

TABLES

FIGURES

APPENDIX A

***LABORATORY ANALYTICAL REPORTS and
DATA VALIDATION REPORT***

MEMORANDUM

To: File – 10077.006

From: Nancy East-Smith

Date: August 11, 2003

Subject: **QUALITY ASSURANCE/QUALITY CONTROL REVIEW
JUNE 19, 2003 SEDIMENT SAMPLES
ASTORIA AREA WIDE SITE**

This report presents the results of our review of the laboratory analytical report and the data validation conducted based on the laboratory report for two sediment samples collected at the Astoria Area Wide site. The sediment samples were collected on June 19, 2003 from south shoreline of Slip 2 (located just north of the Port of Astoria office building). Sample handling, analysis and quality control (QC) procedures were established in the RI/FS and IRAM Development Work Plan, Phase 1, dated July 15, 2002, (RI/FS Work Plan) (*EnviroLogic Resources, Inc.*, 2002). The samples were submitted to North Creek Analytical, Inc., (NCA) of Portland, Oregon, for analysis. The samples were received at the lab on June 20, 2003, and assigned lab order number P3F0722 by NCA.

As stated in Appendix B, Sections 8.0, 9.0, and 10.0 of the RI/FS Work Plan, our goal was to review the laboratory report and chain of custody for Quality Assurance/Quality Control (QA/QC) parameters and statistical parameters. The findings of our review are presented in the following pages. Analyses performed are listed below.

Analysis	Reference
Hydrocarbon Identification	NWTPH Methodology
Gasoline Hydrocarbons	NWTPH-Gx
Diesel and Heavy Range Hydrocarbons	NWTPH-Dx
Volatile Organic Compounds (VOCs)	EPA Method 8260B
Polynuclear Aromatic Compounds (PAHs)	EPA Method 8270M-SIM

EPA = U.S. Environmental Protection Agency
NWTPH = Northwest Total Petroleum Hydrocarbons
SIM = Selected Ion Monitoring

CHAIN OF CUSTODY REVIEW

The chain of custody (COC) was reviewed to determine sample condition upon of arrival at the lab, that analysis requested was in accordance with the RI/FS Work Plan, and that analyses requested were performed.

- No special conditions were noted on COCs to indicate sample containers were broken or otherwise in any adverse condition upon arrival at the laboratory.
- Cooler temperatures were recorded as 7.3°C, 4.7°C, 5.8°C and 7.9°C. P3F0722 was submitted with P3F0694 (Astoria Area Wide 6/19/03 water samples) and it is unclear which cooler the two sediment samples were in.
- Analyses requested on the COC were performed.

QUALITY CONTROL/QUALITY ASSURANCE REVIEW

DATA QUALIFIERS

No data was qualified as a result of this data validation process.

HOLDING TIMES

We reviewed the laboratory reports and compared sample dates, prepared dates and analyzed dates for all the analyses. The laboratory provided us with holding times for each analytical method for soil and water samples. Based on this review no holding time exceptions were noted.

FIELD BLANKS

Equipment Blank

No equipment blank was obtained.

Trip Blank

No trip blank was utilized.

Laboratory Method Blanks

Laboratory method blanks were analyzed at the required frequency for all analysis. Laboratory blanks were performed on sample batches so each blank is associated with a batch of field samples. The batch sample associated with each field sample is identified in the laboratory report. No analytes detected in the laboratory blanks.

SURROGATE RECOVERIES

Field Samples

One or more surrogates were utilized for each analysis. We reviewed all of the surrogate recoveries relative to the specified control limits and observed two exceptions (one analysis) for one sample. Where surrogate recoveries were not within control limits batch specific QC information and laboratory notes were reviewed to evaluate the data. Lack of surrogate recovery due to dilution is not specifically addressed.

Analysis/ QC Batch Number	Field Samples Impacted	Surrogate And % Recovery	Control Limits	Comment
PAHs 3060907	SD-700(P)	Fluorene-d10 Pyrene-d10	40-150 40-150	Case narrative provided by the laboratory states surrogate recovery cannot be accurately quantified due to interference from coeluting compounds.

All other QA/QC was acceptable so no data was qualified.

SPIKE AND SURROGATE RECOVERIES

Laboratory Control Samples

Laboratory Control Samples (LCS) were conducted at the required frequency. Based on our review all LCS quality control information was acceptable. No data was qualified

Matrix Spike Samples

Matrix Spike (MS) were conducted at the required frequency. Based on our review generally all spike compounds and/or surrogates met quality control criteria. Some QC data was impacted or not available due to sample dilution.

Duplicate Samples

Duplicate samples were conducted at the required frequency. Based on our review generally all spike compounds and/or surrogates met quality control limits. Some QC data was impacted or not available due to sample dilution.

LABORATORY AND FIELD DUPLICATES/RELATIVE PERCENT DIFFERENCE

Duplicate samples were analyzed at the required frequency for all analyses. No field duplicate sample was obtained. Matrix Spike Duplicates (MSDs), Laboratory Control Sample Duplicates (LCSDs), and laboratory duplicates analytical information was reviewed. Based on our review all duplicate sample relative percent differences (RPDs) were within acceptable limits. Surrogate recovery exceptions for duplicate samples were included in the previous section.

STATISTICAL EVALUATION

Precision

Precision is a measure of the ability to reproduce data and is evaluated using duplicate samples. This includes field duplicates, laboratory duplicates, MSDs and LCSDs. Relative percent difference (RPD) is used to measure the reproducibility as described in section 10.1 of Appendix B of the RI/FS Work Plan. The RPD control limits are listed in the laboratory reports. These control limits may be slightly different than those presented in the Work Plan, but they are still acceptable. Overall precision for the analysis was acceptable

RPD's outside the control limits would represent statistical exceptions and indicate a lack of ability to reproduce the data. LCSD evaluate the affect laboratory conditions have on precision no RPD exceptions were noted in LCSDs. Field duplicates, MSDs and lab duplicates evaluate the effect field and laboratory conditions have on precision. No RPD exceptions were noted. The precision of the laboratory data is acceptable and no data is qualified due to lack of precision.

Accuracy

Accuracy measures the bias in a system and is evaluated using percent recovery of surrogate, spikes and LCS. LCS evaluates bias due to laboratory conditions. Bias due to field and laboratory conditions is evaluated using surrogates and matrix spikes. Our review indicates that surrogate recovery could not be calculated for two PHA surrogates (SD-700(P)). The third surrogate recovery was acceptable. The laboratory noted coeluting organic compounds as the primary reason for not being able to recover the surrogate. The problem appears to be limited to this sample and the third surrogate was recovered within acceptable limits and other QC criteria were acceptable so the data was not qualified.

Representativeness

Equipment blanks, laboratory blanks and field duplicate samples evaluate how representative analytical results are of actual site conditions. Blanks evaluate the introduction of "analytes" from outside sources such as field equipment, transportation equipment and the laboratory environment. There were no problems with laboratory equipment introducing analytes that were not representative of sample conditions.

Duplicate field samples were not obtained so no evaluation of how representative a sample is of site conditions is available.

Completeness

Completeness evaluates how successful the data set is at being valid. No analysis were rejected or qualified. Our data group was 100 percent complete with respect to rejected analysis.

CONCLUSION

The data from this laboratory report are of acceptable quality.

REFERENCES

- USEPA (U.S. Environmental Protection Agency). 2002. USEPA Contract Laboratory Program, National Functional Guidelines For Inorganics Data Review. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency. EPA 540/R-01/008.
- USEPA (United States Environmental Protection Agency). 1999. USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency. EPA 540/R-99/008.
- EnviroLogic Resources, Inc.* RI/FS and IRAM Development Work Plan, Phase I, Remedial Investigation/Feasibility Study, Astoria Area-Wide Petroleum Site, Astoria, Oregon, July 15, 2002.



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541.383.9310 fax 541.382.7588

7 July, 2003

Tom Calabrese
EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

RE: Astoria Area-Wide Petroleum Site

Enclosed are the results of analyses for samples received by the laboratory on 06/20/03 11:51. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Cone
Industrial Services Manager

Work Orders included in this report:

P3F0722



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EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SD-700 (P)	P3F0722-01	Soil	06/19/03 12:00	06/20/03 11:51
SD-701 (P)	P3F0722-02	Soil	06/19/03 12:00	06/20/03 11:51

North Creek Analytical - Portland

Brian Cone, Industrial Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Hydrocarbon Identification per NW-TPH Methodology North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SD-700 (P) (P3F0722-01) Soil						Sampled: 06/19/03 Received: 06/20/03			
Gasoline Range Hydrocarbons	ND	47.8	mg/kg dry	1	NWTPH HCID	06/25/03	06/25/03	3060956	
Diesel Range Hydrocarbons	DET	120	"	"	"	"	"	"	
Heavy Oil Range Hydrocarbons	DET	239	"	"	"	"	"	"	D-15
<i>Surr: 1-Chlorooctadecane</i>	87.0 %	50-150							
SD-701 (P) (P3F0722-02) Soil						Sampled: 06/19/03 Received: 06/20/03			
Gasoline Range Hydrocarbons	DET	20.0	mg/kg dry	1	NWTPH HCID	06/25/03	06/25/03	3060956	D-15
Diesel Range Hydrocarbons	DET	50.0	"	"	"	"	"	"	D-15
Heavy Oil Range Hydrocarbons	ND	100	"	"	"	"	"	"	
<i>Surr: 1-Chlorooctadecane</i>	89.0 %	50-150							

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Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Gasoline Hydrocarbons per NW TPH-Gx Method
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SD-700 (P) (P3F0722-01) Soil					Sampled: 06/19/03 Received: 06/20/03				
Gasoline Range Hydrocarbons	ND	4.78	mg/kg dry	1	NW TPH-Gx	06/23/03	06/25/03	3060886	
Surr: a,a,a-TFT	77.3 %	50-150							
SD-701 (P) (P3F0722-02) Soil					Sampled: 06/19/03 Received: 06/20/03				
Gasoline Range Hydrocarbons	ND	2.00	mg/kg dry	1	NW TPH-Gx	06/23/03	06/25/03	3060886	
Surr: a,a,a-TFT	95.3 %	50-150							

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Reported:
07/07/03 17:44

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SD-700 (P) (P3F0722-01) Soil					Sampled: 06/19/03 Received: 06/20/03				
Diesel Range Organics	8090	598	mg/kg dry	10	NWTPH-Dx	06/25/03	06/25/03	3060959	
Heavy Oil Range Hydrocarbons	800	789	"	"	"	"	"	"	
<i>Surr: 1-Chlorooctadecane</i>	<i>125 %</i>	<i>50-150</i>							
SD-701 (P) (P3F0722-02) Soil					Sampled: 06/19/03 Received: 06/20/03				
Diesel Range Organics	150	25.0	mg/kg dry	1	NWTPH-Dx	06/25/03	06/26/03	3060959	
Heavy Oil Range Hydrocarbons	143	50.0	"	"	"	"	"	"	D-15
<i>Surr: 1-Chlorooctadecane</i>	<i>104 %</i>	<i>50-150</i>							

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Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Selected Volatile Organic Compounds per EPA Method 8260B

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SD-700 (P) (P3F0722-01) Soil

Sampled: 06/19/03 Received: 06/20/03

1,2-Dibromoethane	ND	120	ug/kg dry	1	EPA 8260B	06/24/03	06/30/03	3060943	
1,2-Dichloroethane	ND	120	"	"	"	"	"	"	
Benzene	ND	120	"	"	"	"	"	"	
Toluene	ND	120	"	"	"	"	"	"	
Ethylbenzene	ND	120	"	"	"	"	"	"	
Xylenes (total)	ND	239	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	478	"	"	"	"	"	"	
Naphthalene	ND	478	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	239	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	120	"	"	"	"	"	"	
Isopropylbenzene	ND	478	"	"	"	"	"	"	
n-Propylbenzene	ND	120	"	"	"	"	"	"	

Surr: 4-BFB	60.7 %	42.6-130
Surr: 1,2-DCA-d4	71.1 %	57.3-144
Surr: Dibromofluoromethane	61.9 %	45.5-130
Surr: Toluene-d8	61.3 %	42.1-144

SD-701 (P) (P3F0722-02) Soil

Sampled: 06/19/03 Received: 06/20/03

1,2-Dibromoethane	ND	50.0	ug/kg dry	1	EPA 8260B	06/24/03	06/30/03	3060943	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
Benzene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Xylenes (total)	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	200	"	"	"	"	"	"	
Naphthalene	ND	200	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	100	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Isopropylbenzene	ND	200	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	

Surr: 4-BFB	78.9 %	42.6-130
Surr: 1,2-DCA-d4	89.4 %	57.3-144
Surr: Dibromofluoromethane	81.5 %	45.5-130
Surr: Toluene-d8	86.5 %	42.1-144

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Brian Cone, Industrial Services Manager

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Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Polynuclear Aromatic Compounds per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SD-700 (P) (P3F0722-01) Soil					Sampled: 06/19/03 Received: 06/20/03			R-05	
Acenaphthene	684	641	ug/kg dry	20	EPA 8270m	06/24/03	06/30/03	3060907	
Acenaphthylene	ND	641	"	"	"	"	"	"	
Anthracene	1910	641	"	"	"	"	"	"	
Benzo (a) anthracene	759	641	"	"	"	"	"	"	
Benzo (a) pyrene	ND	641	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	641	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	641	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	641	"	"	"	"	"	"	
Chrysene	1310	641	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	641	"	"	"	"	"	"	
Fluoranthene	3340	641	"	"	"	"	"	"	
Fluorene	ND	962	"	"	"	"	"	"	R-03
Indeno (1,2,3-cd) pyrene	ND	641	"	"	"	"	"	"	
Naphthalene	ND	641	"	"	"	"	"	"	
Phenanthrene	ND	641	"	"	"	"	"	"	
Pyrene	2960	641	"	"	"	"	"	"	
Surr: Fluorene-d10	NR	40-150							S-02
Surr: Pyrene-d10	NR	40-150							S-02
Surr: Benzo (a) pyrene-d12	70.9 %	40-150							J

SD-701 (P) (P3F0722-02) Soil					Sampled: 06/19/03 Received: 06/20/03			R-05	
Acenaphthene	ND	26.8	ug/kg dry	2	EPA 8270m	06/24/03	07/01/03	3060907	
Acenaphthylene	ND	26.8	"	"	"	"	"	"	
Anthracene	ND	26.8	"	"	"	"	"	"	
Benzo (a) anthracene	70.5	26.8	"	"	"	"	"	"	
Benzo (a) pyrene	52.6	26.8	"	"	"	"	"	"	
Benzo (b) fluoranthene	83.2	26.8	"	"	"	"	"	"	
Benzo (ghi) perylene	33.6	26.8	"	"	"	"	"	"	
Benzo (k) fluoranthene	48.0	26.8	"	"	"	"	"	"	
Chrysene	122	26.8	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	26.8	"	"	"	"	"	"	
Fluoranthene	170	26.8	"	"	"	"	"	"	
Fluorene	ND	26.8	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	30.1	26.8	"	"	"	"	"	"	
Naphthalene	ND	26.8	"	"	"	"	"	"	
Phenanthrene	59.2	26.8	"	"	"	"	"	"	
Pyrene	169	26.8	"	"	"	"	"	"	

North Creek Analytical - Portland

Brian Cone, Industrial Services Manager

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Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Polynuclear Aromatic Compounds per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SD-701 (P) (P3F0722-02) Soil

Sampled: 06/19/03 Received: 06/20/03

R-05

Surr: Fluorene-d10	101 %	40-150
Surr: Pyrene-d10	96.5 %	40-150
Surr: Benzo (a) pyrene-d12	75.4 %	40-150

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Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Percent Dry Weight (Solids) per Standard Methods
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SD-700 (P) (P3F0722-01) Soil					Sampled: 06/19/03 Received: 06/20/03				
% Solids	41.8	1.00 % by Weight		1	NCA SOP	06/24/03	06/25/03	3060927	
SD-701 (P) (P3F0722-02) Soil					Sampled: 06/19/03 Received: 06/20/03				
% Solids	58.7	1.00 % by Weight		1	NCA SOP	06/24/03	06/25/03	3060927	

North Creek Analytical - Portland

Brian Cone, Industrial Services Manager

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EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Hydrocarbon Identification per NW-TPH Methodology - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
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Batch 3060956 - TPH-HCID Extraction

Blank (3060956-BLK1)

Prepared & Analyzed: 06/25/03

Gasoline Range Hydrocarbons	ND	20.0	mg/kg
Diesel Range Hydrocarbons	ND	50.0	"
Heavy Oil Range Hydrocarbons	ND	100	"

Surr: 1-Chlorooctadecane DET " 9.60 77.6 50-150

Duplicate (3060956-DUP1)

Source: P3F0722-01

Prepared & Analyzed: 06/25/03

Gasoline Range Hydrocarbons	ND	47.8	mg/kg dry	ND	50
Diesel Range Hydrocarbons	DET	120	"	3960	25.6 50
Heavy Oil Range Hydrocarbons	DET	239	"	393	15.7 50

Surr: 1-Chlorooctadecane DET " 23.0 100 50-150

Duplicate (3060956-DUP2)

Source: P3F0722-02

Prepared & Analyzed: 06/25/03

Gasoline Range Hydrocarbons	DET	20.0	mg/kg dry	30.4	5.41 50
Diesel Range Hydrocarbons	DET	50.0	"	115	24.9 50
Heavy Oil Range Hydrocarbons	ND	100	"	ND	50

Surr: 1-Chlorooctadecane DET " 16.4 97.6 50-150

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P.O. Box 80762
Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Gasoline Hydrocarbons per NW TPH-Gx Method - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
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Batch 3060886 - EPA 5035

Blank (3060886-BLK1)

Prepared: 06/23/03 Analyzed: 06/24/03

Gasoline Range Hydrocarbons ND 2.00 mg/kg

Surr: a,a,a-TFT 1.70 " 1.25 136 50-150

LCS (3060886-BS1)

Prepared: 06/23/03 Analyzed: 06/24/03

Gasoline Range Hydrocarbons 30.5 2.00 mg/kg 25.0 122 70-130

Surr: a,a,a-TFT 1.59 " 1.25 127 50-150

Duplicate (3060886-DUP1)

Source: P3F0632-02

Prepared: 06/23/03 Analyzed: 06/24/03

Gasoline Range Hydrocarbons ND 2.00 mg/kg dry ND 40

Surr: a,a,a-TFT 1.72 " 1.37 126 50-150

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Brian Cone, Industrial Services Manager

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EnviroLogic Resources, Inc.	Project: Astoria Area-Wide Petroleum Site	
P.O. Box 80762	Project Number: 10077.006	Reported:
Portland, OR 97280-0762	Project Manager: Tom Calabrese	07/07/03 17:44

Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 3060959 - EPA 3550 Fuels

Blank (3060959-BLK1)

Prepared & Analyzed: 06/25/03

Diesel Range Organics	ND	25.0	mg/kg							
Heavy Oil Range Hydrocarbons	ND	50.0	"							
<i>Surr: 1-Chlorooctadecane</i>	3.75		"	4.80		78.1	50-150			

LCS (3060959-BS1)

Prepared & Analyzed: 06/25/03

Diesel Range Organics	126	25.0	mg/kg	125		101	50-150			
Heavy Oil Range Hydrocarbons	72.0	50.0	"	75.0		96.0	50-150			
<i>Surr: 1-Chlorooctadecane</i>	4.33		"	4.80		90.2	50-150			

Duplicate (3060959-DUP1)

Source: P3F0540-01

Prepared & Analyzed: 06/25/03

Diesel Range Organics	ND	500	mg/kg dry	ND				50		R-05
Heavy Oil Range Hydrocarbons	5520	1000	"	5970				7.83	50	
<i>Surr: 1-Chlorooctadecane</i>	0.00		"	9.55		NR	50-150			S-01

Duplicate (3060959-DUP2)

Source: P3F0540-02

Prepared & Analyzed: 06/25/03

Diesel Range Organics	6540	1300	mg/kg dry	7150				8.91	50	
Heavy Oil Range Hydrocarbons	19200	2590	"	20300				5.57	50	
<i>Surr: 1-Chlorooctadecane</i>	0.00		"	12.4		NR	50-150			S-01

North Creek Analytical - Portland

Brian L Cone

Brian Cone, Industrial Services Manager

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EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Selected Volatile Organic Compounds per EPA Method 8260B - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
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Batch 3060943 - EPA 5035

Blank (3060943-BLK1)

Prepared: 06/24/03 Analyzed: 06/30/03

1,2-Dibromoethane	ND	50.0	ug/kg						
1,2-Dichloroethane	ND	50.0	"						
Benzene	ND	50.0	"						
Toluene	ND	50.0	"						
Ethylbenzene	ND	50.0	"						
Xylenes (total)	ND	100	"						
Methyl tert-butyl ether	ND	200	"						
Naphthalene	ND	200	"						
1,2,4-Trimethylbenzene	ND	100	"						
1,3,5-Trimethylbenzene	ND	50.0	"						
Isopropylbenzene	ND	200	"						
n-Propylbenzene	ND	50.0	"						
Surr: 4-BFB	2060		"	2000		103	65.4-143		
Surr: 1,2-DCA-d4	2380		"	2000		119	77.7-144		
Surr: Dibromofluoromethane	2050		"	2000		102	66.5-131		
Surr: Toluene-d8	2230		"	2000		112	77.5-143		

LCS (3060943-BS1)

Prepared: 06/24/03 Analyzed: 06/30/03

Benzene	1930	50.0	ug/kg	2000		96.5	81.9-125		
Toluene	1920	50.0	"	2000		96.0	80-125		
Surr: 4-BFB	1930		"	2000		96.5	65.4-143		
Surr: 1,2-DCA-d4	2250		"	2000		112	77.7-144		
Surr: Dibromofluoromethane	2020		"	2000		101	66.5-131		
Surr: Toluene-d8	2060		"	2000		103	77.5-143		

Matrix Spike (3060943-MS1)

Source: P3F0788-01

Prepared: 06/24/03 Analyzed: 06/30/03

Benzene	1940	50.0	ug/kg dry	3710	ND	52.3	68.5-125		Q-02
Toluene	1890	50.0	"	3710	57.5	49.4	70.3-125		Q-02
Surr: 4-BFB	1550		"	3710		41.8	65.4-143		S-01
Surr: 1,2-DCA-d4	2400		"	3710		64.7	77.7-144		S-01
Surr: Dibromofluoromethane	2210		"	3710		59.6	66.5-131		S-01
Surr: Toluene-d8	1830		"	3710		49.3	77.5-143		S-01

North Creek Analytical - Portland

Brian Cone, Industrial Services Manager

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EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Selected Volatile Organic Compounds per EPA Method 8260B - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
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Batch 3060943 - EPA 5035

Matrix Spike Dup (3060943-MSD1)

Source: P3F0788-01

Prepared: 06/24/03 Analyzed: 06/30/03

Benzene	1960	50.0	ug/kg dry	3710	ND	52.8	68.5-125	1.03	25	Q-02
Toluene	1990	50.0	"	3710	57.5	52.1	70.3-125	5.15	25	Q-02
Surr: 4-BFB	1720		"	3710		46.4	65.4-143			S-01
Surr: 1,2-DCA-d4	2470		"	3710		66.6	77.7-144			S-01
Surr: Dibromofluoromethane	2250		"	3710		60.6	66.5-131			S-01
Surr: Toluene-d8	2020		"	3710		54.4	77.5-143			S-01

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Brian Cone, Industrial Services Manager

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EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Polynuclear Aromatic Compounds per EPA 8270M-SIM - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
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Batch 3060907 - EPA 3550

Blank (3060907-BLK1)

Prepared: 06/24/03 Analyzed: 06/30/03

Acenaphthene	ND	13.4	ug/kg
Acenaphthylene	ND	13.4	"
Anthracene	ND	13.4	"
Benzo (a) anthracene	ND	13.4	"
Benzo (a) pyrene	ND	13.4	"
Benzo (b) fluoranthene	ND	13.4	"
Benzo (ghi) perylene	ND	13.4	"
Benzo (k) fluoranthene	ND	13.4	"
Chrysene	ND	13.4	"
Dibenzo (a,h) anthracene	ND	13.4	"
Fluoranthene	ND	13.4	"
Fluorene	ND	13.4	"
Indeno (1,2,3-cd) pyrene	ND	13.4	"
Naphthalene	ND	13.4	"
Phenanthrene	ND	13.4	"
Pyrene	ND	13.4	"

Surr: Fluorene-d10	90.6	"	83.3	109	40-150
Surr: Pyrene-d10	77.3	"	83.3	92.8	40-150
Surr: Benzo (a) pyrene-d12	67.2	"	83.3	80.7	40-150

LCS (3060907-BS1)

Prepared: 06/24/03 Analyzed: 07/02/03

Acenaphthene	164	13.4	ug/kg	167	98.2	33-139
Benzo (a) pyrene	122	13.4	"	167	73.1	45-149
Pyrene	140	13.4	"	167	83.8	39-138

Surr: Fluorene-d10	87.2	"	83.3	105	40-150
Surr: Pyrene-d10	72.8	"	83.3	87.4	40-150
Surr: Benzo (a) pyrene-d12	65.0	"	83.3	78.0	40-150

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Brian Cone, Industrial Services Manager

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Portland, OR 97280-0762

Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Polynuclear Aromatic Compounds per EPA 8270M-SIM - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	----------------	-----	--------------	-------

Batch 3060907 - EPA 3550

Matrix Spike (3060907-MS1)	Source: P3F0688-01			Prepared: 06/24/03		Analyzed: 06/30/03		R-05	
Acenaphthene	186	26.8	ug/kg dry	196	10.2	89.7	33-139		
Benzo (a) pyrene	178	26.8	"	196	47.0	66.8	45-149		
Pyrene	272	26.8	"	196	147	63.8	39-138		
Surr: Fluorene-d10	98.6		"	98.1		101	40-150		
Surr: Pyrene-d10	88.0		"	98.1		89.7	40-150		
Surr: Benzo (a) pyrene-d12	74.5		"	98.1		75.9	40-150		

Matrix Spike Dup (3060907-MSD1)	Source: P3F0688-01			Prepared: 06/24/03		Analyzed: 06/30/03		R-05	
Acenaphthene	203	26.8	ug/kg dry	196	10.2	98.4	33-139	8.74	60
Benzo (a) pyrene	181	26.8	"	196	47.0	68.4	45-149	1.67	60
Pyrene	284	26.8	"	196	147	69.9	39-138	4.32	60
Surr: Fluorene-d10	105		"	98.1		107	40-150		
Surr: Pyrene-d10	93.3		"	98.1		95.1	40-150		
Surr: Benzo (a) pyrene-d12	77.4		"	98.1		78.9	40-150		

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Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Percent Dry Weight (Solids) per Standard Methods - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	----------------	-----	--------------	-------

Batch 3060927 - Dry Weight

Duplicate (3060927-DUP1)		Source: P3F0671-01		Prepared: 06/24/03 Analyzed: 06/25/03					
% Solids	69.9	1.00%	by Weight		70.2		0.428	20	
Duplicate (3060927-DUP2)		Source: P3E0531-08		Prepared: 06/24/03 Analyzed: 06/25/03					
% Solids	72.2	1.00%	by Weight		72.5		0.415	20	
Duplicate (3060927-DUP3)		Source: P3F0678-21		Prepared: 06/24/03 Analyzed: 06/25/03					
% Solids	89.2	1.00%	by Weight		89.2		0.00	20	

North Creek Analytical - Portland

Brian Cone, Industrial Services Manager

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Project: Astoria Area-Wide Petroleum Site
Project Number: 10077.006
Project Manager: Tom Calabrese

Reported:
07/07/03 17:44

Notes and Definitions

- D-15 Detected hydrocarbons have non-petroleum peaks or elution pattern that suggests the presence of biogenic interference.
- J Estimated value.
- Q-02 The spike recovery for this QC sample is outside of established control limits due to sample matrix interference.
- R-03 The reporting limit for this analyte was raised due to matrix interference.
- R-05 Reporting limits raised due to dilution necessary for analysis. Sample contains high levels of reported analyte, non-target analyte, and/or matrix interference.
- S-01 The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
- S-02 The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis. MRLs are adjusted if %Solids are less than 50%.
- wet Sample results reported on a wet weight basis (as received)
- RPD Relative Percent Difference

North Creek Analytical - Portland

Brian Cone, Industrial Services Manager

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July 25, 2003

Mr. Tom Calabrese
EnviroLogic Resources, Inc.
P.O. Box 80762
Portland, OR 97280-0762

Duxbury Operations
397 Washington Street
Duxbury, Massachusetts 02332
Telephone 781-934-0571
Fax: 781-934-2124

Dear Mr. Calabrese:

Battelle is pleased to deliver the results of the detailed analysis of PAH and alkylated PAH in sediment samples from the Astoria Area-Wide Petroleum site. This letter report describes the methods of sample preparation, instrumental analysis, and quality control data results. The analytical results of the sediment samples are tabulated in Attachment 3. Attachment 1 – Chain-of-Custody, lists the specific samples analyzed for this project.

SAMPLES

Two sediment samples from the Astoria Area-Wide Petro Site RI-1 were delivered to Battelle under chain-of-custody for chemical analysis after being collected by EnviroLogic Resources, Inc. personnel on June 19, 2003. The laboratory stored the samples at Battelle at 4°C until analysis. Table 1 lists inventories of the samples and their analyses performed at Battelle.

Table 1. Inventory of Sediment Samples Analyzed for this Project

Client/Field ID	Battelle ID	Matrix	Collection Date	Analysis
SD-700 (P)	T5155	Sediment	6/19/03	PAH and alkyl-PAH (8270M)
SD-701 (P)	T5156	Sediment	6/19/03	PAH and alkyl-PAH (8270M)

PREPARATION AND ANALYSIS

Sediment samples were handled as one unique batch of samples. The Battelle laboratory batch identifier is 03-0597. The sediment samples were extracted and analyzed for PAH by GC/MS. The batch was accompanied by the following quality control samples:

Procedural blank. Dichloromethane and sodium sulfate, fortified with surrogate internal standards and carried through the analytical procedure outlined below.

Laboratory Control Sample. Dichloromethane and sodium sulfate, fortified with surrogate internal standards and selected PAH compounds and carried through the analytical procedure outlined below.

Matrix Spike/Matrix Spike Duplicate (MS/MSD). A selected sediment sample was fortified with surrogate internal standards and selected PAH compounds and carried through the analytical procedure outlined below.

Sample Duplicate. A selected sample was fortified with surrogate internal standards and carried through the analytical procedure outlined below.

Authentic Samples. Sediment samples were fortified with surrogate internal standards and carried through the analytical procedure outlined below.

Sediment Extraction

Sediment samples were extracted following Battelle SOP 5-203, *Extraction of Soil/Sediment for Petroleum Analysis*. Prior to removing an aliquot for extraction, the sediment samples were thoroughly homogenized. Approximately 6-g of sample was removed for percent moisture determination. Approximately 30 g of well-mixed sediment was spiked with surrogates, dried over anhydrous sodium sulfate, and extracted three times with dichloromethane using shaker table techniques. The combined extract was concentrated and processed through an alumina column and cleaned with activated copper. The purified extract was concentrated to 900µL and spiked with the appropriate recovery internal standards. The extract was then analyzed by GC/MS for PAHs as described below. All data were reported on a dry weight basis.

Instrumental Analysis

Polycyclic Aromatic Hydrocarbons (PAH). Sample extracts were analyzed for selected parent and alkyl homologues of PAH (Table 2) by gas chromatography/mass spectrometry (GC/MS) following Battelle SOP 5-157, *Identification and Quantification of Polynuclear Aromatic Hydrocarbons by Gas Chromatography/Mass Spectrometry*. The GC/MS was operated in the selected ion monitoring (SIM) mode. The system was tuned prior to use with perfluorotributylamine (PFTBA). A minimum of a five level calibration was analyzed before any sample extracts. Analyte concentrations in the standard solutions ranged from a low of approximately 0.010 ng/µL to a high of approximately 10 ng/µL. The lowest calibration level was just above the detection limit, and the range of the calibration encompassed the expected concentration range of the samples. Calibration checks were analyzed every 12 hours.

Table 2. PAH Analyte List

Naphthalene	Dibenzothiophene	Benzo(a)fluoranthene
C1-naphthalenes	C1-dibenzothiophenes	Benzo(e)pyrene
C2-naphthalenes	C2-dibenzothiophenes	Benzo(a)pyrene
C3-naphthalenes	C3-dibenzothiophenes	Perylene
C4-naphthalenes	C4-dibenzothiophenes	Indeno(1,2,3-c,d)pyrene
Biphenyl	Fluoranthene	Dibenz(a,h)anthracene
Acenaphthylene	Benzo[b]fluorene	Benzo(g,h,i)perylene
Acenaphthene	Pyrene	
Dibenzofuran	C1-fluoranthenes/pyrenes	
Fluorene	C2-fluoranthenes/pyrenes	
C1-fluorenes	C3-fluoranthenes/pyrenes	
C2-fluorenes	Benz(a)anthracene	
C3-fluorenes	Chrysene	
Anthracene	C1-chrysenes	
Phenanthrene	C2-chrysenes	
C1-phenanthrenes/anthracenes	C3-chrysenes	
C2-phenanthrenes/anthracenes	C4-chrysenes	
C3-phenanthrenes/anthracenes	Benzo(b)fluoranthene	
C4-phenanthrenes/anthracenes	Benzo(j/k)fluoranthene	

RESULTS

The results of PAH and alkylated PAH analysis for the sediment samples are tabulated in Attachment 2. The attachment includes the following items for the batch:

- A table of the data quality objectives (DQO)
- A table of data qualifiers
- A preliminary quality control (QC) checklist
- Procedural blank (PB) analysis
- Laboratory control sample (LCS) analysis
- Matrix spike (MS) and matrix spike duplicate (MSD) analysis
- Field sample duplicate (DUP) analysis
- Field sample analysis

Batch 03-0597 — Comments on Data Quality

- Data quality objectives (DQO) for the analysis of the batch of sediment samples were met with the following exceptions:
 1. MS/MSD: The recoveries of spiked compounds in the MS were within the 40-120% objective except for Fluoranthene (24%) and Pyrene (26%). This can be attributed to the high concentration of these analytes in the sample relative to the concentration of the analytes spiked into the sample, and the contribution from the sediment matrix affected the recovery of the spiked analytes. The recoveries of spiked compounds in the MSD were within the 40-120% objective except for Fluoranthene (122%), Benzo(a)anthracene (148%), Chrysene (124%), Benzo(b)fluoranthene (150%), Benzo(j/k)fluoranthene (129%), Benzo(e)pyrene (121%), Benzo(a)pyrene (127%), and Indeno(1,2,3-c,d)pyrene (124%). This can be attributed to the high concentration of these analytes in the sample relative to the concentration of the analytes spiked into the sample, and the contribution from the sediment matrix affected the recovery of the spiked analytes. The DQO exceedances here are not due to extraction inefficiency, as the LCS recoveries are within criteria (40-120%). MS/MSD precision (RPD) is >30% for nine analytes because of heterogeneity in the sample.
 2. DUP: The precision (RPD) for all analytes was <30% except for Naphthalene (62.5%), Chrysene (34.8%), Benzo(a)fluoranthene (42.2%), Benzo(e)Pyrene (30.8%), and Benzo(a)pyrene (39.8%). This is due to heterogeneity within the sediment matrix.
- These exceedances should not be considered to adversely affect the overall data quality because they occur as a result of sample matrix, not of quality of the analysis, which is evidenced by the quality seen in the controlled matrix QC sample (LCS.)

If you have any questions, please do not hesitate to call me at 781-952-5248.

Sincerely,

Andy Smith

A handwritten signature in black ink, appearing to read "Andy Smith", written in a cursive style.

Research Scientist

Attachments

Attachment 1: Chain of Custody

Attachment 2: PAH Data Tables

Attachment 1

Chain of Custody Records



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ShpNo SHP-030626-01

Battelle Project No: EnvLog Sed

Sample Receipt Form

Approved: ☒

☒

Project Number: 11077.006

Client: ENVIROLOGIC RESOURCES

Received by: Szleper, Kathleen

Date/Time Received: Thursday, June 26, 2003 10:30 AM

No. of Shipping Containers: 1

SHIPMENT

Method of Delivery: Commercial Carrier

Tracking Number: 8335216456700215

COC Forms: ☒ Shipped with samples ☐ No Forms

Cooler(s)/Box(es)

Container	Type	Sealed With	Seal Condition	Container Condition	Temp C	Total Samples
1 of 1	Cooler	Tape	Intact	Intact	15.0	2

Samples

Sample Labels:

- ☒ Sample labels agree with COC forms
☐ Discrepancies (see Sample Custody Corrective Action Form)

Container Seals:

- ☐ Tape ☐ Custody Seals ☐ Other Seals (See sample Log)
☒ Seals intact for each shipping container
☐ Seals broken (See sample log for impacted samples)

Condition of Samples:

- ☒ Sample containers intact
☐ Sample containers broken/leaking (See Custody Corrective Action Form)

Temperature upon receipt (°C): 15 Temperature Blank used ☐ Yes ☒ No

(Note: If temperature upon receipt differs from required conditions, see sample log comment field)

Samples Acidified: ☐ Yes ☐ No ☒ Unknown

Initial pH 5-9?: ☐ Yes ☐ No ☒ NA

If no, individual sample adjustments on the Auxiliary Sample Receipt Form

Total Residual Chlorine Present?: ☐ Yes ☐ No ☒ NA

If yes, individual sample adjustments on the Auxiliary Sample Receipt Form

Head Space <1% in samples for water VOC analysis: ☐ Yes ☐ No ☒ NA

Individual sample deviations noted on sample log

Samples Containers:

Samples returned in PC-grade jars: ☐ Yes ☒ No ☐ Unknown /Lot No.: Unknown

Storage Location: 28 Freezer

BDO IDs Assigned: T5155 - T5156

Samples logged in by: Szleper, Kathleen

Date/Time: 06/26/2003 11:04 AM

Approved By: Fahey, Jessica

Approved On: 6/26/2003 2:19:

Authorized By: Smith, Stephen

Authorized On: 6/26/2003 2:44:00



... Putting Technology To Work

ShpNo: SHP-030626-01

Battelle Project No: _____

Report Corrective Actions

1 1
Approved: ☐

COC Client: ENVIROLOGIC RESOURCES
COC Project: ASTORIA AREA-WIDE PETRO SITE RI-1
COC Date: 6/26/2003 11:04:00 AM

	Description of Problem:	Explanation:
Temperature and Preservation	Receipt temperature outside of acceptability	Temperature upon receipt was 15.0C.

Documentation of project manager notification

Sample Custodian Szleper, Kathleen **Date:** 6/26/2003 11:12:00 A
Laboratory Manager: [Signature] **Date:** 6.26.03
Project Manager: [Signature] **Date:** 6/26/03

Documentation of client notification (should be completed by project manager within 24 hrs):

On 6/26/03 I contacted Tom Calabrese at 11:30 am 503-768-5121

Results of communication with client (Describe any corrective action directed by the client):

Left voice mail relaying problem. We will move forward with extraction and analysis unless the client indicates otherwise.

Date this form was received back to the custodian: _____

Reference Number: _____



ASTORIA AREA-WIDE PETROLEUM SITE CHAIN OF CUSTODY REPORT

Work Order #:

CLIENT: EnviroLogic Resources <i>tomenlabrese ch2oeco.com</i>			INVOICE TO:														
REPORT TO: TOM CALABRESE E-mail: @			EnviroLogic Resources														
ADDRESS: PO BOX 80762 PORTLAND, OR 97280-0762			P.O. NUMBER: 10077.006														
PHONE: 503-768-5121 FAX: 503-768-5122			PROJECT NAME: Astoria Area-Wide Petro Site RI-1														
PROJECT NUMBER: 10077.006			REQUESTED ANALYSES														
SAMPLED BY: TSC			Held for follow-up														
LOCATOR IDENTIFICATION	SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NWTPH-HCID	NWTPH-Dx	NWTPHGx	NWTPHG/BTEX	8260B RBCA	8270 SIM PAH	VOCs by 8260B	Pb TOTAL 6020	TCLP METALS (Cd, Cr)	RCRA METALS 6000 series	Full PAHs - List	MATRIX (gw, Soil)	# OF CONT.	COMMENTS	
1 SD-700(P)	SD-700(P)	6/19/03											✓	Sediment	1	T5155	
2 SD-701(P)	SD-701(P)	6/19/03											✓	Sediment	1	T5156	
3		/ / :															
4		/ / :															
5		/ / :															
6		/ / :															
7		/ / :															
8		/ / :															
9		/ / :															
10		/ / :															
11		/ / :															
12		/ / :															
13		/ / :															
14		/ / :															
15		/ / :															
RELINQUISHED BY: <i>M.A. H...</i>			FIRM: EnviroLogic Resources			DATE: 6-20-03			RECEIVED BY: <i>Kim Davis</i>			FIRM: NCA			DATE: 6/20/03		
PRINT NAME: Marianne Hancock			FIRM: EnviroLogic Resources			TIME: 1151			PRINT NAME: Kim Davis			FIRM: NCA			TIME: 1151		
RELINQUISHED BY: <i>Kim Davis</i>			FIRM: NCA			DATE: 6/24/03			RECEIVED BY: <i>Kathleen Szep</i>			FIRM: Battelle			DATE: 6/26/03		
PRINT NAME: Kim Davis			FIRM: NCA			TIME: 1200			PRINT NAME: Kathleen Szep			FIRM: Battelle			TIME: 10:30 AM		
ADDITIONAL REMARKS:														TEMP:		PAGE OF	

Sample Receipt Form DetailsApproved: ☒ ☒Project Number: 11077.006Client: ENVIROLOGIC RESOURCESReceived by: Szleper, KathleenDate/Time Received: Thursday, June 26, 2003 10:30 AMNo. of Shipping Containers: 1

BDO Id:	Client Sample ID:	Collection Date:	Login Date:	Ctrs:	Matrix:	Temp:	pH:	TRC:	VOC:	Stored In:	Loc:	No:	Comments:
T5155	SD-700 (p)	06/19/03 0:00	06/26/03 11:13	1	SEDIMENT	15	NA	NA	NA	28 Freezer			
T5156	SD-701 (p)	06/19/03 0:00	06/26/03 11:15	1	SEDIMENT	15	NA	NA	NA	28 Freezer			

Total Samples: 2

Attachment 2

Results of Sediment Sample Analyses – PAH Data

Data Quality Objectives

QC Type/Parameter	DQO Targets	Comment/Corrective Action
Procedural Blank	<5 × MDL, or associated samples >5 × blank concentration	Review with Project Manager, re-analyze or justify in project records.
Laboratory Control Sample	40 – 120% recovery	Review with Project Manager, re-analyze or justify in project records.
Matrix Spike Recovery	40 – 120% recovery	Analyte concentration in MS must be >5 × background concentration to be used for data quality assessment. Review with Project Manager, re-analyze or justify in project records.
Matrix Spike Duplicate/ Sample Duplicate Precision	<30% RPD	Analyte concentration in MS/MSD must be >5 × background concentration to be used for data quality assessment. For Duplicate analysis, analyte concentration must be >5x RL. Review with Project Manager, re-analyze or justify in project records.
Surrogate Compound Recovery	40 – 120% recovery	Review with Project Manager, re-analyze or justify in project records.
Instrument Calibrations		
Initial (minimum of 5-point)	GC/MS: <25% RSD	Review with Project Manager, re-analyze/calibrate or justify in project records.
Continuing Calibration Check	<25% PD vs Avg. RF for all analytes (<15% PD, on average)	At least every 10 samples Minimally middle and end of each batch.

Data Qualifiers

Qualifier	Use
J	Analyte detected below the sample specific RL.
B	Analyte found in the sample at a concentration <5x PB. (This qualifier is applied only to field samples.)
E	Estimate, result > highest concentration level in the calibration.
D	Result from higher dilution.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
T	Holding Time exceeded.
ME	Significant matrix interference — estimated value
MI	Significant matrix interference — value could not be determined or estimated
U	Analyte not detected. Leave empty.
N	QC value outside the accuracy or precision data quality objective.
n	QC value outside the accuracy or precision data quality objective – but meets contingency criteria.
NA	Not applicable.

Miscellaneous Documentation Form

Project Number: N005792-0001

Entered By: James Roush

Project Title: EnviroLogic Sediments

Date: 07/11/2003

QC PARAMETER	CONTROL LIMITS	NUMBER OF DQO EXCEEDENCES	CORRECTIVE ACTION
Procedural Blank	<5 x MDL, or associated samples must be greater than five times the blank concentration.	0	
Surrogates	Recovery results between 40% and 120%.	0	
LCS recoveries	Recovery values 40-120%	0	
MSD recoveries	Recovery values 40-120%	10	T5156MS & T5156MSD had various analytes outside the primary DQO limits, but met the secondary requirements such that analytes in the MS/MSD must be greater than 5x background to be used for data quality assessment.
MSD precision	RPD<30%	9	The same rule applies as stated above. These exceedences were most likely due to non-homogeneous sample mixing producing "hot spots" of differing analyte concentration.
DUP precision	RPD<30%	5	Integrations checked. Again, these exceedences were most likely due to non-homogeneous sample mixing producing "hot spots" of greater differing concentration.
Instrument Control Check	Less than fifteen percent difference from true value (<15%PD).	1	SQB990 ICC (B7799A.D) was ~18%D for Indeno(1,2,3-cd)pyrene. This is caused by a co-elution with dibenz(a,h)anthracene. All other QC was very good for this analyte, and the co-elution issue is being resolved.
Initial Calibration	Initial: $\pm 25\%$ RSD	0	
Continuing Calibration	Continuing: 25% difference for all analytes (15% diff. on average)	0	

- The RF of parent PAH compounds was used for the associated alkylated PAH patterns.
- Fluorene-d10 was manually subtracted from the C3-Naphthalenes range in all field samples as a matrix interference compound. O-terphenyl was also subtracted from the C1-dibenzothiophenes range in samples T5156, T5156MS & T5156MSD as a matrix interference compound. The subtraction reports are included in the Unused Data section of the package.

 Approved: *Red Healey* Date: 7/15/03

 Approved: *Andy* Date: 7/15/03



Project Name EnviroLogic Sediments
Project Number N005792-0001

Client Sample ID	Procedural Blank
Battelle Sample ID	BC866PB
Matrix	Sediment
Batch ID	03-0597
Analytical Method	8270M
Sequence	SQB990.S
Data File	B7801.D
Collection Date	NA
Receipt Date	NA
Extraction Date	06/26/03
Analysis Date	07/03/03
Sample Dry Weight (g)	16
Percent Moisture	NA
Primary Dilution Factor	1.00
Secondary Dilution Factor	NA
PIV (μl)	1000
Min Reporting Limit	0.63
Concentration Units	μg/kg
<hr/>	
Naphthalene	0.158 J
C1-Naphthalenes	0.103 J
C2-Naphthalenes	U
C3-Naphthalenes	U
C4-Naphthalenes	U
Biphenyl	0.0288 J
Acenaphthylene	0.0171 J
Acenaphthene	0.0363 J
Dibenzofuran	U
Fluorene	0.0186 J
C1-Fluorenes	U
C2-Fluorenes	U
C3-Fluorenes	U
Anthracene	U
Phenanthrene	0.0233 J
C1-Phenanthrenes/Anthracenes	U
C2-Phenanthrenes/Anthracenes	U
C3-Phenanthrenes/Anthracenes	U
C4-Phenanthrenes/Anthracenes	U
Dibenzothiophene	0.0275 J
C1-Dibenzothiophenes	U
C2-Dibenzothiophenes	U
C3-Dibenzothiophenes	U
C4-Dibenzothiophenes	U
Benzo[b]fluorene	U
Fluoranthene	0.0136 J
Pyrene	0.0126 J
C1-Fluoranthenes/Pyrenes	U
C2-Fluoranthenes/Pyrenes	U
C3-Fluoranthenes/Pyrenes	U
Benzo[a]anthracene	U
Chrysene	U
C1-Chrysenes	U
C2-Chrysenes	U
C3-Chrysenes	U
C4-Chrysenes	U
Benzo[b]fluoranthene	U
Benzo[k]fluoranthene	U
Benzo[a]fluoranthene	U
Benzo[e]pyrene	U
Benzo[a]pyrene	U
Perylene	U
Indeno[1,2,3-c,d]pyrene	U
Dibenz[a,h]anthracene	U
Benzo[g,h,i]perylene	0.00635 J
<hr/>	
Surrogate Recoveries (%)	
Naphthalene-d8	107
Phenanthrene-d10	89
Chrysene-d12	95

NA - Not applicable
J - Result < Sample RL
U - Not Detected.
D - Values reported using secondary dilution factor.
N - Outside of DQO.
n - Outside of DQO, but meets contingency criteria.
ME - Significant matrix interference - Estimated value.

Not Surrogate Corrected
PB Results

7/15/2003

n03-0597pah.xls



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Project Name EnviroLogic Sediments
Project Number N005792-0001

Client Sample ID	Laboratory Control Sample		
Battelle Sample ID	BC867LCS		
Matrix	Sediment		
Batch ID	03-0597		
Analytical Method	8270M		
Sequence	SQB990.S		
Data File	B7802.D		
Collection Date	NA		
Receipt Date	NA		
Extraction Date	06/26/03		
Analysis Date	07/03/03		
Sample Dry Weight (g)	NA		
Percent Moisture	NA		
Primary Dilution Factor	1.00		
Secondary Dilution Factor	NA		
PIV (µl)	1000		
Min Reporting Limit	10.10		
Concentration Units	FZ46	ng	% Recovery
Naphthalene	1002	985	98
C1-Naphthalenes		U	
C2-Naphthalenes		U	
C3-Naphthalenes		U	
C4-Naphthalenes		U	
Biphenyl	1003	1010	101
Acenaphthylene	1002	838	84
Acenaphthene	1001	936	94
Dibenzofuran	1000	1010	101
Fluorene	1001	998	100
C1-Fluorenes		U	
C2-Fluorenes		U	
C3-Fluorenes		U	
Anthracene	1002	1020	102
Phenanthrene	1001	993	99
C1-Phenanthrenes/Anthracenes		U	
C2-Phenanthrenes/Anthracenes		U	
C3-Phenanthrenes/Anthracenes		U	
C4-Phenanthrenes/Anthracenes		U	
Dibenzothiophene	1004	916	91
C1-Dibenzothiophenes		U	
C2-Dibenzothiophenes		U	
C3-Dibenzothiophenes		U	
C4-Dibenzothiophenes		U	
Benzo[b]fluorene		U	
Fluoranthene	1001	986	99
Pyrene	1001	991	99
C1-Fluoranthenes/Pyrenes		U	
C2-Fluoranthenes/Pyrenes		U	
C3-Fluoranthenes/Pyrenes		U	
Benzo[a]anthracene	1001	967	97
Chrysene	1002	1000	100
C1-Chrysenes		U	
C2-Chrysenes		U	
C3-Chrysenes		U	
C4-Chrysenes		U	
Benzo[b]fluoranthene	1002	951	95
Benzo[k]fluoranthene	1002	998	100
Benzo[a]fluoranthene		U	
Benzo[e]pyrene	998	914	92
Benzo[a]pyrene	1001	901	90
Perylene	1000	893	89
Indeno[1,2,3-c,d]pyrene	1002	736	73
Dibenz[a,h]anthracene	1001	856	86
Benzo[g,h,i]perylene	1002	865	86
Surrogate Recoveries (%)			
Naphthalene-d8		108	
Phenanthrene-d10		100	
Chrysene-d12		104	

NA - Not applicable

J - Result < Sample RL

U - Not Detected.

D - Values reported using secondary dilution factor.

N - Outside of DQO.

n - Outside of DQO, but meets contingency criteria.

ME - Significant matrix interference - Estimated value.

Not Surrogate Corrected
LCS Results

7/15/2003

n03-0597pah.xls



Project Name EnviroLogic Sediments
Project Number N005792-0001

Client Sample ID		SD-701 (p)	SD-701 (p)			SD-701 (p)				
Battelle Sample ID		T5156	T5156MS			T5156MSD				
Matrix		Sediment	Sediment			Sediment				
Batch ID		03-0597	03-0597			03-0597				
Analytical Method		8270M	8270M			8270M				
Sequence		SQB990.S	SQB990.S			SQB990.S				
Data File		B7805.D	B7806.D			B7807.D				
Collection Date		06/19/03	06/19/03			06/19/03				
Receipt Date		06/26/03	06/26/03			06/26/03				
Extraction Date		06/26/03	06/26/03			06/26/03				
Analysis Date		07/03/03	07/03/03			07/03/03				
Sample Dry Weight (g)		18.32	9.05			8.97				
Percent Moisture		59.55	59.55			59.55				
Primary Dilution Factor		3.57	1.43			1.43				
Secondary Dilution Factor		NA	NA			NA				
PIV (μl)		1000	1000			1000				
Min Reporting Limit		1.97	1.59			1.61				
Concentration Units	FZ46	μg/kg	μg/kg	% Recovery	Q	μg/kg	% Recovery	Q	RPD	Q
Naphthalene	1002	20.5	88.8	62		93.4	65		4.7	
C1-Naphthalenes		8.77	105			102				
C2-Naphthalenes		20.6	64.8			69.4				
C3-Naphthalenes		24.4	66.2			40.6				
C4-Naphthalenes		92.8	74			79.8				
Biphenyl	1003	6.25	88	74		91	76		2.7	
Acenaphthylene	1002	14.2	89.9	68		99.7	77		12.4	
Acenaphthene	1001	8.13	96.7	80		98	81		1.2	
Dibenzofuran	1000	14.4	101	78		115	90		14.3	
Fluorene	1001	13	107	85		114	91		6.8	
C1-Fluorenes		19.6	15.5			19				
C2-Fluorenes		57.2	45.4			56.2				
C3-Fluorenes		99.2	93.7			108				
Anthracene	1002	55.4	137	74		162	95		24.8	
Phenanthrene	1001	71.4	154	75		203	118		44.6	n
C1-Phenanthrenes/Anthracenes		47.7	103			127				
C2-Phenanthrenes/Anthracenes		101	92.3			103				
C3-Phenanthrenes/Anthracenes		120	109			117				
C4-Phenanthrenes/Anthracenes		69.1	70.2			69.9				
Dibenzothiophene	1004	12.6	96.2	75		111	88			
C1-Dibenzothiophenes		21.2	20			23				
C2-Dibenzothiophenes		65.5	57.6			63.3				
C3-Dibenzothiophenes		95.3	80.7			85.3				
C4-Dibenzothiophenes		62.3	50.8			52.5				
Benzo[b]fluorene		4.84	3.03			4.63				
Fluoranthene	1001	295	322	24	n	431	122	n	134.0	n
Pyrene	1001	319	348	26	n	443	111		124.0	n
C1-Fluoranthenes/Pyrenes		168	148			203				
C2-Fluoranthenes/Pyrenes		98.8	81.2			126				
C3-Fluoranthenes/Pyrenes		56.5	39.2			51.2				
Benzo[a]anthracene	1001	128	219	82		293	148	n	57.4	n
Chrysene	1002	215	323	98		354	124	n	23.4	
C1-Chrysenes		72.8	65.8			91.2				
C2-Chrysenes		53.9	38.7			47.9				
C3-Chrysenes		54.6	41.8			50				
C4-Chrysenes		U	U			U				
Benzo[b]fluoranthene	1002	149	242	84		316	150	n	56.4	n
Benzo[j,k]fluoranthene	1002	147	222	68		291	129	n	61.9	n
Benzo[a]fluoranthene		26.5	25.5			31.8				
Benzo[e]pyrene	998	115	198	75		250	121	n	46.9	n
Benzo[a]pyrene	1001	106	200	85		248	127	n	39.6	n
Perylene	1000	128	222	85		256	115		30.0	
Indeno[1,2,3-c,d]pyrene	1002	87.5	188	91		226	124	n	30.7	n
Dibenz[a,h]anthracene	1001	16	123	97		138	109		11.6	
Benzo[g,h,i]perylene	1002	74.2	167	84		197	110		26.8	
Surrogate Recoveries (%)										
Naphthalene-d8		64	57			61				
Phenanthrene-d10		93	81			88				
Chrysene-d12		107	94			106				

NA - Not applicable
J - Result < Sample RL
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ME - Significant matrix interference - Estimated value.



Project Name EnviroLogic Sediments
Project Number N005792-0001

Client Sample ID	SD-700 (p)	SD-700 (p)		
Battelle Sample ID	T5155	T5155DUP		
Matrix	Sediment	Sediment		
Batch ID	03-0597	03-0597		
Analytical Method	8270M	8270M		
Sequence	SQB990.S	SQB990.S		
Data File	B7803.D	B7804.D		
Collection Date	06/19/03	06/19/03		
Receipt Date	06/26/03	06/26/03		
Extraction Date	06/26/03	06/26/03		
Analysis Date	07/03/03	07/03/03		
Sample Dry Weight (g)	12.99	12.88		
Percent Moisture	58.19	58.19		
Primary Dilution Factor	40.00	40.00		
Secondary Dilution Factor	NA	NA		
PIV (μl)	1000	1000		
Min Reporting Limit	31.10	31.37		
Concentration Units	μg/kg	μg/kg	RPD	Q
Naphthalene	153	80.1	62.5	N
C1-Naphthalenes	154	151	2.0	
C2-Naphthalenes	1620	1670	3.0	
C3-Naphthalenes	6350	6620	4.2	
C4-Naphthalenes	14900	14900	0.0	
Biphenyl	51.2	46.2	10.3	
Acenaphthylene	82	72.4	12.4	
Acenaphthene	344	327	5.1	
Dibenzofuran	344	282	19.8	
Fluorene	432	407	6.0	
C1-Fluorenes	2840	2920	2.8	
C2-Fluorenes	9350	9320	0.3	
C3-Fluorenes	12000	11600	3.4	
Anthracene	668	625	6.7	
Phenanthrene	676	516	26.8	
C1-Phenanthrenes/Anthracenes	3330	3820	13.7	
C2-Phenanthrenes/Anthracenes	11100	11200	0.9	
C3-Phenanthrenes/Anthracenes	9940	9840	1.0	
C4-Phenanthrenes/Anthracenes	3790	3620	4.6	
Dibenzothiophene	573	582	1.6	
C1-Dibenzothiophenes	3430	3410	0.6	
C2-Dibenzothiophenes	8890	8760	1.5	
C3-Dibenzothiophenes	8270	8920	7.6	
C4-Dibenzothiophenes	4330	4190	3.3	
Benzo[b]fluorene	80	59.5	29.4	
Fluoranthene	2940	2620	11.5	
Pyrene	3370	3110	8.0	
C1-Fluoranthenes/Pyrenes	2700	2580	4.5	
C2-Fluoranthenes/Pyrenes	1610	1580	1.9	
C3-Fluoranthenes/Pyrenes	764	737	3.6	
Benzo[a]anthracene	758	590	24.9	
Chrysene	1550	1090	34.8	N
C1-Chrysenes	534	462	14.4	
C2-Chrysenes	301	260	14.6	
C3-Chrysenes	187	202	7.7	
C4-Chrysenes	U	U		
Benzo[b]fluoranthene	694	519	28.8	
Benzo[k]fluoranthene	677	502	29.7	
Benzo[a]fluoranthene	101	65.8	42.2	N
Benzo[e]pyrene	520	381	30.8	N
Benzo[a]pyrene	392	262	39.8	N
Perylene	192	159	18.8	
Indeno[1,2,3-c,d]pyrene	284	210	30.0	
Dibenz[a,h]anthracene	39.2	30 J	26.6	
Benzo[g,h,i]perylene	221	168	27.2	
Surrogate Recoveries (%)				
Naphthalene-d8	111	112	0.9	
Phenanthrene-d10	91	110	19.5	
Chrysene-d12	109	111	1.7	

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Project Name EnviroLogic Sediments
Project Number N005792-0001

Client Sample ID	SD-700 (p)	SD-701 (p)
Battelle Sample ID	T5155	T5156
Matrix	Sediment	Sediment
Batch ID	03-0597	03-0597
Analytical Method	8270M	8270M
Sequence	SQB990.S	SQB990.S
Data File	B7803.D	B7805.D
Collection Date	06/19/03	06/19/03
Receipt Date	06/26/03	06/26/03
Extraction Date	06/26/03	06/26/03
Analysis Date	07/03/03	07/03/03
Sample Dry Weight (g)	12.99	18.32
Percent Moisture	58.19	59.55
Primary Dilution Factor	40.00	3.57
Secondary Dilution Factor	NA	NA
PIV (μl)	1000	1000
Min Reporting Limit	31.10	1.97
Concentration Units	μg/kg	μg/kg
Naphthalene	153	20.5
C1-Naphthalenes	154	8.77
C2-Naphthalenes	1620	20.6
C3-Naphthalenes	6350	24.4
C4-Naphthalenes	14900	92.8
Biphenyl	51.2	6.25
Acenaphthylene	82	14.2
Acenaphthene	344	8.13
Dibenzofuran	344	14.4
Fluorene	432	13
C1-Fluorenes	2840	19.6
C2-Fluorenes	9350	57.2
C3-Fluorenes	12000	99.2
Anthracene	668	55.4
Phenanthrene	676	71.4
C1-Phenanthrenes/Anthracenes	3330	47.7
C2-Phenanthrenes/Anthracenes	11100	101
C3-Phenanthrenes/Anthracenes	9940	120
C4-Phenanthrenes/Anthracenes	3790	69.1
Dibenzothiophene	573	12.6
C1-Dibenzothiophenes	3430	21.2
C2-Dibenzothiophenes	8890	65.5
C3-Dibenzothiophenes	8270	95.3
C4-Dibenzothiophenes	4330	62.3
Benzo[b]fluorene	80	4.84
Fluoranthene	2940	295
Pyrene	3370	319
C1-Fluoranthenes/Pyrenes	2700	168
C2-Fluoranthenes/Pyrenes	1610	98.8
C3-Fluoranthenes/Pyrenes	764	56.5
Benzo[a]anthracene	758	128
Chrysene	1550	215
C1-Chrysenes	534	72.8
C2-Chrysenes	301	53.9
C3-Chrysenes	187	54.6
C4-Chrysenes	U	U
Benzo[b]fluoranthene	694	149
Benzo[j,k]fluoranthene	677	147
Benzo[a]fluoranthene	101	26.5
Benzo[e]pyrene	520	115
Benzo[a]pyrene	392	106
Perylene	192	128
Indeno[1,2,3-c,d]pyrene	284	87.5
Dibenz[a,h]anthracene	39.2	16
Benzo[g,h,i]perylene	221	74.2
Surrogate Recoveries (%)		
Naphthalene-d8	111	64
Phenanthrene-d10	91	93
Chrysene-d12	109	107

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