subsurface	2,6-Dinitrotoluene (ug/kg)	5	0	0						30 U	2600 U	1490	2200 U	2500 U
subsurface	2-Chloronaphthalene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	2-Nitroaniline (ug/kg)	5	0	0						30 U	2600 U	1490	2200 U	2500 U
subsurface	3,3'-Dichlorobenzidine (ug/kg)	5	0	0						99 U	2600 U	1520	2200 U	2500 U
subsurface	3-Nitroaniline (ug/kg)	5	0	0						120 U	2600 U	1540	2200 U	2500 U

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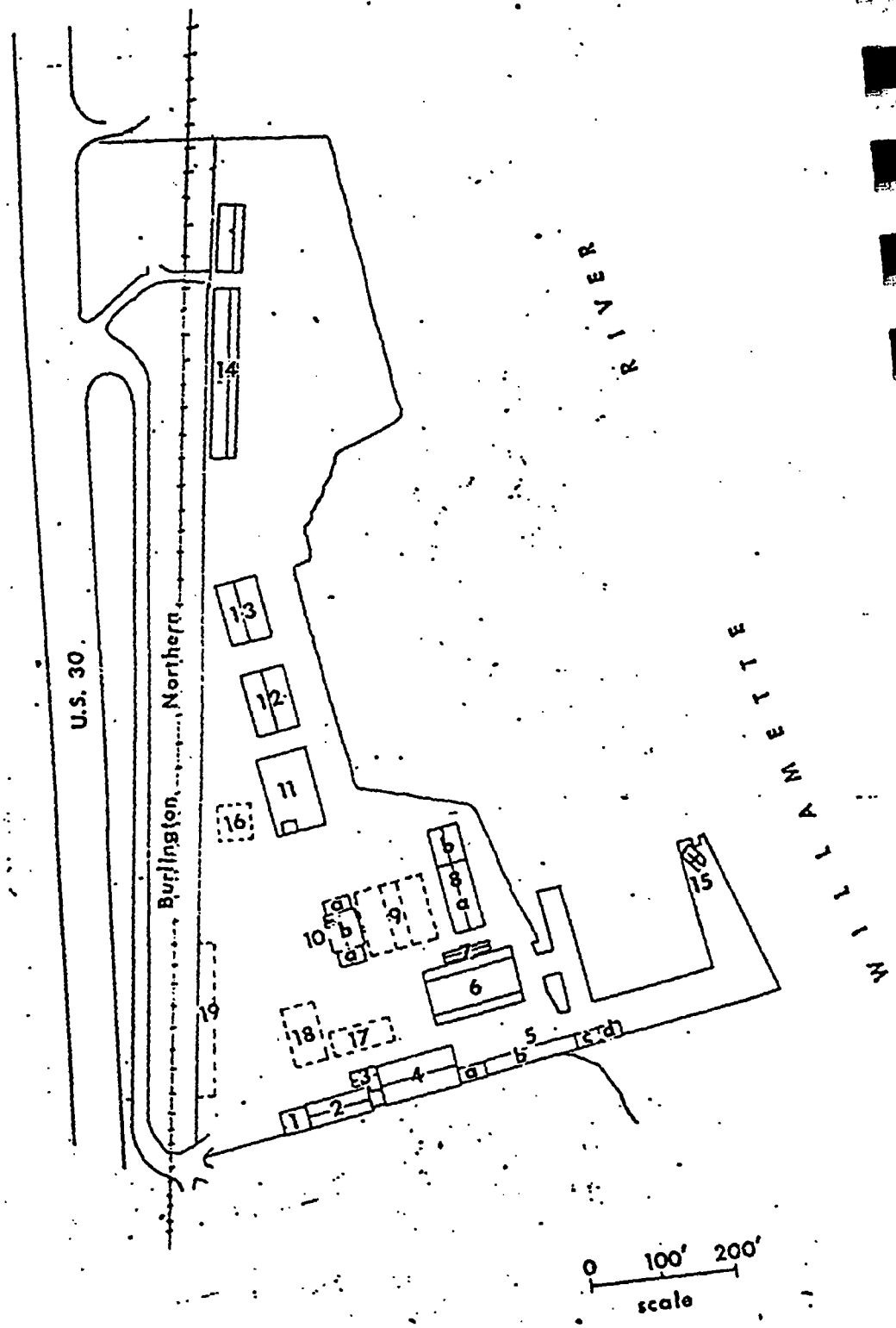
Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
subsurface	4-Bromophenyl phenyl ether (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	4-Chloroaniline (ug/kg)	5	0	0						60 U	1600 U	907	1300 U	1500 U
subsurface	4-Chlorophenyl phenyl ether (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	4-Nitroaniline (ug/kg)	5	0	0						99 U	2600 U	1510	2200 U	2500 U
subsurface	Benzoic acid (ug/kg)	5	2	40	50 J	240	145	50 J	50 J	50 J	5200 U	2960	4300 U	5000 U
subsurface	Benzyl alcohol (ug/kg)	5	0	0						20 U	2600 U	1480	2200 U	2500 U
subsurface	Bis(2-chloroethoxy) methane (ug/kg)	5	0	0						20 U	520 U	300	430 U	500 U
subsurface	Bis(2-chloroethyl) ether (ug/kg)	5	0	0						15 U	520 U	301	430 U	500 U
subsurface	Carbazole (ug/kg)	2	2	100	1 J	34	17.5	1 J	1 J	1 J	34	17.5	1 J	1 J
subsurface	Dibenzofuran (ug/kg)	46	34	73.9	2 J	4850	1010	770	2290	2 J	4850	823	590	1620
subsurface	Hexachlorobenzene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	Hexachlorobutadiene (ug/kg)	5	0	0						15 U	1000 U	577	860 U	990 U
subsurface	Hexachlorocyclopentadiene (ug/kg)	5	0	0						99 U	2600 U	1540	2200 U	2500 U
subsurface	Hexachloroethane (ug/kg)	5	0	0						20 U	1000 U	586	860 U	990 U
subsurface	Isophorone (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	Nitrobenzene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	N-Nitrosodipropylamine (ug/kg)	5	0	0						15 U	520 U	301	430 U	500 U
subsurface	N-Nitrosodiphenylamine (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	3,4,5-Trichloroguaiacol (ug/kg)	3	0	0						2200 U	2600 U	2430	2500 U	2500 U
subsurface	4,5,6-Trichloroguaiacol (ug/kg)	3	0	0						2200 U	2600 U	2430	2500 U	2500 U
subsurface	Bis(2-chloroisopropyl) ether (ug/kg)	1	0	0						15 U	15 U	15	15 U	15 U
subsurface	Guaiacol (ug/kg)	3	0	0						860 U	1000 U	950	990 U	990 U
subsurface	Tetrachloroguaiacol (ug/kg)	3	0	0						1300 U	1600 U	1470	1500 U	1500 U
subsurface	1,2-Dichlorobenzene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	1,3-Dichlorobenzene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	1,4-Dichlorobenzene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U
subsurface	1,2,4-Trichlorobenzene (ug/kg)	5	0	0						15 U	520 U	297	430 U	500 U

SUPPLEMENTAL FIGURES

Site Map (MSA 1990)
Figure 1. Aerial photograph of US Moorings (June 11, 1991) (USACE 1994a)
Figure 2. US Moorings Site Map and Building Designations (USACE 1994a)
Figure 2. Drainage Map (USACE 2002)
Map 1. Aerial Photograph with Sample Locations (December 20, 1994) (USACE 1994c)

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part



U.S. Government Moorings

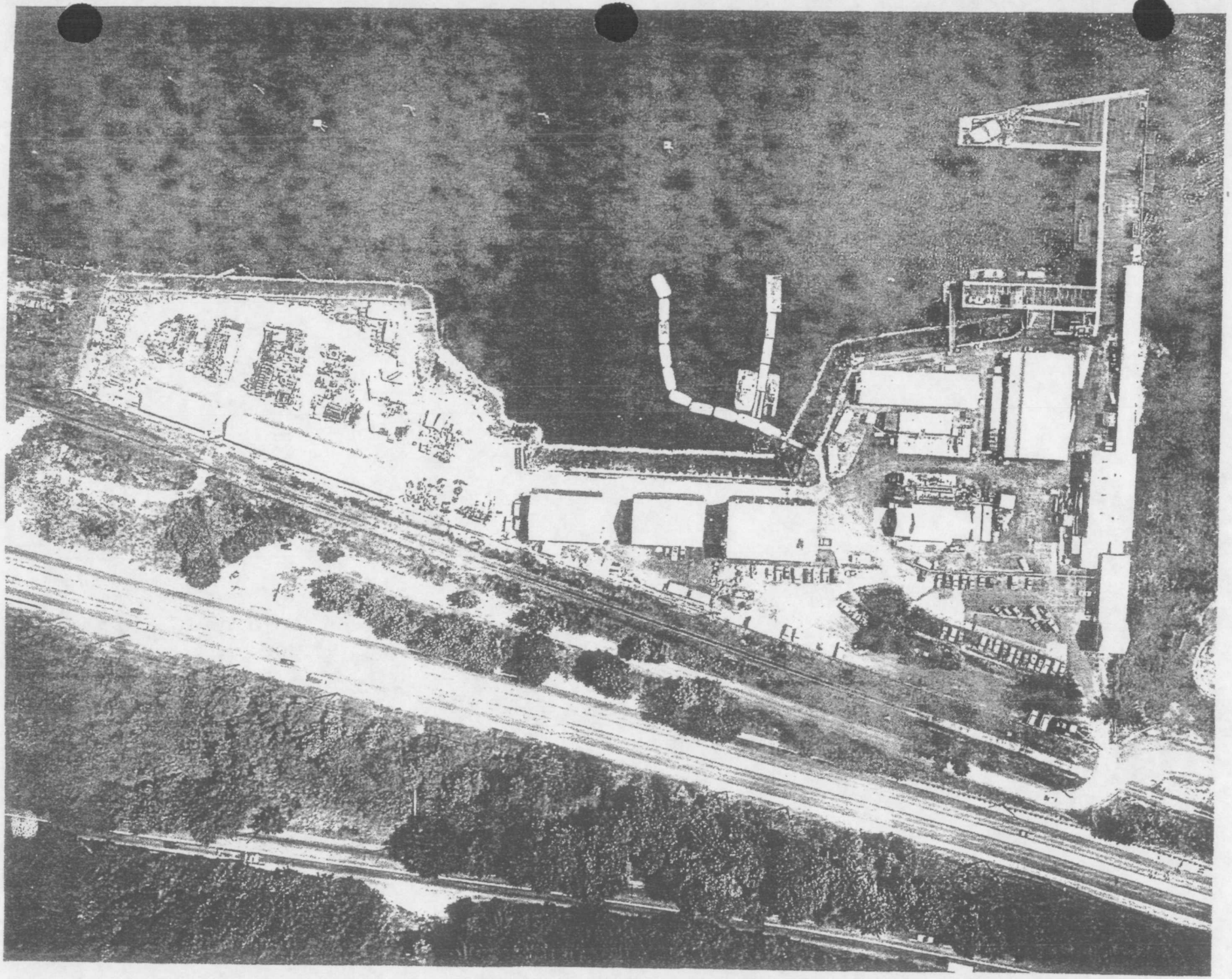
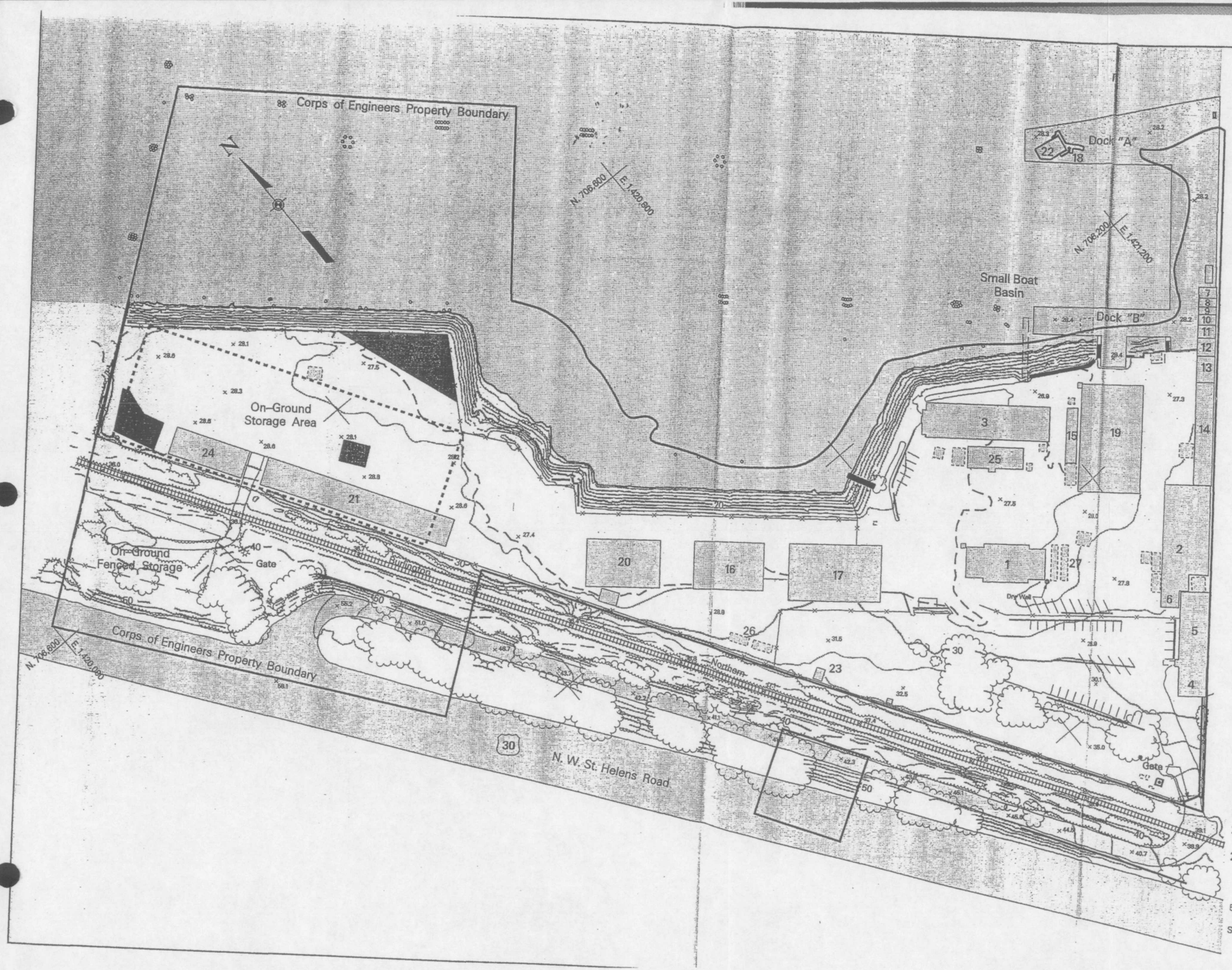


Figure 1, Aerial Photo of U. S. Moorings, Portland, Oregon. (11 June 1991)

U. S. MOORINGS
Figure 2



Project Features

- Temporary Location of Permanent Structure
- Dolphin
- 100 Year Flood Elevation (27.5')
- Corps of Engineers Property Boundary
- Fence Lines
- 1993 Cleanup Areas (Approx. Locations)
- Proposed LMO Warehouse Footprint (approx.)
- × 28.3 Spot Elevations

Building Designations

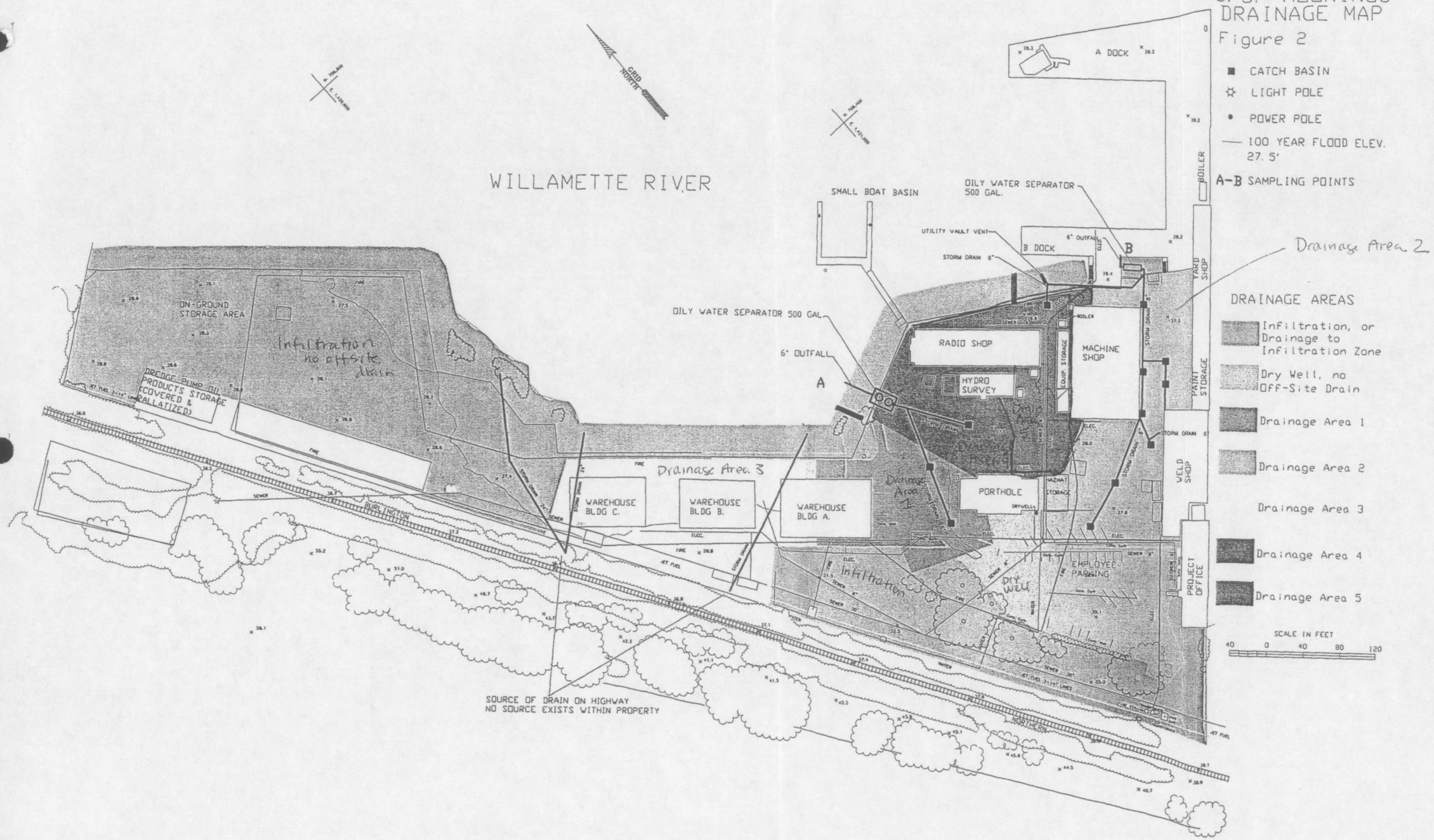
1 Training Room
2 Welding Shop
3 Carpentry and Electrical Shop
4 Plant Section Office
5 Plant Section Engineering Office
6 Locker and Rest Room
7 Dock Office
8 Lunch Room
9 Lunch Room
10 Rigging Storage Room
11 Electrical Equipment Room
12 Storage Room
13 Paint Shop
14 Dock Storage
15 Oil and Paint Storage
16 Logistics Warehouse Building B
17 Logistics Warehouse Building A
18 Dock Crane
19 Machine Shop
20 Logistics Warehouse Building C
21 Logistics Warehouse Building D
22 Crane House
23 Water Service
24 Logistics Warehouse Building E
25 Hyrographic Surveys Trailer
26 Hazardous Material Storage Lockers
27 Environmental Response Equipment Trailers

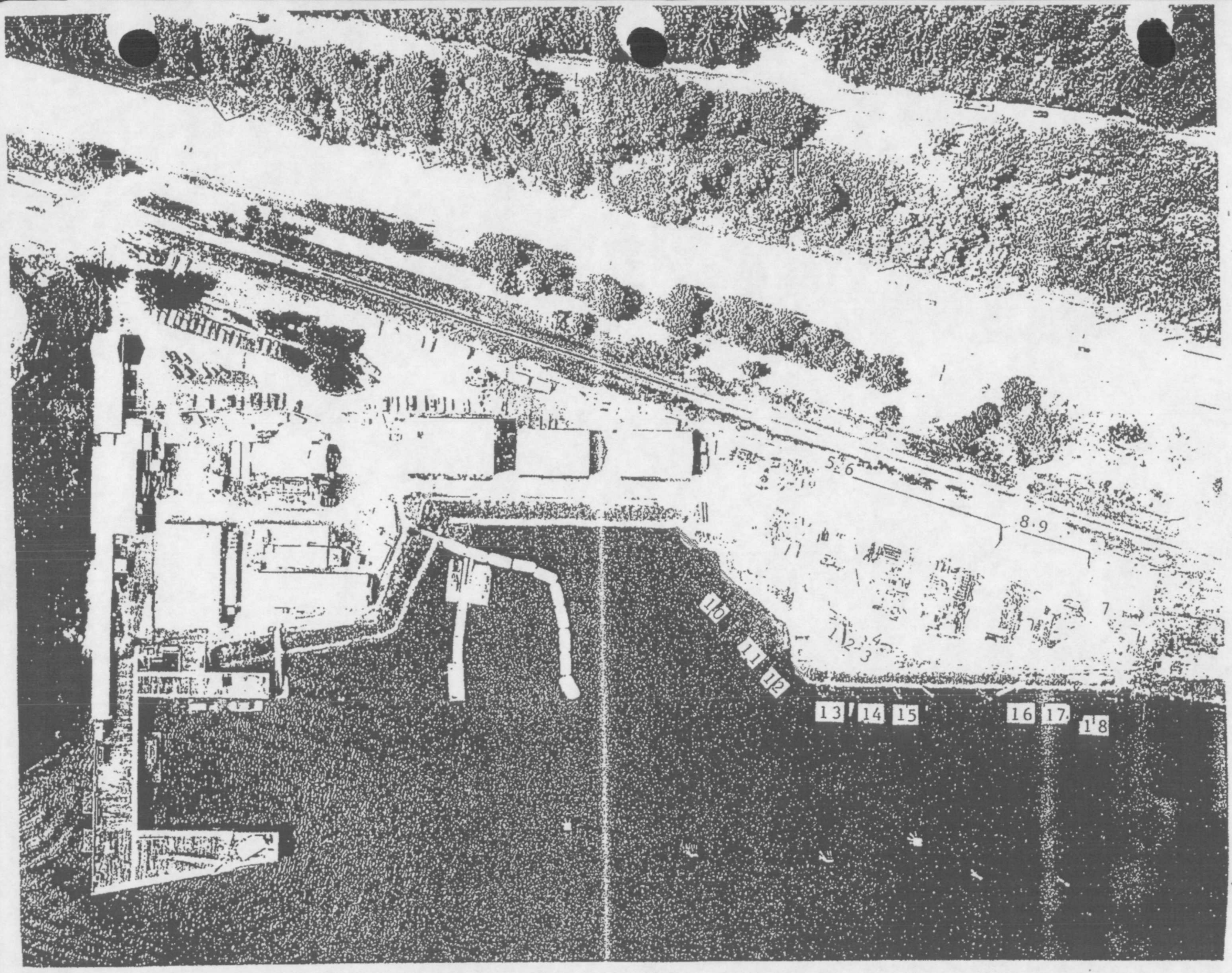
SCALE IN FEET
50 0 50 100 150

State Plane Coordinates – Oregon North Zone
Contour Interval = 2 Feet
Base Map Compiled from Aerial

U. S. MOORINGS DRAINAGE MAP

Figure 2

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U.S. Coast Guard Marine Safety Office
(MSO/Group Portland)

Willamette Cove