

TECHNICAL MEMORANDUM

DATE: January 5, 2015
TO: Mr. Gary Kriedt
FROM: Lisa Gilbert
SUBJECT: Bay 6 Soil Sampling
CC: Darryl Wendle, Parametrix
PROJECT NUMBER: 554-1521-126 (07/02)
PROJECT NAME: Ryerson Base Hydraulic Lifts Replacement Project

On December 11, 2014, Parametrix' subcontractor PBS Environmental Inc. conducted soil sampling at Metro Transit Division's Ryerson Base facility (site) located at 1220 Fourth Ave S in Seattle, Washington. Parametrix' services were performed under Work Order No. 07 to Contract No. E00305E13.

The soil sampling and selected analyses were conducted at the site to provide a waste profile for disposal of the potentially impacted soil material. The laboratory report is attached.

Summary of Work Completed and Field Observations

- Three soil samples (B6CS, B6CN, and B6NE) were collected from the Bay 6 excavation area.
 - B6CS – composite sample collected from the South Pit
 - B6CN – composite sample collected from the North Pit
 - B6NE – sample collected from the Northeast portion of the hoist area
- The samples were delivered to Fremont Analytical and analyzed with a two-day turnaround time for:
 - Total Petroleum Hydrocarbons (Diesel and Heavy Oil range by NWTPH-Dx),
 - Total Metals (Mercury by EPA Method 7471 and Arsenic, cadmium, chromium, and lead by EPA Method 6020,
 - Polyaromatic Hydrocarbons (PAHs, EPA Method 8270-SIM)
- There were several wood pilings observed in the excavation. The wood had a creosote-like odor.

The results of the three (3) soil samples collected by PBS on 12/11/2104 (see attached Laboratory report 1412144) indicated levels of PAHs above the Model Toxics Control Act (MTCA) Method A soil cleanup level. TPH as Diesel and Heavy Oil (TPH-Dx) results were all below the laboratory reporting limits. The detected levels of metals (arsenic, chromium, and lead) were below the MTCA Method A soil cleanup levels.

In accordance with Ecology guidance (Washington Department of Ecology 'Guidelines for Re-Use of Petroleum Contaminated Soil', Ecology Publication 10-09-057-Draft November 2010), the soil represented by the first two composite sample results must be managed as 'WDOE Category 3'-petroleum contaminated soil (PCS), based on detection of PAHs. Category 3 PCS disposal can be at a landfill or an asphalt plant (e.g., CEMEX).

Summary of Soil Sampling Results for Bay 6, Ryerson Base.

Sample #	Sample Date	Location / depth	TPH-Dx (mg/Kg) as Diesel	TPH-Dx (mg/Kg) as Heavy Oil	Arsenic (mg/Kg)	Chromium (mg/Kg)	Lead (mg/Kg)	BAP (mg/Kg)	Disposal Cat.
1412144-001 B6CS	12/11/2014	South pit composite	<21.1	<52.7	3.44	24.9	21.3	0.591	3
1412144-002 B6CN	12/11/2014	North pit composite	<20.2	<50.5	3.30	22.0	7.51	0.137	3
1412144-003 B6NE	12/11/2014	Northeast grab	<20.6	<51.6	1.57	18.0	3.03	<0.053	1
	Table 740-1	MTCA A Soil Standards	2000	2000	20	2,000	250	<0.1	
	Table 12.1	Cat. 1 – Disposal Levels	<25	<100	NA	NA	<17	<0.050	
	Table 12.1	Cat. 2 – Disposal Levels	25 to 200	100 to 200	NA	NA	17 to 100	0.05 to 0.1	
	Table 12.1	Cat.3 - Disposal Levels	>200 to 500	>200 to 500	NA	NA	>100 to 220	>0.1 to 2	

Notes:

mg/Kg = milligram per kilogram (equal to parts per million, ppm)

TPH-Dx = TPH as Diesel and Heavy Oil range

<0.5 = below the laboratory reporting limits (e.g. non-detect levels)

>0.1 = concentrations greater than stated level

Table 12.1 – Washington Department of Ecology 'Guidelines for Re-Use of Petroleum Contaminated Soil', Ecology Publication 10-09-057-Draft November 2010

BAP = Benzo(a)pyrene; regulatory criteria based on toxic equivalency

NA = not available

-- = not analyzed

Laboratory Report



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PBS Engineering & Environmental

Tom Mergy

2517 Eastlake Ave, E #100

Seattle, WA 98102

RE: Metro Ryerson Base-Bay #6

Lab ID: 1412144

December 16, 2014

Attention Tom Mergy:

Fremont Analytical, Inc. received 3 sample(s) on 12/11/2014 for the analyses presented in the following report.

Diesel and Heavy Oil by NWTPH-Dx/Dx Ext.

Mercury by EPA Method 7471

Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)

Sample Moisture (Percent Moisture)

Total Metals by EPA Method 6020

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Chelsea Ward
Project Manager



Date: 12/16/2014

CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6
Lab Order: 1412144

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1412144-001	B6CS	12/11/2014 9:00 AM	12/11/2014 2:02 PM
1412144-002	B6CN	12/11/2014 9:10 AM	12/11/2014 2:02 PM
1412144-003	B6NE	12/11/2014 9:15 AM	12/11/2014 2:02 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.



Analytical Report

WO#: 1412144

Date Reported: 12/16/2014

Client: PBS Engineering & Environmental

Collection Date: 12/11/2014 9:00:00 AM

Project: Metro Ryerson Base-Bay #6

Lab ID: 1412144-001

Matrix: Soil

Client Sample ID: B6CS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Diesel and Heavy Oil by NWTPH-Dx/Dx Ext.

Batch ID: 9558

Analyst: EC

Diesel (Fuel Oil)	ND	21.1		mg/Kg-dry	1	12/11/2014 8:01:00 PM
Heavy Oil	ND	52.7		mg/Kg-dry	1	12/11/2014 8:01:00 PM
Surr: 2-Fluorobiphenyl	91.5	50-150		%REC	1	12/11/2014 8:01:00 PM
Surr: o-Terphenyl	91.7	50-150		%REC	1	12/11/2014 8:01:00 PM

Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)

Batch ID: 9582

Analyst: NG

Naphthalene	84.4	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
2-Methylnaphthalene	161	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
1-Methylnaphthalene	73.0	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Acenaphthylene	ND	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Acenaphthene	423	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Fluorene	188	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Phenanthrene	1,000	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Anthracene	134	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Fluoranthene	1,390	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Pyrene	1,050	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Benz(a)anthracene	913	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Chrysene	1,300	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Benzo(b)fluoranthene	1,500	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Benzo(k)fluoranthene	451	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Benzo(a)pyrene	591	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Indeno(1,2,3-cd)pyrene	392	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Dibenz(a,h)anthracene	153	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Benzo(g,h,i)perylene	395	56.6		µg/Kg-dry	1	12/16/2014 1:00:00 AM
Surr: 2-Fluorobiphenyl	84.3	42.7-132		%REC	1	12/16/2014 1:00:00 AM
Surr: Terphenyl-d14 (surr)	87.7	48.8-157		%REC	1	12/16/2014 1:00:00 AM

Mercury by EPA Method 7471

Batch ID: 9560

Analyst: MW

Mercury	ND	0.264		mg/Kg-dry	1	12/12/2014 1:12:53 PM
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Total Metals by EPA Method 6020

Batch ID: 9569

Analyst: TN

Arsenic	3.44	0.0881		mg/Kg-dry	1	12/15/2014 4:54:51 PM
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Qualifiers:	B	Analyte detected in the associated Method Blank	D	Dilution was required
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits



Analytical Report

WO#: 1412144

Date Reported: 12/16/2014

Client: PBS Engineering & Environmental

Collection Date: 12/11/2014 9:00:00 AM

Project: Metro Ryerson Base-Bay #6

Lab ID: 1412144-001

Matrix: Soil

Client Sample ID: B6CS

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Total Metals by EPA Method 6020

Batch ID: 9569

Analyst: TN

Cadmium	ND	0.176		mg/Kg-dry	1	12/15/2014 4:54:51 PM
Chromium	24.9	0.0881		mg/Kg-dry	1	12/15/2014 4:54:51 PM
Lead	21.3	0.176		mg/Kg-dry	1	12/15/2014 4:54:51 PM

Sample Moisture (Percent Moisture)

Batch ID: R18553

Analyst: SB

Percent Moisture	14.0			wt%	1	12/12/2014 8:25:45 AM
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Qualifiers: B Analyte detected in the associated Method Blank
E Value above quantitation range
J Analyte detected below quantitation limits
RL Reporting Limit

D Dilution was required
H Holding times for preparation or analysis exceeded
ND Not detected at the Reporting Limit
S Spike recovery outside accepted recovery limits



Analytical Report

WO#: 1412144

Date Reported: 12/16/2014

Client: PBS Engineering & Environmental

Collection Date: 12/11/2014 9:10:00 AM

Project: Metro Ryerson Base-Bay #6

Lab ID: 1412144-002

Matrix: Soil

Client Sample ID: B6CN

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<u>Diesel and Heavy Oil by NWTPH-Dx/Dx Ext.</u>				Batch ID: 9558	Analyst: EC	
Diesel (Fuel Oil)	ND	20.2		mg/Kg-dry	1	12/11/2014 8:33:00 PM
Heavy Oil	ND	50.5		mg/Kg-dry	1	12/11/2014 8:33:00 PM
Surr: 2-Fluorobiphenyl	90.4	50-150		%REC	1	12/11/2014 8:33:00 PM
Surr: o-Terphenyl	89.8	50-150		%REC	1	12/11/2014 8:33:00 PM
<u>Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)</u>				Batch ID: 9582	Analyst: NG	
Naphthalene	102	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
2-Methylnaphthalene	228	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
1-Methylnaphthalene	131	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Acenaphthylene	ND	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Acenaphthene	587	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Fluorene	458	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Phenanthrene	1,480	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Anthracene	252	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Fluoranthene	1,230	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Pyrene	884	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Benz(a)anthracene	296	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Chrysene	297	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Benzo(b)fluoranthene	260	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Benzo(k)fluoranthene	93.5	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Benzo(a)pyrene	137	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Indeno(1,2,3-cd)pyrene	ND	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Dibenz(a,h)anthracene	ND	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Benzo(g,h,i)perylene	ND	55.8		µg/Kg-dry	1	12/16/2014 1:24:00 AM
Surr: 2-Fluorobiphenyl	94.6	42.7-132		%REC	1	12/16/2014 1:24:00 AM
Surr: Terphenyl-d14 (surr)	98.2	48.8-157		%REC	1	12/16/2014 1:24:00 AM
<u>Mercury by EPA Method 7471</u>				Batch ID: 9560	Analyst: MW	
Mercury	ND	0.285		mg/Kg-dry	1	12/12/2014 1:14:29 PM
<u>Total Metals by EPA Method 6020</u>				Batch ID: 9569	Analyst: TN	
Arsenic	3.30	0.0905		mg/Kg-dry	1	12/15/2014 5:15:58 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	D	Dilution was required
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits



Analytical Report

WO#: 1412144

Date Reported: 12/16/2014

Client: PBS Engineering & Environmental

Collection Date: 12/11/2014 9:10:00 AM

Project: Metro Ryerson Base-Bay #6

Lab ID: 1412144-002

Matrix: Soil

Client Sample ID: B6CN

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Total Metals by EPA Method 6020

Batch ID: 9569

Analyst: TN

Cadmium	ND	0.181		mg/Kg-dry	1	12/15/2014 5:15:58 PM
Chromium	22.0	0.0905		mg/Kg-dry	1	12/15/2014 5:15:58 PM
Lead	7.51	0.181		mg/Kg-dry	1	12/15/2014 5:15:58 PM

Sample Moisture (Percent Moisture)

Batch ID: R18553

Analyst: SB

Percent Moisture	12.3			wt%	1	12/12/2014 8:25:45 AM
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Qualifiers:

B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
RL	Reporting Limit

D	Dilution was required
H	Holding times for preparation or analysis exceeded
ND	Not detected at the Reporting Limit
S	Spike recovery outside accepted recovery limits



Analytical Report

WO#: 1412144

Date Reported: 12/16/2014

Client: PBS Engineering & Environmental

Collection Date: 12/11/2014 9:15:00 AM

Project: Metro Ryerson Base-Bay #6

Lab ID: 1412144-003

Matrix: Soil

Client Sample ID: B6NE

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
<u>Diesel and Heavy Oil by NWTPH-Dx/Dx Ext.</u>				Batch ID: 9558		Analyst: EC
Diesel (Fuel Oil)	ND	20.6		mg/Kg-dry	1	12/11/2014 9:05:00 PM
Heavy Oil	ND	51.6		mg/Kg-dry	1	12/11/2014 9:05:00 PM
Surr: 2-Fluorobiphenyl	90.5	50-150		%REC	1	12/11/2014 9:05:00 PM
Surr: o-Terphenyl	89.5	50-150		%REC	1	12/11/2014 9:05:00 PM
<u>Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)</u>				Batch ID: 9582		Analyst: NG
Naphthalene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
2-Methylnaphthalene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
1-Methylnaphthalene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Acenaphthylene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Acenaphthene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Fluorene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Phenanthrene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Anthracene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Fluoranthene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Pyrene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Benz(a)anthracene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Chrysene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Benzo(b)fluoranthene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Benzo(k)fluoranthene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Benzo(a)pyrene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Indeno(1,2,3-cd)pyrene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Dibenz(a,h)anthracene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Benzo(g,h,i)perylene	ND	53.0		µg/Kg-dry	1	12/16/2014 12:11:00 AM
Surr: 2-Fluorobiphenyl	93.0	42.7-132		%REC	1	12/16/2014 12:11:00 AM
Surr: Terphenyl-d14 (surr)	98.3	48.8-157		%REC	1	12/16/2014 12:11:00 AM
<u>Mercury by EPA Method 7471</u>				Batch ID: 9560		Analyst: MW
Mercury	ND	0.282		mg/Kg-dry	1	12/12/2014 1:16:06 PM
<u>Total Metals by EPA Method 6020</u>				Batch ID: 9569		Analyst: TN
Arsenic	1.57	0.0905		mg/Kg-dry	1	12/15/2014 5:26:36 PM

Qualifiers:	B	Analyte detected in the associated Method Blank	D	Dilution was required
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits



Analytical Report

WO#: 1412144

Date Reported: 12/16/2014

Client: PBS Engineering & Environmental

Collection Date: 12/11/2014 9:15:00 AM

Project: Metro Ryerson Base-Bay #6

Lab ID: 1412144-003

Matrix: Soil

Client Sample ID: B6NE

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
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Total Metals by EPA Method 6020

Batch ID: 9569

Analyst: TN

Cadmium	ND	0.181		mg/Kg-dry	1	12/15/2014 5:26:36 PM
Chromium	18.0	0.0905		mg/Kg-dry	1	12/15/2014 5:26:36 PM
Lead	3.03	0.181		mg/Kg-dry	1	12/15/2014 5:26:36 PM

Sample Moisture (Percent Moisture)

Batch ID: R18553

Analyst: SB

Percent Moisture	13.0			wt%	1	12/12/2014 8:25:45 AM
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Qualifiers: B Analyte detected in the associated Method Blank
E Value above quantitation range
J Analyte detected below quantitation limits
RL Reporting Limit

D Dilution was required
H Holding times for preparation or analysis exceeded
ND Not detected at the Reporting Limit
S Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT

Total Metals by EPA Method 6020

Sample ID: MB-9569	SampType: MBLK	Units: mg/Kg			Prep Date: 12/15/2014			RunNo: 18607			
Client ID: MBLKS	Batch ID: 9569				Analysis Date: 12/15/2014			SeqNo: 371046			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	ND	0.100									
Cadmium	ND	0.200									
Chromium	ND	0.100									
Lead	ND	0.200									

Sample ID: LCS-9569	SampType: LCS	Units: mg/Kg				Prep Date: 12/15/2014			RunNo: 18607		
Client ID: LCSS	Batch ID: 9569					Analysis Date: 12/15/2014			SeqNo: 371047		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	172	0.100	175.0	0	98.3	70.9	129.7				
Cadmium	308	0.200	299.0	0	103	73.6	126.8				
Chromium	231	0.100	220.0	0	105	70.9	129.1				
Lead	188	0.200	189.0	0	99.2	74.6	125.4				

Sample ID: 1412144-001ADUP	SampType: DUP	Units: mg/Kg-dry				Prep Date: 12/15/2014			RunNo: 18607		
Client ID: B6CS	Batch ID: 9569					Analysis Date: 12/15/2014			SeqNo: 371049		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic	3.10	0.0888						3.440	10.3	20	
Cadmium	ND	0.178						0		20	
Chromium	28.5	0.0888						24.93	13.4	20	
Lead	17.8	0.178						21.26	17.9	20	

Qualifiers:

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits

D Dilution was required
J Analyte detected below quantitation limits
RL Reporting Limit

E Value above quantitation range
ND Not detected at the Reporting Limit
S Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT

Total Metals by EPA Method 6020

Sample ID: 1412144-001AMS		SampType: MS		Units: mg/Kg-dry		Prep Date: 12/15/2014			RunNo: 18607		
Client ID: B6CS		Batch ID: 9569					Analysis Date: 12/15/2014			SeqNo: 371051	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Arsenic	42.5	0.0881	44.06	3.440	88.8	75	125				
Cadmium	2.13	0.176	2.203	0.09115	92.6	75	125				
Chromium	69.2	0.0881	44.06	24.93	100	75	125				
Lead	41.5	0.176	22.03	21.26	91.8	75	125				

Sample ID: 1412144-001AMSD		SampType: MSD			Units: mg/Kg-dry		Prep Date: 12/15/2014			RunNo: 18607		
Client ID: B6CS		Batch ID: 9569			Analysis Date: 12/15/2014					SeqNo: 371052		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Arsenic	46.9	0.0888	44.39	3.440	98.0	75	125	42.55	9.83	30	
Cadmium	2.17	0.178	2.220	0.09115	93.6	75	125	2.131	1.73	30	
Chromium	66.9	0.0888	44.39	24.93	94.6	75	125	69.20	3.36	30	
Lead	40.0	0.178	22.20	21.26	84.4	75	125	41.48	3.64	30	

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT

Mercury by EPA Method 7471

Sample ID: MB-9560	SampType: MBLK	Units: mg/Kg			Prep Date: 12/11/2014			RunNo: 18567			
Client ID: MBLKS	Batch ID: 9560				Analysis Date: 12/12/2014			SeqNo: 370331			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	ND	0.250									

Sample ID: LCS-9560		SampType: LCS		Units: mg/Kg		Prep Date: 12/11/2014			RunNo: 18567			
Client ID: LCSS		Batch ID: 9560					Analysis Date: 12/12/2014			SeqNo: 370332		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	
Mercury	5.04	0.250	5.000	0	101	80	120					

Sample ID: 1412106-001ADUP		SampType: DUP		Units: mg/Kg-dry		Prep Date: 12/11/2014			RunNo: 18567		
Client ID: BATCH		Batch ID: 9560		Analysis Date: 12/12/2014						SeqNo: 370334	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.393	0.219						0.6054	42.7	20	

Sample ID: 1412106-001AMS		SampType: MS		Units: mg/Kg-dry		Prep Date: 12/11/2014		RunNo: 18567			
Client ID: BATCH		Batch ID: 9560				Analysis Date: 12/12/2014		SeqNo: 370335			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercurv	0.759	0.231	0.4620	0.6054	33.3	70	130				S

NOTES:

S - Outlying spike recovery observed due to suspected sample inhomogeneity / matrix type.

Sample ID: 1412106-001AMSD	SampType: MSD	Units: mg/Kg-dry				Prep Date: 12/11/2014			RunNo: 18567		
Client ID: BATCH	Batch ID: 9560	Analysis Date: 12/12/2014							SeqNo: 370336		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	1.44	0.227	0.4537	0.6054	185	70	130	0.7595	62.1	20	RS

Qualifiers:

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits

D Dilution was required
J Analyte detected below quantitation limits
RL Reporting Limit

E Value above quantitation range
ND Not detected at the Reporting Limit
S Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT

Mercury by EPA Method 7471

Sample ID: 1412106-001AMSD		SampType: MSD		Units: mg/Kg-dry		Prep Date: 12/11/2014			RunNo: 18567		
Client ID: BATCH		Batch ID: 9560					Analysis Date: 12/12/2014			SeqNo: 370336	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

NOTES:

SR - Outlying spike recovery and high RPD observed due to suspected sample inhomogeneity / matrix type.

Qualifiers:	B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
	R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT

Diesel and Heavy Oil by NWTPH-Dx/Dx Ext.

Sample ID: 1412139-003ADUP		SampType: DUP		Units: mg/Kg-dry		Prep Date: 12/11/2014			RunNo: 18536		
Client ID: BATCH		Batch ID: 9558					Analysis Date: 12/11/2014			SeqNo: 369662	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Diesel (Fuel Oil)	ND	18.7						0		30	
Heavy Oil	ND	46.8						0		30	
Surr: 2-Fluorobiphenyl	17.4		18.74		92.6	50	150		0		
Surr: o-Terphenyl	17.3		18.74		92.3	50	150		0		

Sample ID: LCS-9558		SampType: LCS			Units: mg/Kg		Prep Date: 12/11/2014			RunNo: 18536		
Client ID: LCSS		Batch ID: 9558			Analysis Date: 12/11/2014			SeqNo: 370070				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Diesel (Fuel Oil)	430	20.0	500.0	0	86.0	65	135				
Surr: 2-Fluorobiphenyl	20.4		20.00		102	50	150				
Surr: o-Terphenyl	20.6		20.00		103	50	150				

Sample ID: MB-9558		SampType: MBLK			Units: mg/Kg		Prep Date: 12/11/2014			RunNo: 18536		
Client ID: MBLKS		Batch ID: 9558			Analysis Date: 12/11/2014			SeqNo: 370071				
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual	

Diesel (Fuel Oil)	ND	20.0									
Heavy Oil	ND	50.0									
Surr: 2-Fluorobiphenyl	18.6		20.00		93.1	50	150				
Surr: o-Terphenyl	18.5		20.00		92.6	50	150				

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT
Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)

Sample ID: MB-9582	SampType: MBLK	Units: µg/Kg			Prep Date: 12/15/2014			RunNo: 18616			
Client ID: MBLKS	Batch ID: 9582	Analysis Date: 12/15/2014						SeqNo: 371251			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Naphthalene	ND	50.0									
2-Methylnaphthalene	ND	50.0									
1-Methylnaphthalene	ND	50.0									
Acenaphthylene	ND	50.0									
Acenaphthene	ND	50.0									
Fluorene	ND	50.0									
Phenanthrene	ND	50.0									
Anthracene	ND	50.0									
Fluoranthene	ND	50.0									
Pyrene	ND	50.0									
Benz(a)anthracene	ND	50.0									
Chrysene	ND	50.0									
Benzo(b)fluoranthene	ND	50.0									
Benzo(k)fluoranthene	ND	50.0									
Benzo(a)pyrene	ND	50.0									
Indeno(1,2,3-cd)pyrene	ND	50.0									
Dibenz(a,h)anthracene	ND	50.0									
Benzo(g,h,i)perylene	ND	50.0									
Surr: 2-Fluorobiphenyl	458		500.0		91.6	42.7	132				
Surr: Terphenyl-d14 (surr)	506		500.0		101	48.8	157				

Sample ID: LCS-9582	SampType: MBLK	Units: µg/Kg			Prep Date: 12/15/2014			RunNo: 18616			
Client ID: MBLKS	Batch ID: 9582				Analysis Date: 12/15/2014			SeqNo: 371252			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Naphthalene	977	50.0									
2-Methylnaphthalene	940	50.0									
1-Methylnaphthalene	985	50.0									

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT

Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)

Sample ID: LCS-9582	SampType: MBLK	Units: µg/Kg				Prep Date: 12/15/2014			RunNo: 18616		
Client ID: MBLKS	Batch ID: 9582	Analysis Date: 12/15/2014							SeqNo: 371252		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Acenaphthylene	920	50.0									
Acenaphthene	968	50.0									
Fluorene	968	50.0									
Phenanthrene	945	50.0									
Anthracene	898	50.0									
Fluoranthene	942	50.0									
Pyrene	935	50.0									
Benz(a)anthracene	960	50.0									
Chrysene	969	50.0									
Benzo(b)fluoranthene	858	50.0									
Benzo(k)fluoranthene	1,070	50.0									
Benzo(a)pyrene	910	50.0									
Indeno(1,2,3-cd)pyrene	694	50.0									
Dibenz(a,h)anthracene	612	50.0									
Benzo(g,h,i)perylene	671	50.0									
Surr: 2-Fluorobiphenyl	494		500.0		98.7	42.7	132				
Surr: Terphenyl-d14 (surr)	495		500.0		98.9	48.8	157				

Sample ID: 1412103-016ADUP		SampType: DUP		Units: µg/Kg-dry		Prep Date: 12/15/2014			RunNo: 18616		
Client ID: BATCH		Batch ID: 9582		Analysis Date: 12/16/2014						SeqNo: 371573	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Naphthalene	287	68.4						257.1	11.0	30	
2-Methylnaphthalene	110	68.4						100.6	9.10	30	
1-Methylnaphthalene	97.6	68.4						93.04	4.81	30	
Acenaphthylene	114	68.4						105.6	7.51	30	
Acenaphthene	ND	68.4						0		30	
Fluorene	ND	68.4						0		30	

Qualifiers:
B Analyte detected in the associated Method Blank
D Dilution was required
E Value above quantitation range

H Holding times for preparation or analysis exceeded
J Analyte detected below quantitation limits
ND Not detected at the Reporting Limit

R RPD outside accepted recovery limits
RL Reporting Limit
S Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT
Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)

Sample ID: 1412103-016ADUP		SampType: DUP		Units: µg/Kg-dry		Prep Date: 12/15/2014			RunNo: 18616		
Client ID: BATCH		Batch ID: 9582					Analysis Date: 12/16/2014			SeqNo: 371573	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phenanthrene	224	68.4						218.5	2.44	30	
Anthracene	ND	68.4						0		30	
Fluoranthene	409	68.4						369.1	10.4	30	
Pyrene	521	68.4						473.2	9.63	30	
Benz(a)anthracene	353	68.4						270.9	26.4	30	
Chrysene	461	68.4						344.2	29.1	30	
Benzo(b)fluoranthene	604	68.4						484.2	22.1	30	
Benzo(k)fluoranthene	132	68.4						99.61	28.0	30	
Benzo(a)pyrene	490	68.4						342.0	35.6	30	R
Indeno(1,2,3-cd)pyrene	417	68.4						344.6	19.0	30	
Dibenz(a,h)anthracene	100	68.4						0	200	30	
Benzo(g,h,i)perylene	493	68.4						413.3	17.6	30	
Surr: 2-Fluorobiphenyl	592		684.4		86.6	42.7	132		0		
Surr: Terphenyl-d14 (surr)	666		684.4		97.4	48.8	157		0		

NOTES:

R - High RPD observed. The method is in control as indicated by the laboratory control sample (LCS).

Sample ID: 1412103-019AMS	SampType: MS	Units: µg/Kg-dry				Prep Date: 12/15/2014			RunNo: 18616		
Client ID: BATCH	Batch ID: 9582	Analysis Date: 12/16/2014							SeqNo: 371575		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Naphthalene	1,120	66.1	1,322	35.53	81.6	42.9	138				
2-Methylnaphthalene	1,150	66.1	1,322	0	86.7	42.8	151				
1-Methylnaphthalene	1,170	66.1	1,322	0	88.6	41.6	148				
Acenaphthylene	1,180	66.1	1,322	0	89.4	32.6	160				
Acenaphthene	1,210	66.1	1,322	0	91.7	46.3	142				
Fluorene	1,150	66.1	1,322	0	86.7	43.4	153				
Phenanthrene	1,240	66.1	1,322	57.62	89.5	45.5	140				
Anthracene	1,230	66.1	1,322	0	93.2	32.6	160				

Qualifiers:

B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
R RPD outside accepted recovery limits

D Dilution was required
J Analyte detected below quantitation limits
RL Reporting Limit

E Value above quantitation range
ND Not detected at the Reporting Limit
S Spike recovery outside accepted recovery limits



Date: 12/16/2014

Work Order: 1412144
CLIENT: PBS Engineering & Environmental
Project: Metro Ryerson Base-Bay #6

QC SUMMARY REPORT
Polyaromatic Hydrocarbons by EPA Method 8270 (SIM)

Sample ID: 1412103-019AMS	SampType: MS	Units: µg/Kg-dry				Prep Date: 12/15/2014			RunNo: 18616		
Client ID: BATCH	Batch ID: 9582	Analysis Date: 12/16/2014							SeqNo: 371575		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoranthene	1,280	66.1	1,322	66.90	91.7	44.6	161				
Pyrene	1,270	66.1	1,322	59.15	91.7	48.3	158				
Benz(a)anthracene	1,170	66.1	1,322	27.70	86.1	57.5	169				
Chrysene	1,240	66.1	1,322	0	93.4	45.2	146				
Benzo(b)fluoranthene	1,140	66.1	1,322	0	86.4	42.2	168				
Benzo(k)fluoranthene	992	66.1	1,322	0	75.0	48	161				
Benzo(a)pyrene	1,280	66.1	1,322	0	96.4	34.4	179				
Indeno(1,2,3-cd)pyrene	1,280	66.1	1,322	0	96.6	41.1	165				
Dibenz(a,h)anthracene	1,290	66.1	1,322	0	97.6	38.1	166				
Benzo(g,h,i)perylene	1,240	66.1	1,322	0	93.7	45.6	157				
Surr: 2-Fluorobiphenyl	461		661.2		69.7	42.7	132				
Surr: Terphenyl-d14 (surr)	620		661.2		93.7	48.8	157				

Qualifiers:	B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
	R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Client Name: **PBS**
 Logged by: **Erica Silva**

Work Order Number: **1412144**
 Date Received: **12/11/2014 2:02:00 PM**

Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐
 2. How was the sample delivered? Client

Log In

3. Coolers are present? Yes ☒ No ☐ NA ☐
 4. Shipping container/cooler in good condition? Yes ☒ No ☐
 5. Custody seals intact on shipping container/cooler? Yes ☐ No ☐ Not Required ☒
 6. Was an attempt made to cool the samples? Yes ☒ No ☐ NA ☐
 7. Were all coolers received at a temperature of >0°C to 10.0°C? Yes ☒ No ☐ NA ☐
 8. Sample(s) in proper container(s)? Yes ☒ No ☐
 9. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐
 10. Are samples properly preserved? Yes ☒ No ☐
 11. Was preservative added to bottles? Yes ☐ No ☒ NA ☐
 12. Is the headspace in the VOA vials? Yes ☐ No ☐ NA ☒
 13. Did all samples containers arrive in good condition(unbroken)? Yes ☒ No ☐
 14. Does paperwork match bottle labels? Yes ☒ No ☐
 15. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐
 16. Is it clear what analyses were requested? Yes ☒ No ☐
 17. Were all holding times able to be met? Yes ☒ No ☐

Special Handling (if applicable)

18. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified: Date:
 By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
 Regarding:
 Client Instructions:

19. Additional remarks:

Item Information

Item #	Temp °C	Condition
Cooler	5.5	Good
Sample	4.9	Good



Fremont

Analytical

Chain of Custody Record

3600 Fremont Ave N.
Seattle, WA 98103

Tel: 206-352-3790
Fax: 206-352-7178

Date: 12/11/14

Laboratory Project No (Internal):

141244

Client:

PBS

Project Name:

Metro Ryerson Base - Baugh

Address:

City, State, Zip

Seattle, WA

Tel:

206-233-9639

Location:

Page:

of:

Reports To (PM):

Tom Mergay

Fax:

tom.mergay@pbsonion.com

Project No: 41241.003

*Matrix Codes: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, WW = Waste Water

Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	VOC (EPA 8260)	GX/BTEX	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	SEMI-VOL (EPA 8270)	PAH (EPA 8270)	PCB (EPA 8082)	Metals** (6020 / 200.8)	Total (T) Dissolved (D)	Anions (IC)***	EDS (B011)	Comments/Depth
1 B6 LS	12/11	9:00	Soil				X	X	X	X	X	X	X	X	X	
2 B6 CN	12/11	9:15	Soil				X	X	X	X	X	X	X	X	X	
3 B6 NE	12/11	9:15	Soil				X	X	X	X	X	X	X	X	X	
4																
5																
6																
7																
8																
9																
10																

***Metals Analysis (Circle): MTT-A-5 RICA-8 Priority Pollutants TAL Individual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sn Se Sr Ti Tl U V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide Iodide Fluoride Nitrate+Nitrite

Sample Disposal: ☐ Return to Client ☒ Disposal by Lab (a fee may be assessed if samples are retained after 30 days)

Relinquished: 12/11/14 2:02 Received: 12/11/14 1402

Relinquished: 12/11/14 2:02 Received: 12/11/14 1402

TAT -> Same Day (Next Day) 2 Day 3 Day STD

Please coordinate with the lab in advance