— CITY OF PORTLAND —
ENVIRONMENTAL SERVICES
1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204-1912 ▪ Sam Adams, Commissioner ▪ Dean Marriott, Director

TECHNICAL MEMORANDUM No. OF45-1

Outfall Basin 45
Inline Solids Sampling

TO: Karen Tarnow, Oregon Department of Environmental Quality (DEQ)

FROM: Linda Scheffler, City of Portland, Bureau of Environmental Services (BES)
Dawn Sanders, BES

COPIES: Michael Romero, DEQ
Kristine Koch, U.S. Environmental Protection Agency (EPA)
Mark Leece, CH2M HILL
Julia Fowler, GSI Water Solutions, Inc.

DATE: June 17, 2008

SUBJECT: **Portland Harbor Source Control Investigation**

Introduction

This technical memorandum summarizes the results of the City of Portland BES source control investigation of inline solids in the Outfall Basin 45 stormwater conveyance system. In 2007, the Lower Willamette Group (LWG) identified an area that includes City Outfall 45 as an area of potential concern for polychlorinated biphenyls (PCBs) (Integral, 2007).

The objectives of the BES source control investigation were to evaluate whether inline solids within Basin 45 may be contributing PCBs to river sediment and to assess whether the spatial distribution of PCBs within conveyance system solids indicates the presence of potential PCB sources within the basin. The results of this source control investigation indicate that inline solids within Basin 45 do not appear to be a significant source of PCBs to river sediment. There may be minor PCB sources present in the basin, but they do not appear significant because (1) the detected PCB concentrations in an in-river sediment sample just offshore of Outfall 45 are significantly less than upriver sediment PCB concentrations, and (2) the PCB concentrations in inline solids are significantly less than Joint Source Control Strategy (JSCS) screening level values (SLVs) for toxicity (DEQ/EPA, 2005).

This Basin 45 investigation, conducted in June 2007, is part of the City's ongoing source control program associated with the Portland Harbor City of Portland Outfalls Project. These investigation results are submitted pursuant to the August 13, 2003, Intergovernmental Agreement between DEQ and the City.

Basin 45 Configuration and Background

Basin Physical System. Outfall 45 discharges to the east side of the Willamette River at river mile 11. Bathymetric data indicate sediment accumulation around dock structures located in the immediate vicinity of the outfall (Integral, 2007). Figure 1 provides an overview of the Basin 45 stormwater conveyance system. The system consists of two main branches. The upper eastern branch conveys stormwater from the North Russell Street right-of-way and portions of adjoining industrial properties, including a southern portion of the Union Pacific Railroad (UPRR) Albina Yard. The lower eastern branch conveys stormwater from the North Loring Street right-of-way and portions of adjacent industrial sites. The two branches converge at the intersection of North Essex Avenue and North Loring Avenue and discharge through a 27-inch-diameter pipe to Outfall 45.

Land use in the 10-acre basin is industrial, though approximately 1.7 acres currently included in the basin boundary represents a portion of the I-405 freeway that is believed to drain to an Oregon Department of Transportation outfall. Prior to revising the basin boundary, field reconnaissance will be performed to evaluate whether portions of the area underneath the I-405 freeway discharge to Basin 45.

Stormwater Permits. The UPRR Albina Yard has a National Pollutant Discharge Elimination System (NPDES) stormwater permit, though none of the operational areas regulated under this permit are known to discharge to Basin 45. According to City records, there are no other facilities located in Basin 45 that have NPDES stormwater permits.

Identified Upland Cleanup Sites. Based on the DEQ Environmental Cleanup Site Information (ECSI) database, the UPRR Albina Yard is the only cleanup site located (or partially located) within Basin 45. The remedial investigation underway at the site will include an evaluation of the on-site conveyance system to verify whether portions of the southern yard currently discharge to Basin 45 (CH2M HILL, 2007).

In-river Sediment Sampling. In-river sediment sampling locations in the vicinity of Outfall 45 are depicted on Figure 2. The LWG collected one shallow sediment sample (LW2-G516) just offshore of Outfall 45 during Round 2 of the Portland Harbor Remedial Investigation in 2004 (Integral, 2005). Sediment samples also have been collected by the LWG and others upriver and downriver from Outfall 45. The results of PCB Aroclor analyses for these samples are presented in the following table. PCBs were detected in river sediment above, at, and below Outfall 45, but were detected at significantly higher concentrations in samples collected upriver of the outfall compared to the samples collected at and downstream of the outfall.

Sample Identification	109799990 42 0113[1]	10979999044 0115[1]	LW2-G516[2]	SD-1[3]	LWG3-UG01[4]	LWG3-UG02[4]	LWG3-UG03[4]
Distance from outfall	680' downriver	200' downriver	at Outfall	300' upriver	1,000' upriver	1,600' upriver	1,900' upriver
Sample date	5/23/2005	5/23/2005	9/3/2004	8/9/2000	2/1/2007	1/31/2007	1/31/2007
Total Aroclors (ug/kg)	19.0	190	28.13	35.0	312	5,900	760

(1) O&M Dredge Sediment Characterization (2005)

(2) LWG Round 2A Portland Harbor Sediment Sample (2004)

(3) UPRR Albina Yard Expanded Preliminary Assessment (2000)
(4) LWG Round 3 Portland Harbor Sediment Sample (2007)

Field Activities

In May 2007, the City conducted a video survey of the Basin 45 system to identify connections to the City's storm sewer lines and to determine target locations for sampling solids. A large portion of the basin is unpaved railroad property and the lines in the upper eastern branch were found to contain abundant solids.

The City coordinated with DEQ regarding this source control investigation before conducting this work. Inline solids were sampled at four locations on June 21, 2007 (see Figure 1). Target sampling locations were selected to represent locations within the two main branches of the system. Final sampling locations were chosen based on inline solids availability.

Samples were collected using a stainless steel spoon and bowl, in accordance with BES Field Operations' Standard Operating Procedures. Photographs of the sampling locations and collected solids are included in Attachment A. Field notes recorded during sampling activities are provided in Attachment B. The sampling locations are described as follows:

Upper Eastern Branch

Manhole AAX696 (22-inch-diameter line): Inline solids were sampled from the 22-inch-diameter line, approximately one foot downstream of manhole AAX696. Solids at this location represent discharges from industrial properties along North Russell Street. The majority of the drainage area contributing to this sample location is unpaved. Grain size analysis indicates that the sample consisted of primarily silt and sand with smaller percentages of clay and gravel. No odor was noted in the sample.

Manhole AAX693: Inline solids were sampled from the 24-inch-diameter line, approximately one foot downstream of manhole AAX693, beneath the I-405 Freeway Bridge. This location is approximately 200 feet downstream of manhole AAX696. Solids at this location represent discharges from the industrial area between N. Russell Street and N. Knott Street. The majority of the drainage area contributing to this sample location is unpaved. Based on grain size analysis, solids consisted mostly of clay and silt. No odor was noted in the sample.

Manhole ABC297: Inline solids were sampled from the 21-inch-diameter line, just upstream of manhole ABC297. The sample location is upstream of the convergence of the two branches of the system. Solids from this location represent all discharges to the upper eastern branch, which crosses the southern portion of the UPRR Albina site. Unlike the other samples, grain size analysis indicates that the sample was comprised of gravel and sand, with relatively no silt or clay. No odor was noted in the sample.

Lower Eastern Branch

Manhole ABC318: Inline solids were sampled from the 10-inch-diameter line immediately downstream of manhole ABC318. Solids from this location represent discharges from the industrial areas along N. Loring Street. The sample was comprised of predominantly sand with very little fines or gravel. No odor was noted.

Summary of Results

The four inline solids samples obtained from the Basin 45 stormwater conveyance system were analyzed for PCB Aroclors, total organic carbon, and grain size. Table 1 summarizes the physical and chemical analytical results. The laboratory analytical results and data review memorandum for the samples are provided in Attachment C.

PCB Aroclor 1260 was detected at low concentrations (23 to 49 µg/Kg) in the samples from the upper eastern branch at manholes AAX696, AAX693 and AAX297. The detected concentrations are all less than the JSCS toxicity SLV for Aroclor 1260 and for total PCBs. No other Aroclors were detected in these samples. PCBs were not detected in the sample from the lower eastern branch.

Conclusions

The results of the Basin 45 source control investigation indicate that inline solids within Basin 45 do not appear to be a significant source of PCBs to river sediment. PCB Aroclor 1260 has been discharged to the City stormwater conveyance system at very low concentrations in the upper eastern branch of the conveyance system. However, the PCB concentrations detected in the in-river sediment sample collected near Outfall 45 are well below the JSCS toxicity SLVs and are significantly less than concentrations detected in upriver sediment samples. The outfall is located in a transitional area of sediment deposition (Integral, 2004), so contaminants may be migrating to the vicinity of the outfall from upriver sources.

To ensure that inline solids within the basin are not contributing low-level PCBs to the river and in response to significant inline solids accumulation, the City cleaned the storm lines in the upper eastern branch (manhole AAX698 to manhole ABC297) in February 2008. This winter, the City is conducting stormwater screening in Basin 45 at a sample location downstream of all known connections to the basin. The resulting stormwater data will be evaluated in conjunction with the results of the ongoing stormwater pathway evaluation at the UPRR Albina site to determine whether additional source investigation is needed in Basin 45.

References

CH2M HILL. 2007. Quarterly Progress Report, UPRR Albina Yard Remedial Investigation and Source Control Measures. Letter report submitted to DEQ. June 13, 2007.

DEQ/EPA. 2005. Portland Harbor Joint Source Control Strategy, Final, dated December 2005, as amended July 2007.

Integral. 2004. Portland Harbor RI/FS Round 1 Site Characterization Summary Report. Prepared for the Lower Willamette Group, Portland, OR. October 12, 2004.

Integral. 2005. Portland Harbor RI/FS, Round 2A Sediment Site Characterization Report. Prepared for the Lower Willamette Group.

Integral. 2007. Comprehensive Round 2 Site Characterization Summary and Data Gaps Analysis Report. Prepared for the Lower Willamette Group.

Jacobs Engineering. 2000. Expanded Preliminary Assessment Data Report. Union Pacific Railroad Albina Yard. Portland, Oregon. Prepared for DEQ. November 2000.

Table

Table 1 - *Summary of Chemical Analytical Results, Inline Solids Sampling, Outfall Basin 45*

Figures

Figure 1 – *Basin 45, Inline Solids Sampling Locations*
Figure 2 – *Basin 45, Relevant In-river Sediment Sampling Locations*

Attachments

Attachment A - *Field Photographs*
Attachment B - *Field Notes*
Attachment C - *Laboratory Results*

Table 1
Summary of Chemical Analytical Results
Inline Solids Sampling
Outfall Basin 45

			Upstream ---------- Downstream					
			Inline Solids	**Inline Solids**	**Inline Solids**	**Inline Solids**		
			Manhole AAX696 Downstream in 22" Line	Manhole AAX693 Downstream in 24" Line	Manhole ABC297 Upstream in 21" Line	Manhole ABC318 Downstream in 10" Line	**JSCS[1] Screening Level Value**	
			FO 070814	FO 070813	FO 070812	FO 070811		
Class	**Analyte**	**Units**	6/21/2007	6/21/2007	6/21/2007	6/21/2007	**(Toxicity)**	**(Bioaccumulation)**
Total Organic Carbon (EPA 9060MOD)								
	TOC	mg/Kg	37500	65100	15400	4900	--	--
Total Soids (SM 2540 G)								
	TS	% W/W	80.3	61	82.4	81.9	--	--
Grain Size (ASTM D421/422)								
	Gravel (>4750 µm)	Fract %	11.6	1.9	21.2	1	--	--
	Coarse Sand (4750-2000 µm)	Fract %	3.8	1.5	20.9	3	--	--
	Medium Sand (2000-425 µm)	Fract %	16.1	12.0	36.6	35.7	--	--
	Fine Sand (425-75 µm)	Fract %	23.3	13.0	16.8	53.2	--	--
	Silt (75-3.2 µm)	Fract %	38.9	54.7	4.4	7.1	--	--
	Clay (<3.2 µm)	Fract %	6.4	16.9	ND	ND	--	--
Polychlorinated Biphenyls (PCBs) (EPA 8082)								
	PCB Aroclor 1016	µg/Kg	10 U	10 U	10 U	10 U	530	--
	PCB Aroclor 1221	µg/Kg	20 U	20 U	20 U	20 U	--	--
	PCB Aroclor 1232	µg/Kg	10 U	10 U	10 U	10 U	--	--
	PCB Aroclor 1242	µg/Kg	10 U	10 U	10 U	10 U	--	--
	PCB Aroclor 1248	µg/Kg	10 U	10 U	10 U	10 U	1500	--
	PCB Aroclor 1254	µg/Kg	10 U	10 U	10 U	10 U	300	--
	PCB Aroclor 1260	µg/Kg	49	23	24	10 U	200	--
	PCB Aroclor 1262	µg/Kg	10 U	10 U	10 U	10 U	--	--
	PCB Aroclor 1268	µg/Kg	10 U	10 U	10 U	10 U	--	--
	Total PCBs	µg/Kg	**49**	**23**	**24**	ND	676	0.39

Notes:

ND = not detected at concentrations greater than the laboratory reporting limit.

U = The analyte was not detected above the reported sample quantification limit.

Chemical units in micrograms per kilogram (µg/Kg) or milligrams per kilogram (mg/Kg) dry weight.

-- = No JSCS SLV has been established

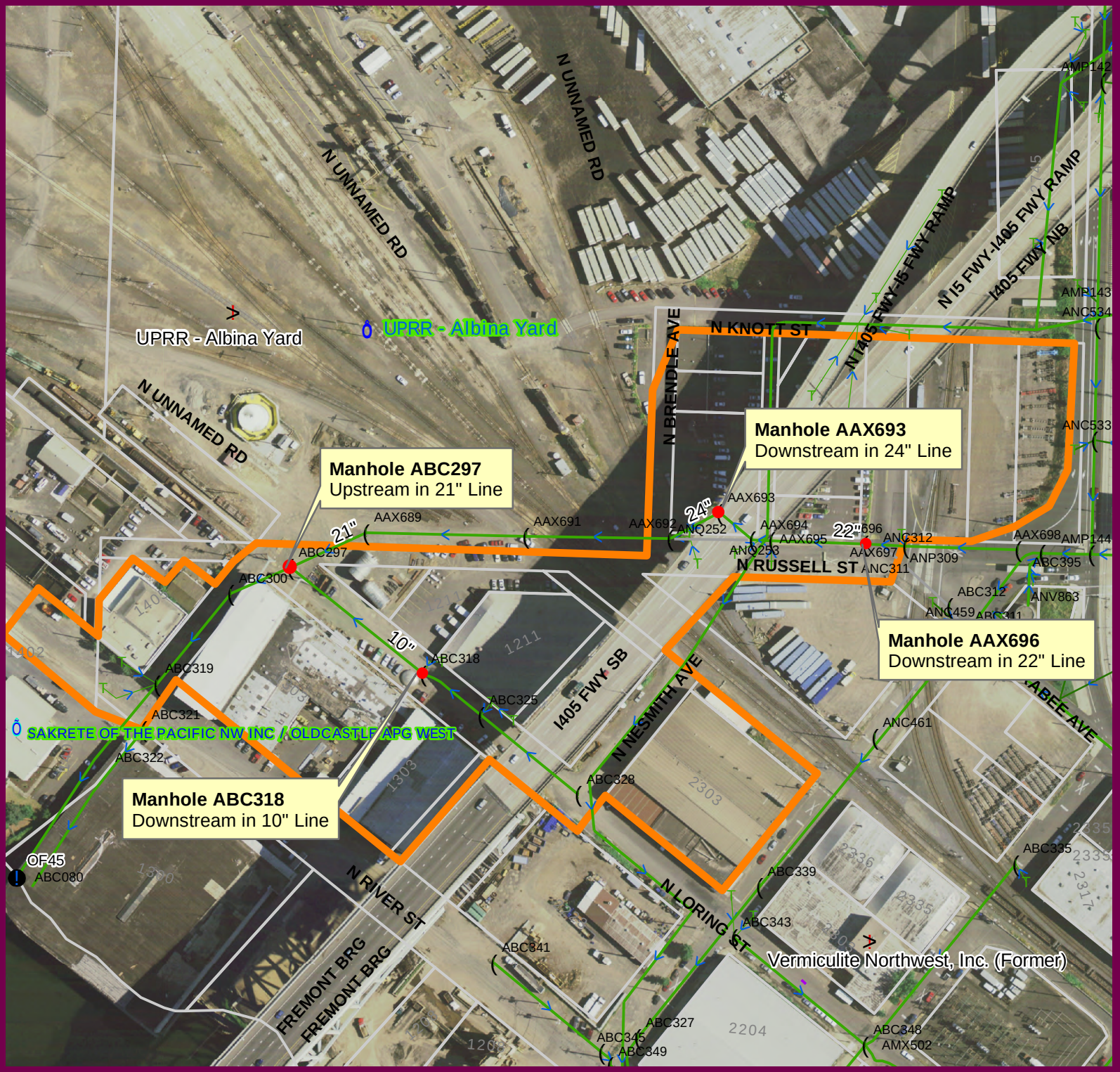
µm = microns

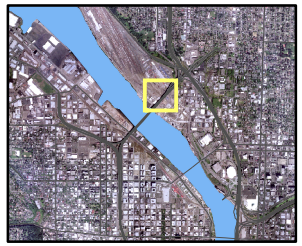
Fract % = Percent of soil retained in grain size category during grain size analysis.

Total PCBs - Sum of detected aroclors.

[1]JSCS - Portland Harbor Joint Source Control Strategy (DEQ/EPA Final December 2005, Amended July 2007).

bold = concentration exceeds JSCS Bioaccumulation Screening Level Value





Legend

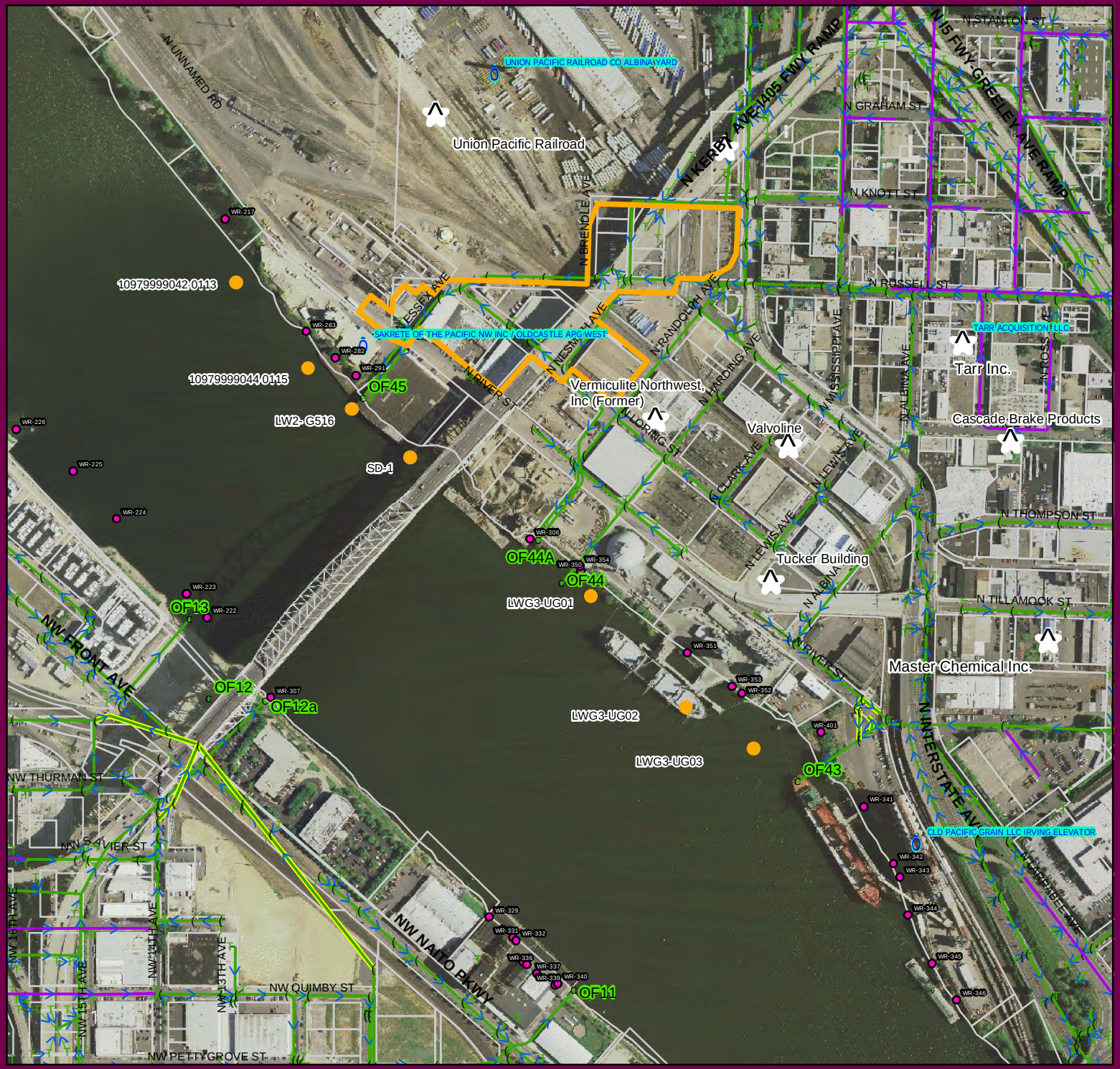
- Storm Pipe
- Basin 45 Boundary
- Taxlot
- City Outfall
- DEQ Environmental Cleanup Sites
- 1200Z Stormwater Permits
- Manhole
- Catch Basin
- Manhole Accessed

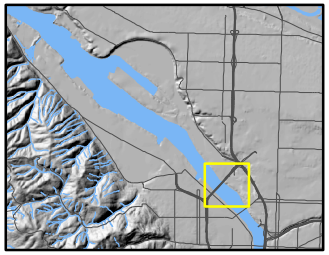
0 50 100 200 Feet

Information contained on this map is accurate according to available records, however, the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published

Figure 1
Basin 45
Inline Solids
Sampling Locations

Source: City of Portland BES Aerial photo 2006	Environmental Services City of Portland 1120 SW 10th Avenue, Room 1001 Portland Oregon, 97204-1912
File Name: s:\gis\outfalls\outfall45\ sampling\of45basin.mxd	Program Manager: Dawn Sanders Portland Harbor Superfund
Sheet No. 1 OF 1	Date Printed: 03/20/08 Prepared by: Sara Gardner





Legend

- Combined Pipe
- Storm Pipe
- Storm Inlets
- Manhole
- Basin 45 Boundary
- DEQ Environmental Cleanup Sites
- Industrial Stormwater Permits
- Non-City Outfalls
- City Outfalls
- Relevant Sediment Sampling Location

0 150 300 600 Feet

Figure 2
Basin 45
Relevant In-River Sediment Sample Locations

Source: City of Portland BES Aerial photo 2006	Environmental Services City of Portland 1120 SW Fifth Avenue, Room 1000 Portland Oregon, 97204-1912
File Name: S:\gis\outfalls\outfalls_16\16_figure3.mxd	Program Manager: Dawn Sanders Portland Harbor Superfund
Sheet No. 1 OF 1	Date Printed: 06/12/2008 Prepared by: Sara Gardner

Attachment A
Field Photographs

Photo 1 (June 14, 2007). Aboveground location of manhole AAX696.

Photo 2 (June 21, 2007). Inline solids were collected from this 22-inch-diameter line discharging to the west from manhole AAX696.

Photo 3 (June 14, 2007). Aboveground location of manhole AAX693.

Photo 4 (June 21, 2007). Inline solids were collected from this 24-inch-diameter line discharging to the southwest from manhole AAX693.

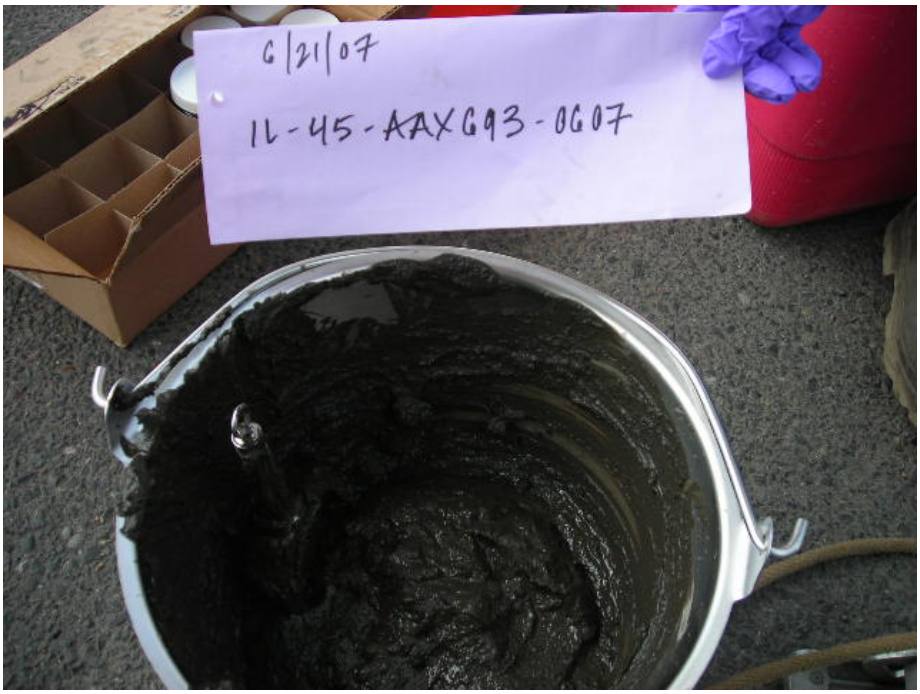


Photo 5 (June 21, 2007). Inline solids collected at manhole AAX693 from the 24-inch-diameter line.

Photo 6 (June 14, 2007). Aboveground location of manhole ABC297.

Photo 7 (June 21, 2007). Sample was collected from the 21-inch-diameter line upstream of manhole ABC297.

Photo 8 (June 21, 2007). Inline sample collected just upstream of manhole ABC297.

Photo 9 (June 14, 2007). Aboveground location of manhole ABC318.

Photo 10 (June 21, 2007). Inline solids sample was collected from the 10-inch-diameter line discharging from manhole ABC318.

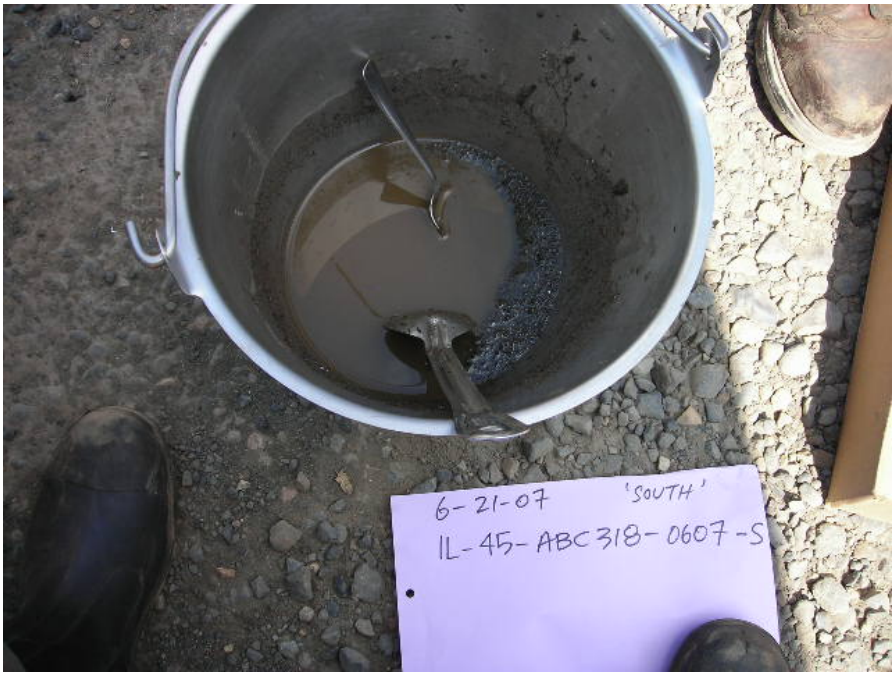


Photo 11 (June 21, 2007). Inline solids sample from just downstream of manhole ABC318.

Attachment B
Field Notes

CITY OF PORTLAND
ENVIRONMENTAL SERVICES
Water Pollution Control Laboratory
6543 N. Burlington Ave.,
Portland, OR 97203-5452

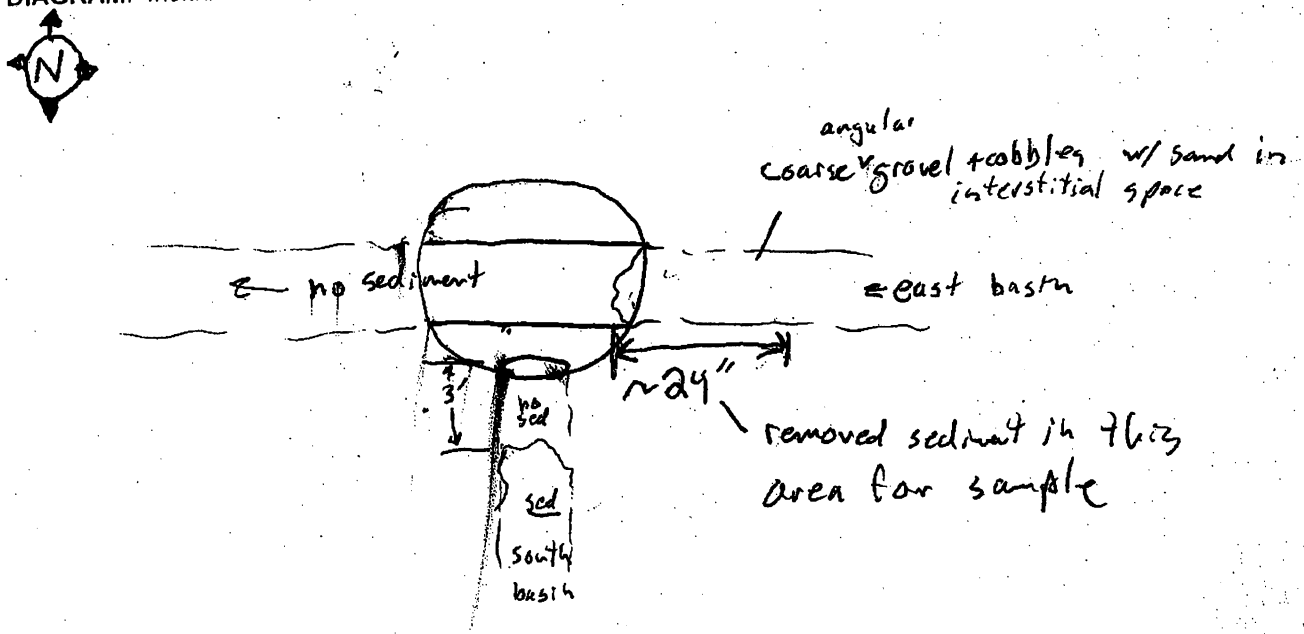
INLINE SEDIMENT SAMPLING FIELD DATA SHEET

Project Name: PDX Harbor In-line Sampling			Project Number: 1020.001
Sampling Team: MJS, ECH, LAP	Date: 6-21-07	Arrival Time: 0900	Current Weather Conditions/Last Rain: Sunny; 6-16-07
Basin: 45	Node: ABC297		Subbasin: Lower Eastern Branch
Sampling Location Description/Address: 1303 N River ST – 21" line from East			

SECTION 1 - PRE-SAMPLING VISUAL OBSERVATION REPORT

Describe any flowing or standing water observed in the line?	Some standing water in places. <1/2"
Does river appear to back up to this location? Describe rate/color/odor of flow:	NOT APPARENT.
Are sediments observed in the line?	YES
Are sample-able quantities of sediments present in the line?	YES, very coarse materials, cobble & gravel
Describe lateral extent of sample-able sediments present in the line:	Approx 12" wide swath, extends upstream as far as the eye can see.

SITE DIAGRAM: Include street intersections/laterals/catch basins/MH's/driveways cuts and extent of solids accumulation.



Date: 6.21.07	SECTION 2 - SAMPLE COLLECTION REPORT	Node: ABC297
Sampling Equipment:	☒ Stainless steel spoon & stainless steel bucket ☐ Other (Describe)	
Equipment Decontamination process:	☒ Per SOP7.01a ☐ Other (Describe)	
Sample date: 6.21.07	Sample time: 0930	Sample Identification: (IL-XX-NNNNNN-mmyy) IL-45-ABC297-0607-E
Sample location description: (number of feet from node of entry) Ø - 2' upstream of node		
Sample collection technique:	SS spoon & bucket	
Describe Color of sample:	dark brown	
Describe Texture/Particle size:	primarily sand, cobble & gravels	
Describe visual or olfactory evidence of contamination in bulk sediment sample (odor, sheen, discoloration, etc.):	Nothing of note.	
Describe depth of solids in area where sample collected:	2.5"	
Describe amount and type of debris in sample:	Fines 5% SAND 55% COBBLE/GRAVEL 40%.	
Amount and type of debris removed from final sample:	Cobbles & gravel - 40%.	
Compositing notes: Large volume of coarse material removed. See above.		
Sample Jars Collected (number, size, full or partial)? (7) 4 oz, (1) 8 oz; all full.		

If not enough sample to fill all of the jars, list jars collected and related analytes sampled (as per analyte priority list in work order).				
	N/A			

Lab ID FO 070812	Duplicate sample collected? Y (N) Dupe ID
Duplicate sample identification # on COC:	—
Any deviations from standard procedures: NO	

SECTION 3 - PHOTOGRAPH LOG

Overview of node showing drainage area	NO
Plan view of sediments inline	PHOTOS 2 & 3
Homogenized sample (sediment in bowl)	PHOTO # 4
Other?	NO

CITY OF PORTLAND

ENVIRONMENTAL SERVICES

Water Pollution Control Laboratory
6543 N. Burlington Ave.,
Portland, OR 97203-5452

INLINE SEDIMENT SAMPLING FIELD DATA SHEET

Project Name: PORTLAND HARBOR INLINE			Project Number: 1020.001
Sampling Team: ECH, LAP, MJS	Date: 8/21/07	Arrival Time: 1004	Current Weather Conditions/Last Rain: SUNNY, 8/16/07
Basin: 45	Node: ABC318		Subbasin: SOUTHERN BRANCH

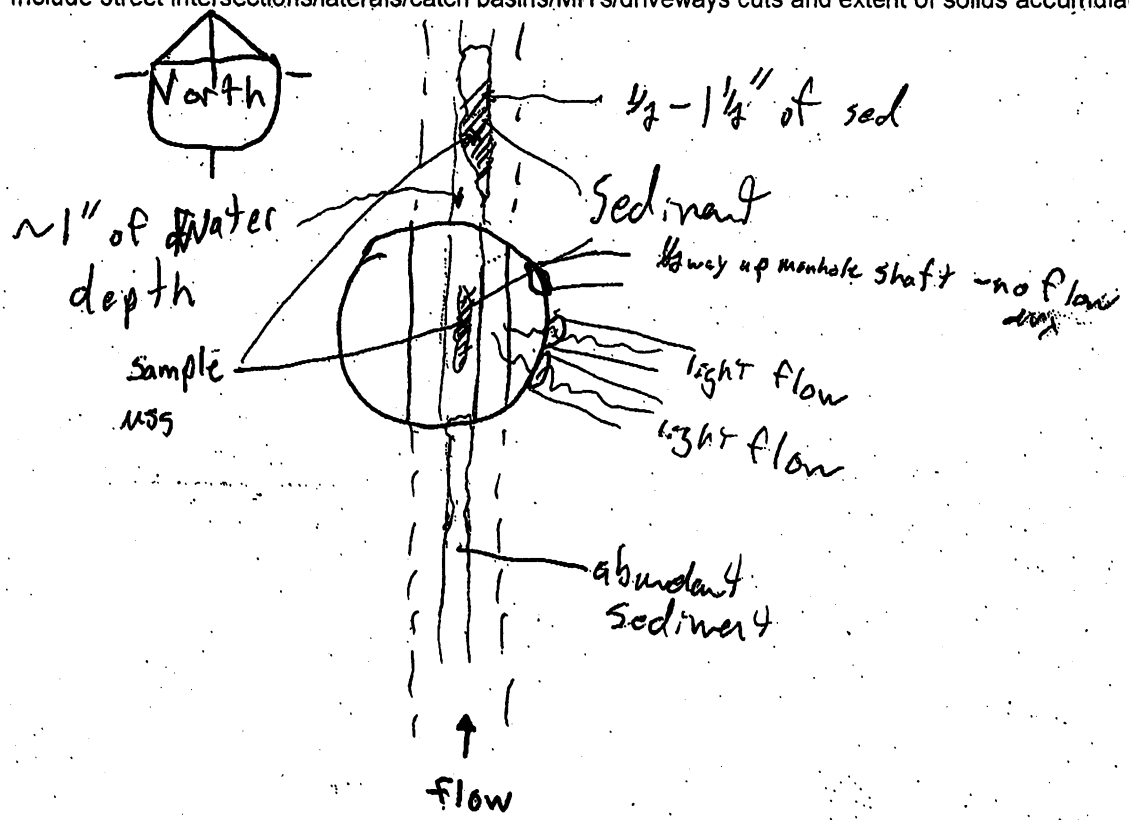
Sampling Location Description/Address:

1303 N RIVER ST - ~~10" LINE FROM SOUTH~~ MJS

SECTION 1 - PRE-SAMPLING VISUAL OBSERVATION REPORT

Describe any flowing or standing water observed in the line?	ABOUT 1" OF FLOWING WATER INLINE.
Does river appear to back up to this location? Describe rate/color/odor of flow:	NO. FLOW IS CLEAR AND ODORLESS.
Are sediments observed in the line?	~~FLOW ECH IN MAINLINE AND 2 EASTERN~~ LATS. YES SMALL IN MH. ABUNDENT IN US. SOME IN DS.
Are sample-able quantities of sediments present in the line?	YES.
Describe lateral extent of sample-able sediments present in the line:	~~KB~~ ECH US - SED IS PRESENT AS FAR AS CAN SEE. DS - SOME SED.

SITE DIAGRAM: Include street intersections/laterals/catch basins/MH's/driveways cuts and extent of solids accumulation.



Date: 6/21/07	SECTION 2 - SAMPLE COLLECTION REPORT	Node: ABC318

Sampling Equipment:	X Stainless steel spoon & stainless steel bucket □ Other (Describe)
Equipment Decontamination process:	X Per SOP7.01a □ Other (Describe)

Sample date:	Sample time:	Sample Identification: (IL-XX-NNNNNN-mmyy)
06/21/07	1037	IL-45-ABC318-0607-S

Sample location description: (number of feet from node of entry)
0-2' Downstream of node.

Sample collection technique:	SS spoon + bucket.
Describe Color of sample:	dark brown.
Describe Texture/Particle size:	Sand.
Describe visual or olfactory evidence of contamination in bulk sediment sample (odor, sheen, discoloration, etc.):	light sheen.
Describe depth of solids in area where sample collected:	1/2" - 1 1/2"
Describe amount and type of debris in sample:	Sand 75%, fines 25%
Amount and type of debris removed from final sample:	Nothing removed
Compositing notes:	Composited in SS bucket, ~~no~~ debris removed
Sample Jars Collected (number, size, full or partial)?	(7) 4oz, (1) 8oz, all full.

If not enough sample to fill all of the jars, list jars collected and related analytes sampled (as per analyte priority list in work order).				
N/A				

Lab ID FO 070811	Duplicate sample collected? Y (N) Dupe ID
Duplicate sample identification # on COC:	-
Any deviations from standard procedures: No	

SECTION 3 - PHOTOGRAPH LOG

Overview of node showing drainage area	NO
Plan view of sediments inline	#5 + #6
Homogenized sample (sediment in bowl)	#7
Other?	NO

CITY OF PORTLAND

ENVIRONMENTAL SERVICES

Water Pollution Control Laboratory
6543 N. Burlington Ave.,
Portland, OR 97203-5452

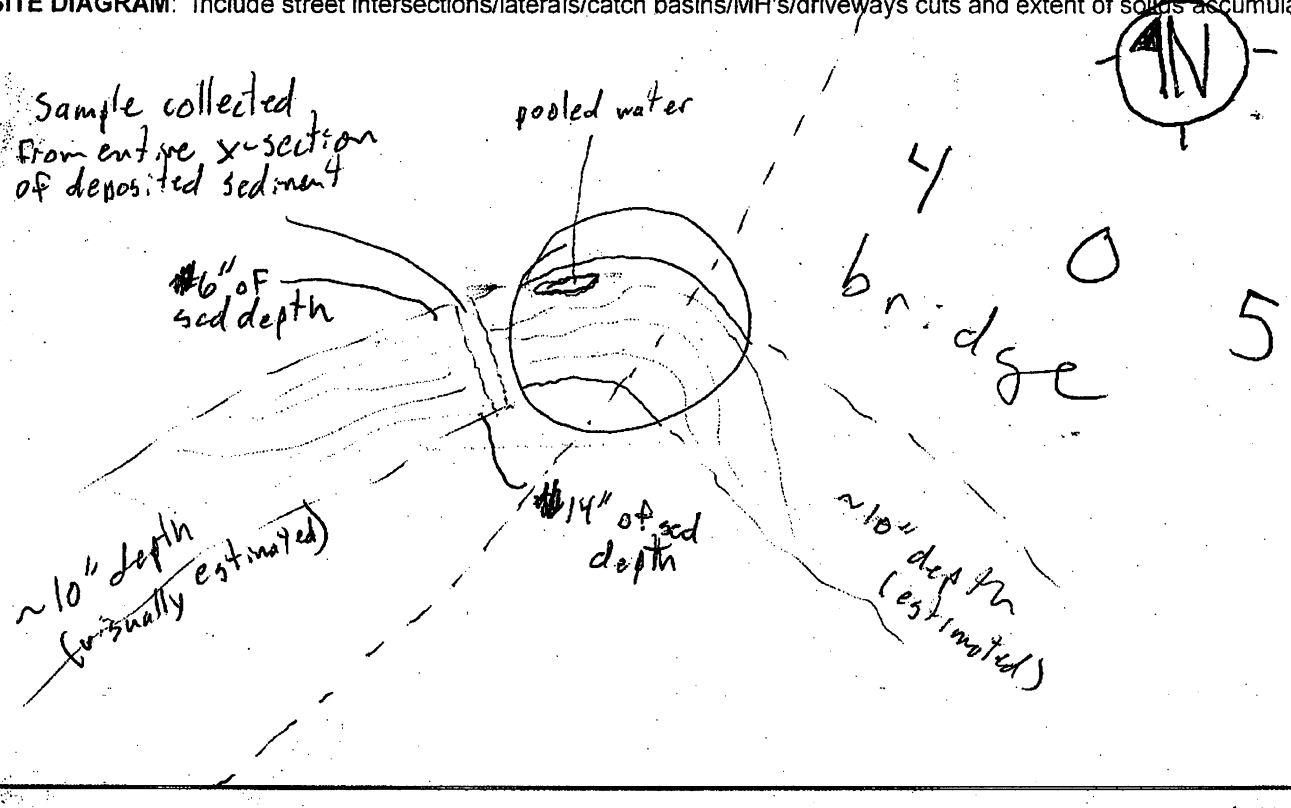
INLINE SEDIMENT SAMPLING FIELD DATA SHEET

Project Name: PDX Harbor In-line Samp.			Project Number: 1020.001
Sampling Team: ECH, MJS, LAP	Date: 6-21-07	Arrival Time: 1114	Current Weather Conditions/Last Rain: Sunny, 6-16-07
Basin: 45	Node: AAX 693		Subbasin: Middle Eastern Branch
Sampling Location Description/Address: N. Russell, Under I-405 AAX693			

SECTION 1 - PRE-SAMPLING VISUAL OBSERVATION REPORT

Describe any flowing or standing water observed in the line?	some standing water; approx 1" depth
Does river appear to back up to this location? Describe rate/color/odor of flow:	NOT APPARENT; possible
Are sediments observed in the line?	YES
Are sample-able quantities of sediments present in the line?	YES
Describe lateral extent of sample-able sediments present in the line:	Sediment as far as the eye can see. Approx. 10" depth

SITE DIAGRAM: Include street intersections/laterals/catch basins/MH's/driveways cuts and extent of solids accumulation.



Date: 6-21-07	SECTION 2 - SAMPLE COLLECTION REPORT	Node: AAX693

Sampling Equipment:	☒ Stainless steel spoon & stainless steel bucket ☐ Other (Describe)
Equipment Decontamination process:	☒ Per SOP7.01a ☐ Other (Describe)

Sample date:	Sample time:	Sample Identification: (IL-XX-NNNNNN-mmyy)
6-21-07	1131	IL-45-AAX693-0607

Sample location description: (number of feet from node of entry)
1' downstream of node

Sample collection technique:	SS spoon & bucket
Describe Color of sample:	dark brown
Describe Texture/Particle size:	Primarily fines (90%) & sand (10%)
Describe visual or olfactory evidence of contamination in bulk sediment sample (odor, sheen, discoloration, etc.):	Nothing of note.
Describe depth of solids in area where sample collected:	6-14"
Describe amount and type of debris in sample:	fines 90% / sand 10%
Amount and type of debris removed from final sample:	NONE
Compositing notes:	—
Sample Jars Collected (number, size, full or partial)?	(7) 4 oz; (1) 8 oz. All full.

If not enough sample to fill all of the jars, list jars collected and related analytes sampled (as per analyte priority list in work order).				
	N/A			

Lab ID FO 070813	Duplicate sample collected? Y (N) Dupe ID
Duplicate sample identification # on COC:	—
Any deviations from standard procedures:	NO

SECTION 3 - PHOTOGRAPH LOG

Overview of node showing drainage area	NO
Plan view of sediments inline	YES
Homogenized sample (sediment in bowl)	YES
Other?	NO

CITY OF PORTLAND

ENVIRONMENTAL SERVICES

Water Pollution Control Laboratory
6543 N. Burlington Ave.,
Portland, OR 97203-5452

INLINE SEDIMENT SAMPLING FIELD DATA SHEET

Project Name: PDX Harbor In-line Sampling			Project Number: 1020.001
Sampling Team: ECH, MJS, LAP	Date: 6-21-07	Arrival Time: 1152	Current Weather Conditions/Last Rain: Sunny, 6-16-07
Basin: 45	Node: AAX 696		Subbasin: Upper Eastern Branch

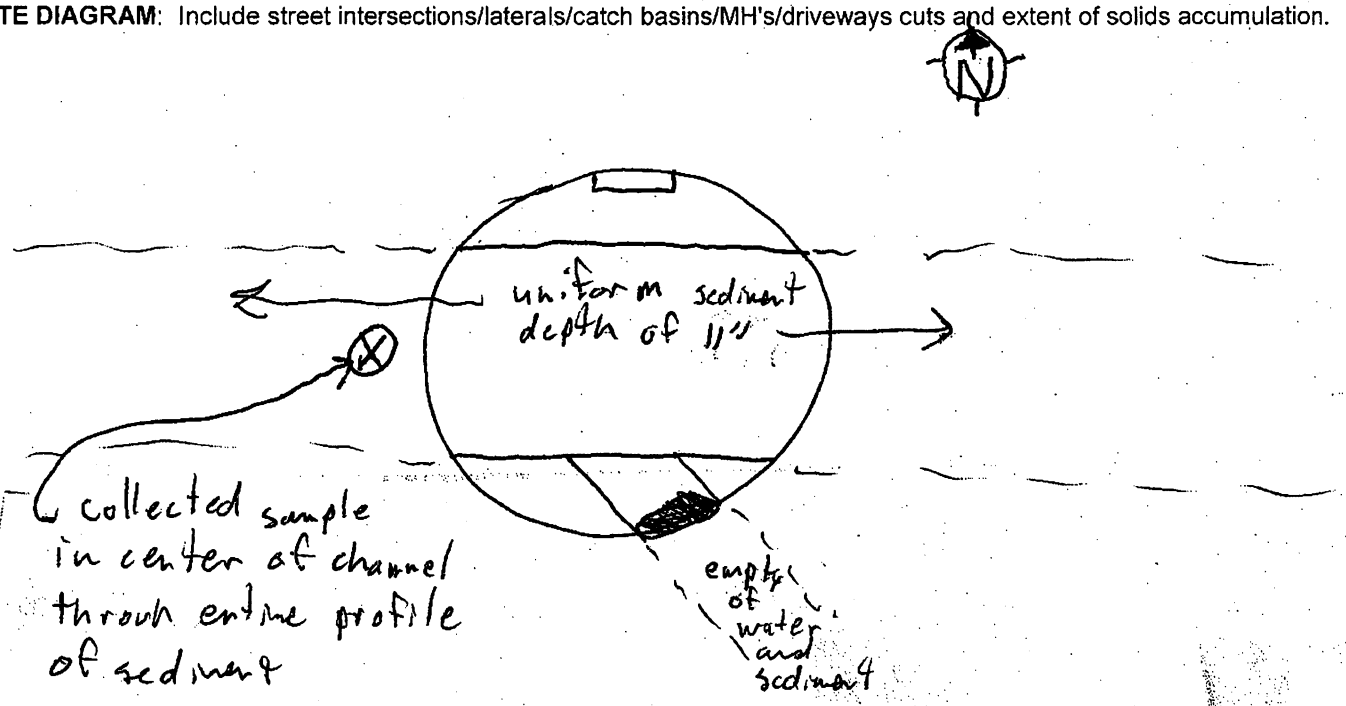
Sampling Location Description/Address:

N Larabee & Russell

SECTION 1 - PRE-SAMPLING VISUAL OBSERVATION REPORT

Describe any flowing or standing water observed in the line?	NO
Does river appear to back up to this location? Describe rate/color/odor of flow:	NOT APPARENT, probable
Are sediments observed in the line?	YES
Are sample-able quantities of sediments present in the line?	YES
Describe lateral extent of sample-able sediments present in the line:	As far as the eye can see both up- & downstream. No seds in 'south' lateral

SITE DIAGRAM: Include street intersections/laterals/catch basins/MH's/driveways cuts and extent of solids accumulation.



Date: 6-21-07	SECTION 2 - SAMPLE COLLECTION REPORT	Node: AAX 696
Sampling Equipment:	☒ Stainless steel spoon & stainless steel bucket ☐ Other (Describe)	
Equipment Decontamination process:	☒ Per SOP7.01a ☐ Other (Describe)	
Sample date: 6-21-07 / Sample time: 1203	Sample Identification: (IL-XX-NNNNNN-mmyy) IL-45-AAX696-0607	
Sample location description: (number of feet from node of entry)	1' downstream of node.	
Sample collection technique:	SS spoon & bucket	
Describe Color of sample:	dark brown	
Describe Texture/Particle size:	Primarily Sands w/ fines.	
Describe visual or olfactory evidence of contamination in bulk sediment sample (odor, sheen, discoloration, etc.):	Nothing of note.	
Describe depth of solids in area where sample collected:	11"	
Describe amount and type of debris in sample:	~~NONE~~ Sand 70%. Fines 25%. gravel 5%.	
Amount and type of debris removed from final sample:	NONE	
Compositing notes:	—	
Sample Jars Collected (number, size, full or partial)?	(7) 4 oz; (1) 8 oz. All full.	

If not enough sample to fill all of the jars, list jars collected and related analytes sampled (as per analyte priority list in work order).				
	N/A			

Lab ID FO 070814	Duplicate sample collected? Y/(N) Dupe ID
Duplicate sample identification # on COC:	—
Any deviations from standard procedures:	NO

SECTION 3 - PHOTOGRAPH LOG

Overview of node showing drainage area	NO
Plan view of sediments inline	YES
Homogenized sample (sediment in bowl)	YES
Other?	YES photo #15, 'SOUTH' lateral.

City of Portland
Environmental Services

DAILY FIELD REPORT

Project PORTLAND HARBOR IN-LINE
(MULTIPLE) Locations 1303 N River ST (ABC297)
Subject 'SOUTH' & 'EAST', ETC...

Project No. 1020.001
Date 6-21-07
By ECH, LAP, MJS

0900 - Arrive onsite @ NW Copper Works & ~~receive permission~~ (re) notify them of our presence & location.

0915 - 'SOUTH' line is 10" Some baseflow. Some sediment in pipe seam approx. 3 feet up line from confluence. Unable to sample, however due to location & pipe diameter. PHOTO # 1.

0930 - 'EAST' is a 21" line. Some standing water in places. Sediment consisting of primarily large, coarse material. (l.g. cobble & gravel.) MJS removes uppermost large material & samples the underlying finer sediments. PHOTOS 2 & 3, 4. No odor detected.

0935 - Sample IL-45-ABC297-0607-E (EAST) Routine sample.

Attachments

City of Portland
Environmental Services

DAILY FIELD REPORT

Project PORTLAND HARBOR IN-LINE Project No. 1020-001
Location 1303 N RIVER ST (ABC318) Date 6/21/07
Subject 'SOUTH' By

1004 - ~~Travel ECH Arrive onsite~~ ECH Arrive at ABC318 to collect Sed Sample.

1024 - In 10" line from the South. Sediment is present and sample-able. Baseflow in the main line. Appears to be groundwater flow also coming from 2 eastern laterals. Began collecting sediment from ~~main line~~ DS. Sed very abundant >V3. Some present DS and in MH trough. ~~PHOTO # 1 + #2~~ ECH ~~PHOTO # 4 + #5~~ PHOTO # 5 + #6 ECH

1037 - Sample IL-45-ABC318-0607-S. No deviation from standard collection.

1114: Arrive on site @ IL-45-AAX693 (N Russell under I-405). Some standing water present. Pipe diameter = 24". Sediment consists of primarily fines & some sands. Copious amount of sediments @ this location. No odor detected. PHOTOS # 9 - 12.

1131: Sample site AAX693. Routine sample.

1152: Arrive on site @ N Larabee & Russell (AAX696). No water present. River likely backs up into this line. Copious amounts

Attachments

City of Portland
Environmental Services

DAILY FIELD REPORT

Project PDX Harbor In-line Sampling
Project No. 1020-001
Location ASSORTED
Date 6-21-07
Subject
By

of sediments @ this location. Approx. 11" depth uniformly ~~thru~~ up as far as the eye can see, both up- & downstream of node. Note that the 'SOUTH' lateral appears to be devoid of sediment. Pipe diameter = 24" (PHOTO # 15 ↑). Sediments consists of primarily sands & fine material. photos 13-15

1203: Sample node AAX696 N Larabee & Russell. Routine sample.

1336: returned to 1303 N River (ABC 318 South) for lateral photos

#16 upstream of main line
#17 South (lateral)
#18 South east lateral
#19 east lateral

Attachments

Attachment C
Laboratory Results

GSI Water Solutions, Inc.
55 SW Yamhill Street, Suite 400 Portland, OR 97204
P: 503.239.8799 F: 503.239.8940
info@gsiwatersolutions.com www.gsiwatersolutions.com

Laboratory Data QA/QC Review
Upland Source Control Investigation
City Outfall Basin 45

To: Dawn Sanders, City of Portland, Bureau of Environmental Services (BES)
Linda Scheffler (BES)

From: Karen Demsey, GSI Water Solutions, Inc.

Date: January 14, 2008

This memorandum presents a quality assurance/quality control (QA/QC) review of the laboratory data generated for chemical analysis of inline solids obtained during source control investigation activities conducted in June 2007 by the City of Portland in Outfall Basin 45 (OF-45). The results of the sampling and analysis are presented in the Technical Memorandum No. OF 45-1.

The laboratory analysis of the OF-45 sediment samples was conducted by the City of Portland's Water Pollution Control Laboratory. The samples were analyzed for total solids using method SM 2540 G, polychlorinated biphenyls (PCBs) using EPA Method 8082, total organic carbon using EPA Method 9060 (modified) and grain size by ASTM Method D421/422. The laboratory data report for the analysis of these samples is included along with this QA/QC review in Attachment C to Technical Memorandum No. OF 45-1.

This QA/QC review of the analytical data, based upon the available documentation supplied by the laboratory, consisted of reviewing the following:

- Chain-of-custody complete and correct
- Analysis within holding times
- Chemicals of interest in method blanks

The results of the laboratory report QA/QC review are presented below.

Chain-of-Custody

The chain-of-custody forms showed continuous custody of the samples. The chain-of-custody procedures were adequate and sample integrity was maintained through the sample collection and delivery process.

Analysis Holding Times

The samples were extracted and analyzed for PCBs within 4 days of the sampling date, which is within the acceptable holding times for analysis of PCBs by EPA Method 8082. No chemical analytical data are qualified.

Method Blanks

According to the laboratory report, a method blank was processed during the laboratory analysis of PCBs, but the method blank results were not included in the laboratory report. The narrative included for each of the sample results states that unless otherwise indicated, all QA/QC criteria, including those for method blanks, were met for the sample. No problems with method blanks were noted in the laboratory reports, indicating that no chemicals were detected in the method blank.

Other

The following notes were included in the laboratory narratives for the four OF-45 samples; these observations do not affect the results for PCB analysis by EPA Method 8082 as reported in Technical Memorandum No. OF 45-1:

- For sample 45-1 (from Manhole ABC318), the laboratory narrative states, "Trace level of Aroclor 1260 was detected (<10 ug/Kg). For Grain Size analysis, the result for Silt (75-32 um) represents all particles <75 um. The sample did not contain enough fines to run the hydrometer portion of the test."
- For sample 45-2 (from Manhole ABC297), the laboratory narrative states, "For Grain Size analysis, the result for Silt (75-32 um) represents all particles <75 um. The sample did not contain enough fines to run the hydrometer portion of the test."
- For sample 45-3 (from Manhole AAX693), the laboratory narrative states, "For Grain Size analysis, organic matter in the sample may have broken down during sieving, affecting the results."

Water Pollution Control Laboratory
6543 N. Burlington Ave.
Portland, Oregon 97203-4552
(503) 823-5696

City of Portland Chain-of-Custody

Bureau of Environmental Services

Date: 6/21/07
Page: 1 of 1
Collected By: MJS, LAP, ECH

Project Name: PORTLAND HARBOR INLINE SAMP
File Number: 1020.001 **Matrix:** SEDIMENT

OUTFALL 45 CHAIN-OF-CUSTODY

Requested Analyses

WPCL Sample I.D.	Location	Point Code	Sample Date	Sample Time	Sample Type	General: PCBs	General: TOC	General: Grain Size	General: Total Solids	Metals	Field Comments
FO 070811	IL-45-ABC318-0607 1303 N River St	45_1	21-Jun-07	1037	G	●	●	●	●		
FO 070812	IL-45-ABC297-0607-E 1303 N River St - East	45_2	21-Jun-07	930	G	●	●	●	●		
FO 070813	IL-45-AAX693-0607 N Russell, under I-405	45_3	21-Jun-07	1131	G	●	●	●	●		
FO 070814	IL-45-AAX696-0607 N Larabee & Russell	45_4	21-Jun-07	1203	G	●	●	●	●		
5											
6											
7											
8											
9											
10											

Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.	Relinquished By: 4.
Signature: [signature] Time: 1436	Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Matt Sullivan Date: 6/21/07	Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Received By: 1.	**Received By:** 2.	**Received By:** 3.	**Received By:** 4.
Signature: [signature] Time: 1436	Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Kirby Dennis Date: 6/21/07	Printed Name: Date:	Printed Name: Date:	Printed Name: Date:

City of Portland
Water Pollution Control Laboratory
6543 N. Burlington Ave. / Portland OR 97203 (503) 823-5600 fax (503) 823-5656

LABORATORY ANALYSIS REPORT

Sample ID: **FO070811** **Sample Collected:** 6/21/2007 10:37 **Sample Received:** 06/21/07 **Sample Status:** **COMPLETE AND VALIDATED**

Proj./Company Name: PORTLAND HARBOR INLINE SAMP
Address/Location: IL-45-ABC318-0607
1303 N RIVER ST
Sample Point Code: 45_1
Sample Type: GRAB
Sample Matrix: SEDIMENT

Report Page: Page 1 of 1
System ID: AL05875
EID File # : 1020.001
LocCode: PORTHARI
Collected By: MJS/LAP

Comments:
QA/QC: Unless otherwise noted, all analytical QA/QC criteria were met for this sample including holding times, calibration, method blanks, laboratory control sample recoveries, duplicate precision, matrix spike recoveries, and surrogate recoveries, as applicable. LAB: Trace level of Aroclor 1260 was detected (<10 ug/Kg). For Grain Size analysis, the result for Silt (75-32 um) represents all particles <75 um. The sample did not contain enough fines to run the hydrometer portion of the test.

Test Parameter	Result	Units	MRL	Method	Analysis Date
GENERAL					
TOTAL SOLIDS	81.9	% W/W	0.01	SM 2540 G	06/25/07
GC ANALYSIS					
POLYCHLORINATED BIPHENYLS (PCB)					
Aroclor 1016	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1221	<20	µg/Kg dry wt	20	EPA 8082	06/25/07
Aroclor 1232	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1242	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1248	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1254	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1260	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1262	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1268	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
OUTSIDE ANALYSIS					
TOTAL ORGANIC CARBON	4900	mg/Kg dry wt	100	EPA 9060 MOD	07/05/07
GRAIN SIZE BY ASTM - ARI					
Coarse Sand (4750-2000 µm)	3.0	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (150-75 µm)	10.5	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (250-150 µm)	17.8	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (425-250 µm)	24.9	Fract %	0.1	ASTM D421/422	07/03/07
Gravel (>4750 µm)	1.0	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (2000-850 µm)	14.5	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (850-425 µm)	21.2	Fract %	0.1	ASTM D421/422	07/03/07
Silt (75-32 µm)	7.1	Fract %	0.1	ASTM D421/422	07/03/07

End of Report for Sample ID: FO070811

Report Date: 08/15/07 **Validated By: Signature on File**

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Water Pollution Control Laboratory
6543 N. Burlington Ave. / Portland OR 97203 (503) 823-5600 fax (503) 823-5656

LABORATORY ANALYSIS REPORT

Sample ID: **FO070812** **Sample Collected:** 6/21/2007 09:30 **Sample Received:** 06/21/07 **Sample Status:** **COMPLETE AND VALIDATED**

Proj./Company Name: PORTLAND HARBOR INLINE SAMP
Address/Location: IL-45-ABC297-0607-E
1303 N RIVER ST - 21 INCH LINE FROM EAST
Sample Point Code: 45_2
Sample Type: GRAB
Sample Matrix: SEDIMENT

Report Page: Page 1 of 1
System ID: AL05876
EID File # : 1020.001
LocCode: PORTHARI
Collected By: MJS/LAP

Comments:
QA/QC: Unless otherwise noted, all analytical QA/QC criteria were met for this sample including holding times, calibration, method blanks, laboratory control sample recoveries, duplicate precision, matrix spike recoveries, and surrogate recoveries, as applicable. LAB: For Grain Size analysis, the result for Silt (75-32 um) represents all particles <75 um. The sample did not contain enough fines to run the hydrometer portion of the test.

Test Parameter	Result	Units	MRL	Method	Analysis Date
GENERAL					
TOTAL SOLIDS	82.4	% W/W	0.01	SM 2540 G	06/25/07
GC ANALYSIS					
POLYCHLORINATED BIPHENYLS (PCB)					
Aroclor 1016	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1221	<20	µg/Kg dry wt	20	EPA 8082	06/25/07
Aroclor 1232	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1242	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1248	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1254	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1260	24	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1262	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1268	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
OUTSIDE ANALYSIS					
TOTAL ORGANIC CARBON	15400	mg/Kg dry wt	100	EPA 9060 MOD	07/05/07
GRAIN SIZE BY ASTM - ARI					
Coarse Sand (4750-2000 µm)	20.9	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (150-75 µm)	2.4	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (250-150 µm)	4.3	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (425-250 µm)	10.1	Fract %	0.1	ASTM D421/422	07/03/07
Gravel (>4750 µm)	21.2	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (2000-850 µm)	16.8	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (850-425 µm)	19.8	Fract %	0.1	ASTM D421/422	07/03/07
Silt (75-32 µm)	4.4	Fract %	0.1	ASTM D421/422	07/03/07

End of Report for Sample ID: FO070812

Report Date: 08/15/07 **Validated By: Signature on File**

City of Portland
Water Pollution Control Laboratory
6543 N. Burlington Ave. / Portland OR 97203 (503) 823-5600 fax (503) 823-5656

LABORATORY ANALYSIS REPORT

Sample ID: **FO070813** **Sample Collected:** 6/21/2007 11:31 **Sample Received:** 06/21/07 **Sample Status:** COMPLETE AND VALIDATED

Proj./Company Name: PORTLAND HARBOR INLINE SAMP
Address/Location: IL-45-AAX693-0607
N RUSSELL UNDER I-405
Sample Point Code: 45_3
Sample Type: GRAB
Sample Matrix: SEDIMENT

Report Page: Page 1 of 1
System ID: AL05877
EID File # : 1020.001
LocCode: PORTHARI
Collected By: MJS/LAP

Comments:
QA/QC: Unless otherwise noted, all analytical QA/QC criteria were met for this sample including holding times, calibration, method blanks, laboratory control sample recoveries, duplicate precision, matrix spike recoveries, and surrogate recoveries, as applicable. LAB: For Grain Size analysis, organic matter in the sample may have broken down during sieving, affecting the results.

Test Parameter	Result	Units	MRL	Method	Analysis Date
GENERAL					
TOTAL SOLIDS	61.0	% W/W	0.01	SM 2540 G	06/25/07
GC ANALYSIS					
POLYCHLORINATED BIPHENYLS (PCB)					
Aroclor 1016	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1221	<20	µg/Kg dry wt	20	EPA 8082	06/25/07
Aroclor 1232	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1242	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1248	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1254	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1260	23	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1262	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1268	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
OUTSIDE ANALYSIS					
TOTAL ORGANIC CARBON	65100	mg/Kg dry wt	100	EPA 9060 MOD	07/05/07
GRAIN SIZE BY ASTM - ARI					
Clay (<3.2 µm)	16.9	Fract %	0.1	ASTM D421/422	07/03/07
Coarse Sand (4750-2000 µm)	1.5	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (150-75 µm)	5.1	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (250-150 µm)	3.0	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (425-250 µm)	4.9	Fract %	0.1	ASTM D421/422	07/03/07
Gravel (>4750 µm)	1.9	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (2000-850 µm)	5.3	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (850-425 µm)	6.7	Fract %	0.1	ASTM D421/422	07/03/07
Silt (13-9 µm)	14.0	Fract %	0.1	ASTM D421/422	07/03/07
Silt (22-13 µm)	5.2	Fract %	0.1	ASTM D421/422	07/03/07
Silt (32-22 µm)	5.9	Fract %	0.1	ASTM D421/422	07/03/07
Silt (7-3.2 µm)	12.5	Fract %	0.1	ASTM D421/422	07/03/07
Silt (75-32 µm)	9.7	Fract %	0.1	ASTM D421/422	07/03/07
Silt (9-7 µm)	7.4	Fract %	0.1	ASTM D421/422	07/03/07

End of Report for Sample ID: FO070813

Report Date: 08/15/07 **Validated By: Signature on File**

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Water Pollution Control Laboratory
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LABORATORY ANALYSIS REPORT

Sample ID: **FO070814** **Sample Collected:** 6/21/2007 12:03 **Sample Received:** 06/21/07 **Sample Status:** COMPLETE AND VALIDATED

Proj./Company Name: PORTLAND HARBOR INLINE SAMP
Address/Location: IL-45-AAX696-0607
N LARABEE AND RUSSELL
Sample Point Code: 45_4
Sample Type: GRAB
Sample Matrix: SEDIMENT

Report Page: Page 1 of 1
System ID: AL05878
EID File # : 1020.001
LocCode: PORTHARI
Collected By: MJS/LAP

Comments:
QA/QC: Unless otherwise noted, all analytical QA/QC criteria were met for this sample including holding times, calibration, method blanks, laboratory control sample recoveries, duplicate precision, matrix spike recoveries, and surrogate recoveries, as applicable.

Test Parameter	Result	Units	MRL	Method	Analysis Date
GENERAL					
TOTAL SOLIDS	80.3	% W/W	0.01	SM 2540 G	06/25/07
GC ANALYSIS					
POLYCHLORINATED BIPHENYLS (PCB)					
Aroclor 1016	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1221	<20	µg/Kg dry wt	20	EPA 8082	06/25/07
Aroclor 1232	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1242	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1248	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1254	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1260	49	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1262	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
Aroclor 1268	<10	µg/Kg dry wt	10	EPA 8082	06/25/07
OUTSIDE ANALYSIS					
TOTAL ORGANIC CARBON	37500	mg/Kg dry wt	100	EPA 9060 MOD	07/05/07
GRAIN SIZE BY ASTM - ARI					
Clay (<3.2 µm)	6.4	Fract %	0.1	ASTM D421/422	07/03/07
Coarse Sand (4750-2000 µm)	3.8	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (150-75 µm)	9.0	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (250-150 µm)	6.5	Fract %	0.1	ASTM D421/422	07/03/07
Fine Sand (425-250 µm)	7.8	Fract %	0.1	ASTM D421/422	07/03/07
Gravel (>4750 µm)	11.6	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (2000-850 µm)	8.0	Fract %	0.1	ASTM D421/422	07/03/07
Medium Sand (850-425 µm)	8.1	Fract %	0.1	ASTM D421/422	07/03/07
Silt (13-9 µm)	5.8	Fract %	0.1	ASTM D421/422	07/03/07
Silt (22-13 µm)	7.1	Fract %	0.1	ASTM D421/422	07/03/07
Silt (32-22 µm)	5.1	Fract %	0.1	ASTM D421/422	07/03/07
Silt (7-3.2 µm)	6.4	Fract %	0.1	ASTM D421/422	07/03/07
Silt (75-32 µm)	11.9	Fract %	0.1	ASTM D421/422	07/03/07
Silt (9-7 µm)	2.6	Fract %	0.1	ASTM D421/422	07/03/07

End of Report for Sample ID: FO070814

Report Date: 08/15/07 **Validated By: Signature on File**