

**SAF-RC-189**  
**100N Field Remediation –**  
**Soil Full Protocol**  
**FINAL DATA PACKAGE**

**COMPLETE COPY OF DATA PACKAGE TO:**

Kathy Wendt H4-21

KW 10/22/12  
INITIAL/DATE

**COMMENTS:**

**SDG K3992**

**SAF-RC-189**

Rad only

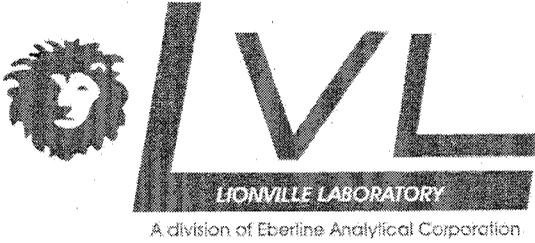
Chem only

Rad & Chem

Complete

Partial

**Sample Location: UPR-100-N-42 Waste Site - Split**



264 Welsh Pool Road  
Exton, Pennsylvania 19341  
Phone (610) 280-3000  
Fax (610) 280-3041

11 October 2012

Joan Kessner  
WC-Hanford, Inc.  
2620 Fermi Avenue  
MSIN H4-21  
Richland, WA 99354

Subject: Analytical Data Package

Dear Ms. Kessner:

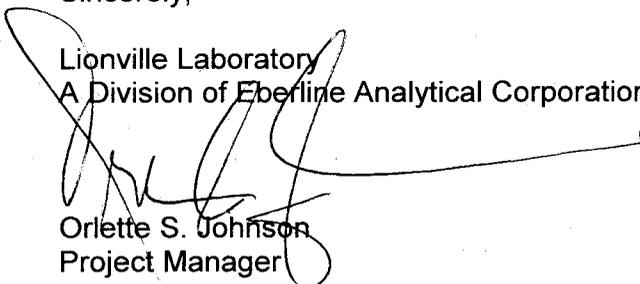
Enclosed are the hard copy analytical reports for the batch number/fraction indicated (marked X) in the following table:

LvLI Batch #	1209069
SDG #	K3992
SAF #	RC-189
Date Received	09/21/12
# Samples	1
Matrix	SOIL
Volatiles	
Semivolatiles	
Pest/PCB	X
Glycols	
DRO/KRO/GRO	X
PAHs	X
Herbicides	
Metals	X
Inorganics	X

The electronic data deliverable (EDD) has been emailed. If you have any questions, please don't hesitate to contact me at (610) 280-3012.

Sincerely,

Lionville Laboratory  
A Division of Eberline Analytical Corporation

  
Orlette S. Johnson  
Project Manager

The results presented in this report relate only to the analytical testing and conditions of the samples at receipt and during storage. All pages of this report are integral parts of the analytical data. Therefore, this report should only be reproduced in its entirety of 53 pages.

# **CHAIN OF CUSTODY**





**Lionville Laboratory**  
**SAMPLE RECEIPT CHECKLIST (SRC)**

CLIENT: WC Hanfers  
 Project/SAF/SOW/Release #: RC-189

Date: 9-21-12

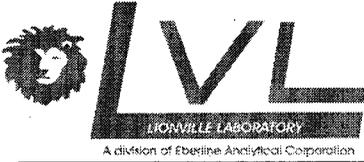
LvL Batch #: 1209069

Sample Custodian: [Signature]

NOTE: EXPLAIN ALL DISCREPANCIES

- |  |   |                                      |   |
|--|---|--------------------------------------|---|
| 1. Samples Hand Delivered or <u>Shipped?</u>   | Carrier <u>Fed Ex</u>                   | <input type="checkbox"/> No          | Airbill # <u>7990 1225 4931</u>           |
| 2. Custody Seals on coolers or shipping containers intact, signed & dated?   | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          | <input type="checkbox"/> No Seals         |
| 3. Outside of coolers or shipping containers are free from damage?   | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          | Comments:                                 |
| 4. All expected paperwork received (coc & other client specific information) sealed in plastic bag and easily accessible?                  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 5. Samples received <u>cooled</u> or ambient?  | Temp <u>2.9</u> °C                      |                                      | Cooler # <u>WCH-11-020</u>                |
| How was the temperature taken?   | <input checked="" type="checkbox"/> IR  | <input type="checkbox"/> Temp. Blank | <input type="checkbox"/> Other (Specify): |
| Is the Temp. Criteria met for these samples? (Hg in soils @ 4°C)   | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 6. Custody seals on sample containers intact, signed and dated?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          | <input type="checkbox"/> No Seals         |
| 7. COC (Client & LvL) signed & dated?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 8. Sample containers are intact?   | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 9. All samples on COC received?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| All samples received on COC?   | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 10. All sample label information matches COC?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 11. Samples properly preserved? (If #5 is no, then this is no.)  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 12. Samples received within hold times?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| Short holds taken to wet lab?  | <input type="checkbox"/> Yes            | <input type="checkbox"/> No          | <input checked="" type="checkbox"/> N/A   |
| 13. VOA, TOC, TOX free of headspace?   | <input type="checkbox"/> Yes            | <input type="checkbox"/> No          | <input checked="" type="checkbox"/> N/A   |
| 14. QC stickers placed on bottles designated by client?  | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          | <input type="checkbox"/> N/A              |
| 15. Shipment meets LvL Sample Acceptance Policy? (Identify all bottles that do not meet the policy, which is on the reverse of this page.) | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No          |   |
| 16. Project Manager contacted concerning any discrepancies?  | <input type="checkbox"/> Yes            | <input type="checkbox"/> No          | <input checked="" type="checkbox"/> N/A   |
| Person Contacted _____   |   | Date _____                           |   |

# PCBs

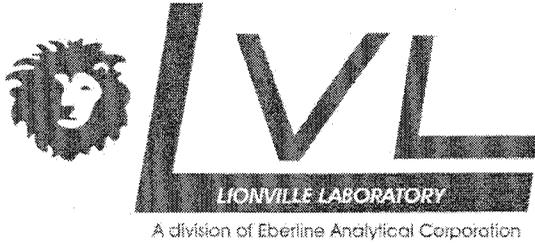


264 Welsh Pool Road  
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Fax: 610-280-3041

WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 09/27/2012 21:23
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**Analytical Report for Polychlorinated Biphenyls by SW846 8082**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
J1R299	1209069-01	Soil	09/19/2012 10:55	09/21/2012 09:45



264 Welsh Pool Road  
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### Case Narrative

**Client:** WC-HANFORD RC-189 K3992  
**LVL #:** 1209069

**W.O. #:** 60049-001-001-0001-00  
**Received:** 09-21-2012

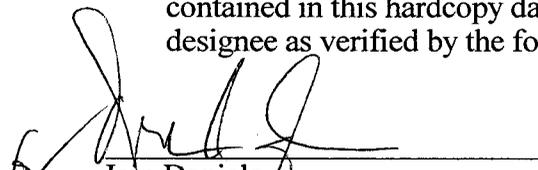
#### PCBs

One (1) soil sample was collected on 09-19-2012.

The sample and associated QC samples were extracted 09-25-2012 and analyzed 09-26,27-2012 according to criteria set forth in Lionville Laboratory SOPs. The extraction procedure was based on SW846 Method 3540C and the analysis procedure was based on SW846 Method 8082. All samples received Copper-Sulfur and Sulfuric Acid cleanups based on SW846 methods 3660A and 3665A.

Lionville Laboratory (LvL) is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements:

1. The results presented in this report are derived from a sample that met LvL's sample acceptance policy with exceptions noted on the Sample Receipt Checklist.
2. All required holding times for extraction and analysis have been met.
3. All obtainable surrogate recoveries were within acceptance criteria.
4. The method blank was below the reporting limits for all target compounds.
5. All blank spike recoveries were within acceptance criteria.
6. All matrix spike recoveries were within acceptance criteria.
7. The samples were reported on a dry weight basis.
8. All initial calibrations associated with this data set were within acceptance criteria.
9. All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria.
10. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the laboratory manager or a designee as verified by the following signature.

  
Iam Daniels  
LvL Laboratory Manager

  
Date



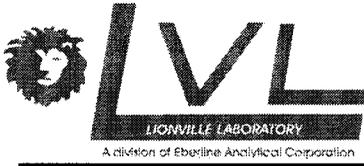
## GLOSSARY OF DATA

### DATA QUALIFIERS

- U = Indicates that the compound was analyzed for but not detected. The minimum detection limit for the sample (not the method detection limit) is reported with the U (e.g., 10U).
- J = Indicates an estimated value. This flag is used in cases where a target analyte is detected at a level less than the lower quantification level. If the limit of quantification is 10 ug/L and a concentration of 3 ug/L is calculated, it is reported as 3J.
- B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination.
- E = Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution.
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### ABBREVIATIONS

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- MS = Indicates matrix spike.
- MSD = Indicates matrix spike duplicate.
- DL = Indicates that recoveries were not obtained because the extract had to be diluted for analysis.
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- DF = Dilution Factor.
- NR = Not Required.
- NS = Not Spiked.
- SP = Indicates Spiked Compound.
- NPM = No pattern match for multi-component target analytes.



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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 09/27/2012 21:23
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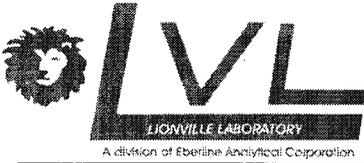
**J1R299**  
**1209069-01 (Soil)**

Analyte	Result and Qualifier	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
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**Lionville Laboratory**

**Polychlorinated Biphenyls by SW846 8082**

Aroclor 1016	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1221	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1232	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1242	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1248	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1254	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1260	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1262	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Aroclor 1268	13.3 U	13.3	ug/kg dry	1	L209189	09/25/2012	09/27/2012	8082
Surrogate: Decachlorobiphenyl	105 %	43-144			L209189	09/25/2012	09/27/2012	8082
Surrogate: Tetrachloro-meta-xylene	109 %	52-141			L209189	09/25/2012	09/27/2012	8082



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**Polychlorinated Biphenyls by SW846 8082 - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209189 - SW 3540C</b>									
<b>Blank (L209189-BLK2)</b>					Prepared: 09/25/2012 Analyzed: 09/26/2012				
Aroclor 1016	13.3 U	13.3	ug/kg wet						
Aroclor 1221	13.3 U	13.3	ug/kg wet						
Aroclor 1232	13.3 U	13.3	ug/kg wet						
Aroclor 1242	13.3 U	13.3	ug/kg wet						
Aroclor 1248	13.3 U	13.3	ug/kg wet						
Aroclor 1254	13.3 U	13.3	ug/kg wet						
Aroclor 1260	13.3 U	13.3	ug/kg wet						
Aroclor 1262	13.3 U	13.3	ug/kg wet						
Aroclor 1268	13.3 U	13.3	ug/kg wet						
Surrogate: Decachlorobiphenyl	37.4		ug/kg wet	33.333		112	43-144		
Surrogate: Tetrachloro-meta-xylene	36.8		ug/kg wet	33.337		110	52-141		
<b>LCS (L209189-BS2)</b>					Prepared: 09/25/2012 Analyzed: 09/26/2012				
Aroclor 1016	157	13.3	ug/kg wet	166.67		94	50-138		
Aroclor 1260	174	13.3	ug/kg wet	166.67		104	50-148		
Surrogate: Decachlorobiphenyl	35.7		ug/kg wet	33.333		107	43-144		
Surrogate: Tetrachloro-meta-xylene	34.7		ug/kg wet	33.337		104	52-141		
<b>Matrix Spike (L209189-MS4) Source: 1209069-01</b>					Prepared: 09/25/2012 Analyzed: 09/27/2012				
Aroclor 1016	163	13.3	ug/kg dry	167.15	13.3 U	98	50-138		
Aroclor 1260	184	13.3	ug/kg dry	167.15	13.3 U	110	50-148		
Surrogate: Decachlorobiphenyl	36.7		ug/kg dry	33.429		110	43-144		
Surrogate: Tetrachloro-meta-xylene	35.8		ug/kg dry	33.432		107	52-141		
<b>Matrix Spike Dup (L209189-MSD4) Source: 1209069-01</b>					Prepared: 09/25/2012 Analyzed: 09/27/2012				
Aroclor 1016	161	13.4	ug/kg dry	168.09	13.3 U	96	50-138	2	40
Aroclor 1260	180	13.4	ug/kg dry	168.09	13.3 U	107	50-148	3	40
Surrogate: Decachlorobiphenyl	38.0		ug/kg dry	33.618		113	43-144		
Surrogate: Tetrachloro-meta-xylene	35.1		ug/kg dry	33.622		104	52-141		

PREPARATION BENCH SHEET

L209189

Lionville Laboratory

Printed: 9/26/2012 1:36:51PM

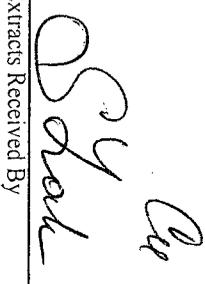
Matrix: Solid

Prepared using: GC - SW 3540C

Surrogate used: 1201060

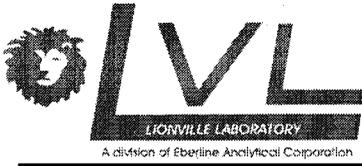
Lab Number	Analysis	Prepared	Initial (g)	Final (mL)	Spike ID	Source ID	ul Spike	ul Surrogate	Client	Extraction Comments
L209067-01	8081A TCL Pesticides	09/25/2012 13:25	30.01	10			250	250	WC-Hanford, Inc.	
L209067-01	8082 PCBs	09/25/2012 13:25	30.01	10			250	250	WC-Hanford, Inc.	
L209068-01	8081A TCL Pesticides	09/25/2012 13:25	15.68	10			250	250	WC-Hanford, Inc.	Added for Batch QC in: L209189
L209068-01	8082 PCBs	09/25/2012 13:25	15.68	10			250	250	WC-Hanford, Inc.	
L209069-01	8081A TCL Pesticides	09/25/2012 13:25	30.31	10			250	250	WC-Hanford, Inc.	Added for Batch QC in: L209189
L209069-01	8082 PCBs	09/25/2012 13:25	30.31	10			250	250	WC-Hanford, Inc.	
L209189-BLK1	QC	09/25/2012 13:25	30	10			250	250		PEST
L209189-BLK2	QC	09/25/2012 13:25	30	10			250	250		PCB
L209189-BS1	QC	09/25/2012 13:25	30	10	1200903		250	250		PEST
L209189-BS2	QC	09/25/2012 13:25	30	10	1200902		250	250		PCB
L209189-MS1	QC	09/25/2012 13:25	30.89	10	1200903	1209067-01	250	250		PEST
L209189-MS2	QC	09/25/2012 13:25	30.05	10	1200902	1209067-01	250	250		PCB
L209189-MS3	QC	09/25/2012 13:25	15.34	10	1200902	1209068-01	250	250		PCB
L209189-MS4	QC	09/25/2012 13:25	30.21	10	1200902	1209069-01	250	250		PCB
L209189-MSD1	QC	09/25/2012 13:25	30.82	10	1200903	1209067-01	250	250		PEST
L209189-MSD2	QC	09/25/2012 13:25	30.03	10	1200902	1209067-01	250	250		PCB
L209189-MSD3	QC	09/25/2012 13:25	15.72	10	1200902	1209068-01	250	250		PCB
L209189-MSD4	QC	09/25/2012 13:25	30.04	10	1200902	1209069-01	250	250		PCB

Extracts Relinquished By  Date 9/26/12 13:52

Extracts Received By  Date 09.26.12 13:55

Scheared 09.26.12 52  
Cu 107X B10X086

**GASOLINE RANGE ORGANICS (GRO)**

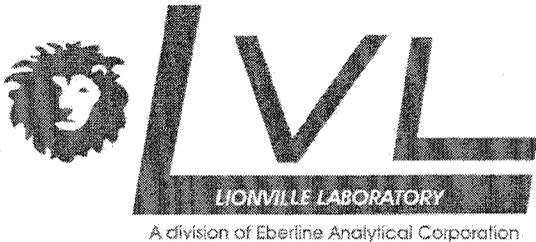


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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 09/27/2012 21:11
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**Analytical Report for GRO by SW846 8015**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
J1R299	1209069-01	Soil	09/19/2012 10:55	09/21/2012 09:45



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## Case Narrative

**Client:** WC-HANFORD RC-189 K3992  
**LVL #:** 1209069

**W.O. #:** 60049-001-001-0001-00  
**Date Received:** 09-21-2012

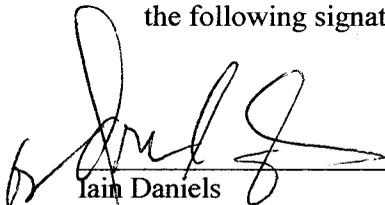
### GASOLINE RANGE ORGANICS

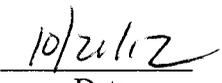
One (1) soil sample was collected on 09-19-2012.

The samples and their associated QC samples were extracted and analyzed according to criteria set forth in Lionville Laboratory SOPs based on method 8015 for Gasoline Range Organics on 09-27-2012.

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Iain Daniels  
LVL Laboratory Manager

  
Date



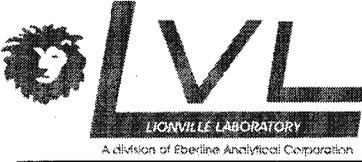
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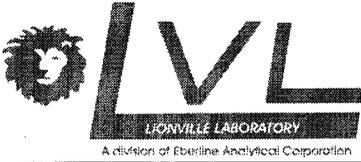
**J1R299**  
**1209069-01 (Soil)**

Analyte	Result and Qualifier	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
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**Lionville Laboratory**

**GRO by SW846 8015**

Gasoline Range Organics	90.5 U	90.5	ug/kg dry	1	L209219	09/27/2012	09/27/2012	SW846 8015
Surrogate: Fluorobenzene	103 %	38-141			L209219	09/27/2012	09/27/2012	SW846 8015



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**GRO by SW846 8015 - Quality Control  
 Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209219 - 8015</b>									
<b>Blank (L209219-BLK1)</b>				Prepared & Analyzed: 09/27/2012					
Gasoline Range Organics	90.0 U	90.0	ug/kg wet						
Surrogate: Fluorobenzene	41.6		ug/kg wet	45.000		92	38-141		
<b>LCS (L209219-BS1)</b>				Prepared & Analyzed: 09/27/2012					
Gasoline Range Organics	436	90.0	ug/kg wet	450.00		97	40-150		
Surrogate: Fluorobenzene	46.3		ug/kg wet	45.000		103	38-141		
<b>Matrix Spike (L209219-MS1)</b>				Source: 1209069-01		Prepared & Analyzed: 09/27/2012			
Gasoline Range Organics	437	90.7	ug/kg dry	453.54	90.5 U	96	40-150		
Surrogate: Fluorobenzene	47.5		ug/kg dry	45.354		105	38-141		
<b>Matrix Spike Dup (L209219-MSD1)</b>				Source: 1209069-01		Prepared & Analyzed: 09/27/2012			
Gasoline Range Organics	398	90.5	ug/kg dry	452.64	90.5 U	88	40-150	9	40
Surrogate: Fluorobenzene	42.5		ug/kg dry	45.264		94	38-141		



**DRO/MO**



264 Welsh Pool Road  
Exton, PA 19341  
Phone: 610-280-3000  
Fax: 610-280-3041

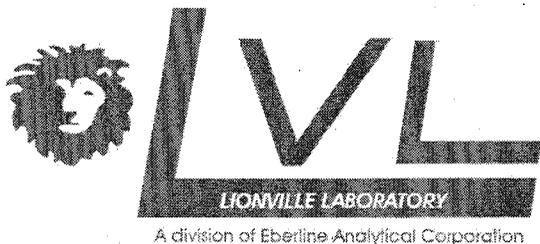
WC-Hanford, Inc.  
2620 Fermi Avenue  
Richland WA, 99354

Project: RC-189  
Project Number: K3992  
Project Manager: Joan Kessner

Reported:  
10/01/2012 21:52

**Analytical Report for Extractable Petroleum Hydrocarbons by SW846 8015**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
J1R299	1209069-01	Soil	09/19/2012 10:55	09/21/2012 09:45



264 Welsh Pool Road  
Exton, Pennsylvania 19341  
Phone (610) 280-3000  
Fax (610) 280-3041

### Case Narrative

**Client:** WC-HANFORD RC-189 K3992  
**LVL #:** 1209069

**W.O. #:** 60049-001-001-0001-00  
**Date Received:** 09-21-2012

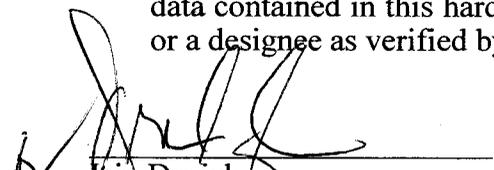
### DIESEL RANGE ORGANICS

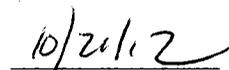
One (1) soil sample was collected on 09-19-2012.

The sample and associated QC samples were extracted 09-26-2012 and analyzed 09-30-2012 according to criteria set forth in Lionville Laboratory SOPs. The extraction procedure was based on SW846 Method 3540C and the analysis procedure was based on SW846 Method 8015B for Diesel Range Organics.

Lionville Laboratory (LvL) is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements:

1. The results presented in this report are derived from a sample that met LvL's sample acceptance policy with exceptions noted on the Sample Receipt Checklist.
2. All required holding times for extraction and analysis have been met.
3. All obtainable surrogate recoveries were within acceptance criteria.
4. The method blank was below the reporting limits for all target compounds.
5. All blank spike recoveries were within acceptance criteria.
6. All matrix spike recoveries were within acceptance criteria.
7. The samples were reported on a dry weight basis.
8. All initial calibrations associated with this data set were within acceptance criteria.
9. All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria.
10. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the laboratory manager or a designee as verified by the following signature.

  
Brian Daniels  
LvL Laboratory Manager

  
Date



## GLOSSARY OF DATA

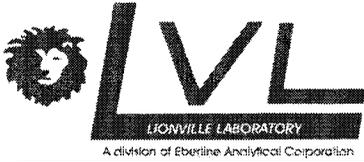
### DATA QUALIFIERS

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- U** = Indicates that the compound was analyzed for but not detected. The minimum detection limit for the sample (not the method detection limit) is reported with the U (e.g., 10U).
- J** = Indicates an estimated value. This flag is used in cases where a target analyte is detected at a level less than the lower quantification level. If the limit of quantification is 10 ug/L and a concentration of 3 ug/L is calculated, it is reported as 3J.
- B** = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination.
- E** = Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution.
- I** = Interference.
- .I** = Indicates an interference on one analytical column only. Result is reported from remaining analytical column.
- P** = This flag is used for a dual column analysis (i.e. pesticides/PCB/herbicides) when there is greater than 40% difference for detected concentrations between the two GC columns; the lower of the two values is reported on Form 1 and flagged with a "P".
- D** = This flag identifies all compounds identified in an analysis at a secondary dilution factor.
- C** = This flag applies to a compound that has been confirmed by GC/MS.

### ABBREVIATIONS

- BS** = Indicates blank spike in which reagent grade water is spiked with the CLP matrix spiking solutions and carried through all the steps in the method. Spike recoveries are reported.
- BSD** = Indicates blank spike duplicate.
- MS** = Indicates matrix spike.
- MSD** = Indicates matrix spike duplicate.
- DL** = Indicates that recoveries were not obtained because the extract had to be diluted for analysis.
- NA** = Not Applicable.
- DF** = Dilution Factor.
- NR** = Not Required.
- NS** = Not Spiked.
- SP** = Indicates Spiked Compound.
- NPM** = No pattern match for multi-component target analytes.



264 Welsh Pool Road  
 Exton, PA 19341  
 Phone: 610-280-3000  
 Fax: 610-280-3041

WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/01/2012 21:52
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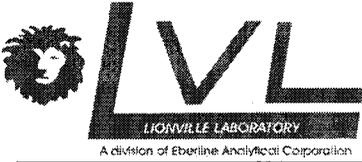
**J1R299**  
**1209069-01 (Soil)**

Analyte	Result and Qualifier	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
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**Lionville Laboratory**

**Extractable Petroleum Hydrocarbons by SW846 8015**

Diesel Range Organics	1100 J	3290	ug/kg dry	1	L209208	09/26/2012	09/30/2012	8015M
Motor Oil	9860 U	9860	ug/kg dry	1	L209208	09/26/2012	09/30/2012	8015M
Surrogate: <i>p</i> -Terphenyl	83 %	39-129			L209208	09/26/2012	09/30/2012	8015M



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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/01/2012 21:52
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**Extractable Petroleum Hydrocarbons by SW846 8015 - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209208 - SW 3540/3550</b>									
<b>Blank (L209208-BLK1)</b>				Prepared: 09/26/2012 Analyzed: 09/30/2012					
Diesel Range Organics	3330 U	3330	ug/kg wet						
Motor Oil	10000 U	10000	ug/kg wet						
<i>Surrogate: p-Terphenyl</i>	5240		ug/kg wet	6666.7		79	39-129		
<b>LCS (L209208-BS1)</b>				Prepared: 09/26/2012 Analyzed: 09/30/2012					
Diesel Range Organics	50700	3330	ug/kg wet	66667		76	42-133		
<i>Surrogate: p-Terphenyl</i>	5470		ug/kg wet	6666.7		82	39-129		
<b>Matrix Spike (L209208-MS2)</b>				Source: 1209069-01		Prepared: 09/26/2012 Analyzed: 09/30/2012			
Diesel Range Organics	59900	3360	ug/kg dry	67147	1100	88	42-133		
<i>Surrogate: p-Terphenyl</i>	6640		ug/kg dry	6714.7		99	39-129		
<b>Matrix Spike Dup (L209208-MSD2)</b>				Source: 1209069-01		Prepared: 09/26/2012 Analyzed: 09/30/2012			
Diesel Range Organics	55200	3350	ug/kg dry	67058	1100	81	42-133	8	40
<i>Surrogate: p-Terphenyl</i>	5920		ug/kg dry	6705.8		88	39-129		

PREPARATION BENCH SHEET

L209208

Lionville Laboratory

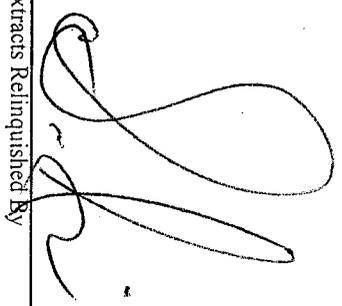
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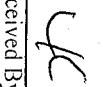
Prepared using: Extraction - SW 3540/3550

Surrogate used: 12011028

Matrix: Solid

Lab Number	Analysis	Prepared	Initial (g)	Final (mL)	Spike ID	Source ID	Spike $\mu$ l	Surrogate $\mu$ l	Client	Extraction Comments
L209067-01	8015M DRO	09/26/2012 15:28	30.34	1			1000	1000	WC-Hanford, Inc.	
L209069-01	8015M DRO	09/26/2012 15:28	30.72	1			1000	1000	WC-Hanford, Inc.	
L209208-BLK1	QC	09/26/2012 15:28	30	1			1000	1000		
L209208-BS1	QC	09/26/2012 15:28	30	1	1200846		1000	1000		
L209208-MS1	QC	09/26/2012 15:28	30.05	1	1200846	1209067-01	1000	1000		
L209208-MS2	QC	09/26/2012 15:28	30.08	1	1200846	1209069-01	1000	1000		
L209208-MSD1	QC	09/26/2012 15:28	30.15	1	1200846	1209067-01	1000	1000		
L209208-MSD2	QC	09/26/2012 15:28	30.12	1	1200846	1209069-01	1000	1000		


  
 Extracis Relinquished By \_\_\_\_\_ Date 9/27/12


  
 Extracis Received By \_\_\_\_\_ Date 9/27/12

# PAHs



264 Welsh Pool Road  
Exton, PA 19341  
Phone: 610-280-3000  
Fax: 610-280-3041

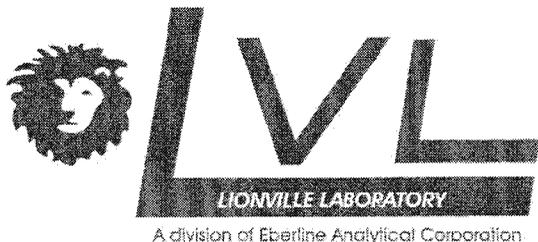
WC-Hanford, Inc.  
2620 Fermi Avenue  
Richland WA, 99354

Project: RC-189  
Project Number: K3992  
Project Manager: Joan Kessner

Reported:  
10/03/2012 19:02

**Analytical Report for Polynuclear Aromatic Compounds by SW846 8310**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
J1R299	1209069-01	Soil	09/19/2012 10:55	09/21/2012 09:45



264 Welsh Pool Road  
Exton, Pennsylvania 19341  
Phone (610) 280-3000  
Fax (610) 280-3041

### Case Narrative

**Client:** WC-HANFORD RC-189 K3992  
**LVL #:** 1209069

**W.O. #:** 60049-001-001-0001-00  
**Date Received:** 09-14-2012

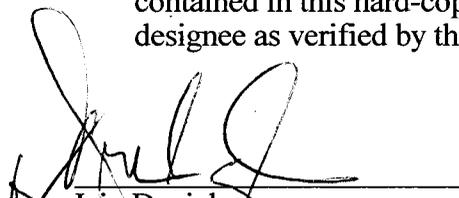
### POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)

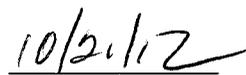
One (1) soil sample was collected on 09-19-2012.

The sample and associated QC samples were extracted 09-26-2012 and analyzed 10-01,02-2012 according to criteria set forth in Lionville Laboratory SOPs. The extraction procedure was based on SW846 Method 3540C and the analysis procedure was based on SW846 Method 8310.

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8. All continuing calibration standards analyzed prior to sample extracts were within acceptance criteria.
9. The sample was reported on a dry weight basis.
10. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard-copy data package has been authorized by the laboratory manager or a designee as verified by the following signature.

  
Iain Daniels  
LvL Laboratory Manager

  
Date



## GLOSSARY OF DATA

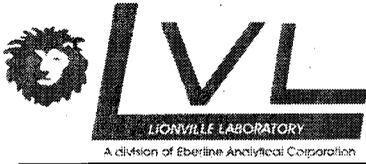
### DATA QUALIFIERS

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264 Welsh Pool Road  
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Phone: 610-280-3000  
Fax: 610-280-3041

WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/03/2012 19:02
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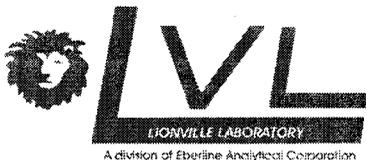
**J1R299**  
**1209069-01 (Soil)**

Analyte	Result and Qualifier	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
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**Lionville Laboratory**

**Polynuclear Aromatic Compounds by SW846 8310**

Naphthalene	11.6		3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Acenaphthylene	0.876	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Acenaphthene	3.30	U	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Fluorene	1.62	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Phenanthrene	1.97	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Anthracene	3.30	U	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Fluoranthene	4.78		3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Indeno[1,2,3-cd]pyrene	1.07	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Pyrene	3.80		3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Benz[a]anthracene	1.92	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Chrysene	2.22	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Benzo[b] fluoranthene	1.07	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Benzo[k] fluoranthene	3.30	U	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Benzo[a] pyrene	1.41	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Dibenz[a,h]anthracene	3.30	U	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Benzo[g,h,i] perylene	0.843	J	3.30	ug/kg dry	1	L209207	09/26/2012	10/02/2012	8310
Surrogate: Triphenylene	103 %		68-129			L209207	09/26/2012	10/02/2012	8310

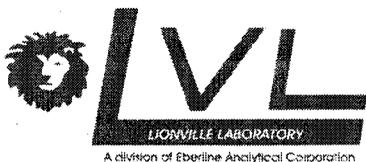


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Fax: 610-280-3041

WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/03/2012 19:02
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**Polynuclear Aromatic Compounds by SW846 8310 - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209207 - SW 3540C</b>									
<b>Blank (L209207-BLK1)</b>				Prepared: 09/26/2012 Analyzed: 10/01/2012					
Naphthalene	3.33 U	3.33	ug/kg wet						
Acenaphthylene	3.33 U	3.33	ug/kg wet						
Acenaphthene	3.33 U	3.33	ug/kg wet						
Fluorene	3.33 U	3.33	ug/kg wet						
Phenanthrene	3.33 U	3.33	ug/kg wet						
Anthracene	3.33 U	3.33	ug/kg wet						
Fluoranthene	3.33 U	3.33	ug/kg wet						
Indeno[1,2,3-cd]pyrene	3.33 U	3.33	ug/kg wet						
Pyrene	3.33 U	3.33	ug/kg wet						
Benz[a]anthracene	3.33 U	3.33	ug/kg wet						
Chrysene	3.33 U	3.33	ug/kg wet						
Benzo[b] fluoranthene	3.33 U	3.33	ug/kg wet						
Benzo[k] fluoranthene	3.33 U	3.33	ug/kg wet						
Benzo[a] pyrene	3.33 U	3.33	ug/kg wet						
Dibenz[a,h]anthracene	3.33 U	3.33	ug/kg wet						
Benzo[g,h,i] perylene	3.33 U	3.33	ug/kg wet						
<i>Surrogate: Triphenylene</i>	179		ug/kg wet	166.67		108	68-129		
<b>LCS (L209207-BS1)</b>				Prepared: 09/26/2012 Analyzed: 10/01/2012					
Naphthalene	128	3.33	ug/kg wet	166.67		77	0-127		
Acenaphthylene	141	3.33	ug/kg wet	166.67		85	50-140		
Acenaphthene	135	3.33	ug/kg wet	166.67		81	17-139		
Fluorene	137	3.33	ug/kg wet	166.67		82	28-145		
Phenanthrene	139	3.33	ug/kg wet	166.67		83	30-152		
Anthracene	143	3.33	ug/kg wet	166.67		86	19-171		
Fluoranthene	139	3.33	ug/kg wet	166.67		83	34-159		
Indeno[1,2,3-cd]pyrene	140	3.33	ug/kg wet	166.67		84	31-156		
Pyrene	137	3.33	ug/kg wet	166.67		82	33-152		
Benz[a]anthracene	144	3.33	ug/kg wet	166.67		86	32-157		
Chrysene	136	3.33	ug/kg wet	166.67		82	31-159		
Benzo[b] fluoranthene	144	3.33	ug/kg wet	166.67		86	33-164		
Benzo[k] fluoranthene	142	3.33	ug/kg wet	166.67		85	28-161		
Benzo[a] pyrene	143	3.33	ug/kg wet	166.67		86	29-149		
Dibenz[a,h]anthracene	147	3.33	ug/kg wet	166.67		88	27-153		
Benzo[g,h,i] perylene	145	3.33	ug/kg wet	166.67		87	32-157		
<i>Surrogate: Triphenylene</i>	206		ug/kg wet	166.67		123	68-129		



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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/03/2012 19:02
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**Polynuclear Aromatic Compounds by SW846 8310 - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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**Batch L209207 - SW 3540C**

<b>Matrix Spike (L209207-MS2)</b>		<b>Source: 1209069-01</b>		<b>Prepared: 09/26/2012</b>		<b>Analyzed: 10/02/2012</b>	
Naphthalene	143	3.33	ug/kg dry	166.65	11.6	79	0-127
Acenaphthylene	164	3.33	ug/kg dry	166.65	0.876	98	50-140
Acenaphthene	137	3.33	ug/kg dry	166.65	3.30 U	82	17-139
Fluorene	154	3.33	ug/kg dry	166.65	1.62	91	28-145
Phenanthrene	157	3.33	ug/kg dry	166.65	1.97	93	30-152
Anthracene	159	3.33	ug/kg dry	166.65	3.30 U	95	19-171
Fluoranthene	164	3.33	ug/kg dry	166.65	4.78	95	34-159
Indeno[1,2,3-cd]pyrene	162	3.33	ug/kg dry	166.65	1.07	97	31-156
Pyrene	163	3.33	ug/kg dry	166.65	3.80	96	33-152
Benz[a]anthracene	170	3.33	ug/kg dry	166.65	1.92	101	32-157
Chrysene	163	3.33	ug/kg dry	166.65	2.22	96	31-159
Benzo[b] fluoranthene	178	3.33	ug/kg dry	166.65	1.07	106	33-164
Benzo[k] fluoranthene	167	3.33	ug/kg dry	166.65	3.30 U	100	28-161
Benzo[a] pyrene	169	3.33	ug/kg dry	166.65	1.41	101	29-149
Dibenz[a,h]anthracene	173	3.33	ug/kg dry	166.65	3.30 U	104	27-153
Benzo[g,h,i] perylene	176	3.33	ug/kg dry	166.65	0.843	105	32-157

*Surrogate: Triphenylene*      187      ug/kg dry      166.65      112      68-129

<b>Matrix Spike Dup (L209207-MSD2)</b>		<b>Source: 1209069-01</b>		<b>Prepared: 09/26/2012</b>		<b>Analyzed: 10/02/2012</b>			
Naphthalene	144	3.31	ug/kg dry	165.83	11.6	80	0-127	1	40
Acenaphthylene	148	3.31	ug/kg dry	165.83	0.876	89	50-140	10	40
Acenaphthene	171	3.31	ug/kg dry	165.83	3.30 U	103	17-139	22	40
Fluorene	142	3.31	ug/kg dry	165.83	1.62	85	28-145	8	40
Phenanthrene	150	3.31	ug/kg dry	165.83	1.97	89	30-152	4	40
Anthracene	149	3.31	ug/kg dry	165.83	3.30 U	90	19-171	6	40
Fluoranthene	183	3.31	ug/kg dry	165.83	4.78	107	34-159	12	40
Indeno[1,2,3-cd]pyrene	152	3.31	ug/kg dry	165.83	1.07	91	31-156	6	40
Pyrene	179	3.31	ug/kg dry	165.83	3.80	106	33-152	10	40
Benz[a]anthracene	165	3.31	ug/kg dry	165.83	1.92	98	32-157	3	40
Chrysene	170	3.31	ug/kg dry	165.83	2.22	101	31-159	5	40
Benzo[b] fluoranthene	191	3.31	ug/kg dry	165.83	1.07	114	33-164	8	40
Benzo[k] fluoranthene	160	3.31	ug/kg dry	165.83	3.30 U	97	28-161	4	40
Benzo[a] pyrene	167	3.31	ug/kg dry	165.83	1.41	100	29-149	0.7	40
Dibenz[a,h]anthracene	158	3.31	ug/kg dry	165.83	3.30 U	95	27-153	9	40
Benzo[g,h,i] perylene	173	3.31	ug/kg dry	165.83	0.843	104	32-157	1	40

*Surrogate: Triphenylene*      188      ug/kg dry      165.83      113      68-129

PREPARATION BENCH SHEET

L209207

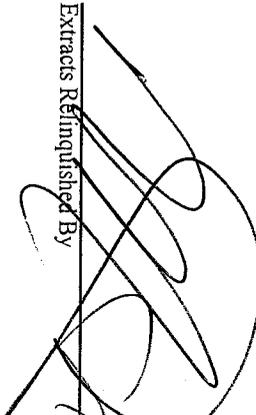
Lionville Laboratory

Printed: 9/27/2012 1:08:55PM

Prepared using: Extraction - SW 3540C

Surrogate used: 1200612

Lab Number	Analysis	Prepared	Initial (g)	Final (mL)	Spike ID	Source ID	Spike (ul)	Surrogate (ul)	Client	Extraction Comments
L209067-01	8310 PAH	09/26/2012 15:23	30.83	5				50	WC-Hanford, Inc.	
L209069-01	8310 PAH	09/26/2012 15:23	30.54	5				50	WC-Hanford, Inc.	
L209207-BLK1	QC	09/26/2012 15:23	30	5				50		
L209207-BS1	QC	09/26/2012 15:23	30	5	1200963		50	50		
L209207-MS1	QC	09/26/2012 15:23	30.27	5	1200963	1209067-01	50	50		
L209207-MS2	QC	09/26/2012 15:23	30.3	5	1200963	1209069-01	50	50		
L209207-MSD1	QC	09/26/2012 15:23	30.46	5	1200963	1209067-01	50	50		
L209207-MSD2	QC	09/26/2012 15:23	30.45	5	1200963	1209069-01	50	50		

Extracts Relinquished By 

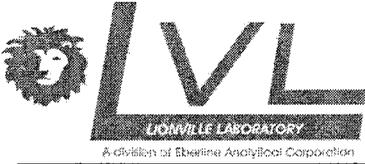
Date 9/27/12

1320

Extracts Received By 

Date 9/27/12

# METALS



264 Welsh Pool Road  
Exton, PA 19341  
Phone: 610-280-3000  
Fax: 610-280-3041

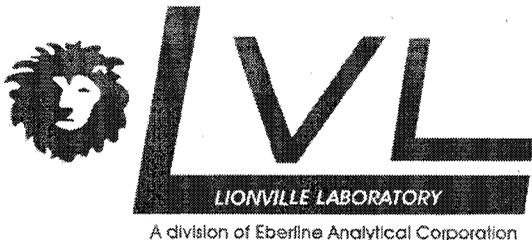
WC-Hanford, Inc.  
2620 Fermi Avenue  
Richland WA, 99354

Project: RC-189  
Project Number: K3992  
Project Manager: Joan Kessner

Reported:  
10/01/2012 13:32

**Analytical Report for Metals by SW846 6000/7000 series**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
J1R299	1209069-01	Soil	09/19/2012 10:55	09/21/2012 09:45



264 Welsh Pool Road  
Exton, Pennsylvania 19341  
Phone (610) 280-3000  
Fax (610) 280-3041

## Case Narrative

**Client:** WC-HANFORD RC-189  
**LVL#:** 1209069  
**SDG/SAF#:** K3992/RC-189

**W.O.#:** 60049-001-001-0001-00  
**Date Received:** 09-21-12

### METALS

The following is a summary of the QC results accompanying the sample results. Lionville Laboratory (LvL) certifies that all test results meet the requirements of NELAC except as noted below.

All soil samples are reported on a dry weight basis unless requested by the client, required by the method, or noted otherwise.

1. This narrative covers the analysis of 1 soil sample.
2. The sample was prepared and analyzed in accordance with methods listed on the data report forms.

The sample was analyzed and reported with a 3-fold dilution for ICP metals due to sample matrix.

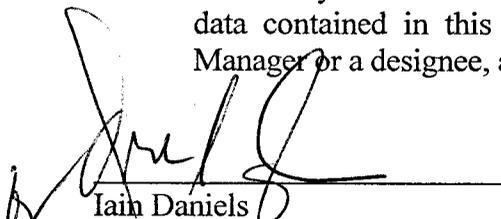
3. All analyses were performed within the required holding times.
4. Please refer to the Sample Receipt Check List for any sample discrepancies in LvL's sample acceptance policy.
5. All Initial and Continuing Calibration Verifications (ICV/CCVs) were within the 90-110% control limits (80-120% for Mercury).
6. All Initial and Continuing Calibration Blanks (ICB/CCBs) were within control limits.
7. All preparation/method blanks (MB) were within method criteria {less than the Limit of Quantitation, samples greater than 20X MB value}.
8. All ICP Interference Check Standards were within control limits.
9. All Standard Reference Material (SRM) analytes were within the Prediction Interval control limits supplied by the manufacturer.
10. The matrix spike (MS) recoveries for 6 analytes were outside the 75-125% control limits.

11. For analytes where the ICP MS is out-of-control, a post-digestion MS (PDS) and serial dilution are performed. A PDS was prepared at meaningful concentration levels for the following analytes:

<u>Sample ID</u>	<u>Element</u>	<u>PDS Concentration (ppb)</u>	<u>PDS % Recovery</u>
J1R299	Aluminum	22,000	81.5
	Antimony	100	88.4
	Iron	42,000	64.7
	Magnesium	21,600	78.3
	Manganese	1,000	78.6
	Silicon	1,000	86.9

The PDS was prepared with sample L209198-DUP2 due to insufficient sample volume of sample J1R299.

12. The duplicate analysis for 1 analyte was outside the 20% Relative Percent Difference (RPD) control limits. The  $\pm 20\%$  RPD control limit applies to sample results greater than ten times the MDL.
13. For the purposes of this report, the data have been reported to the Limit of Detection (LOD). Values between the LOD and the Limit of Quantitation (LOQ) are acquired in a region of less-certain quantification.
14. LvL is NELAP accredited by the State of Pennsylvania. For a complete listing of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager.
15. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard-copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

  
 Iain Daniels  
 Laboratory Manager  
 Lionville Laboratory

10/8/12  
 Date

alm/09-069hg%



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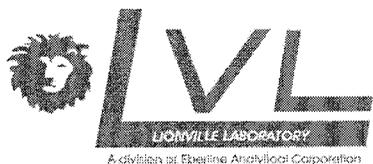
WC-Hanford, Inc.  
2620 Fermi Avenue  
Richland WA, 99354

Project: RC-189  
Project Number: K3992  
Project Manager: Joan Kessner

Reported:  
10/01/2012 13:32

### Notes and Definitions

- U Analyte included in the analysis, but not detected
- J Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
- B Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag)
- \* Value outside QC acceptance criteria
- 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
- wet Sample results reported on a wet weight basis
- RPD Relative Percent Difference



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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/01/2012 13:32
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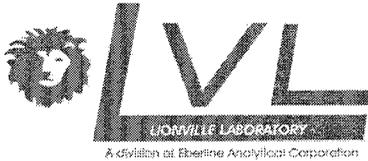
**J1R299**  
**1209069-01 (Soil)**

Analyte	Result and Qualifier	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
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**Lionville Laboratory**

**Metals by SW846 6000/7000 series**

<b>Aluminum</b>	<b>5020</b>		14.0	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Antimony	1.68	U	1.68	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Arsenic</b>	<b>1.66</b>	B	2.81	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Barium</b>	<b>46.6</b>		1.40	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Beryllium</b>	<b>0.212</b>	B	0.561	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Boron	5.61	U	5.61	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Cadmium	0.561	U	0.561	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Calcium</b>	<b>6250</b>		281	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Chromium</b>	<b>4.88</b>		0.561	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Cobalt</b>	<b>9.82</b>		5.61	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Copper</b>	<b>15.8</b>		2.81	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Iron</b>	<b>30500</b>		56.1	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Lead</b>	<b>2.45</b>		1.40	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Magnesium</b>	<b>5070</b>		210	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Manganese</b>	<b>343</b>		14.0	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Molybdenum	5.61	U	5.61	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Nickel</b>	<b>9.83</b>	B	11.2	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Potassium</b>	<b>601</b>	B	1120	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Selenium	0.842	U	0.842	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Silicon</b>	<b>584</b>		5.61	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Silver	0.561	U	0.561	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Sodium</b>	<b>390</b>		140	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Vanadium</b>	<b>89.7</b>		7.01	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
<b>Zinc</b>	<b>52.3</b>		28.1	mg/kg dry	3	L209198	09/26/2012	09/28/2012	6010B
Mercury	0.0239	U	0.0239	mg/kg dry	1	L209202	09/26/2012	09/28/2012	7471A



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WC-Hanford, Inc.  
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 Richland WA, 99354

Project: RC-189  
 Project Number: K3992  
 Project Manager: Joan Kessner

Reported:  
 10/01/2012 13:32

**Metals by SW846 6000/7000 series - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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**Batch L209198 - SW 3050B**

<b>Blank (L209198-BLK1)</b>					Prepared: 09/26/2012 Analyzed: 09/27/2012				
Aluminum	4.90	U	4.90	mg/kg wet					
Antimony	0.588	U	0.588	mg/kg wet					
Arsenic	0.980	U	0.980	mg/kg wet					
Barium	0.490	U	0.490	mg/kg wet					
Beryllium	0.196	U	0.196	mg/kg wet					
Boron	1.96	U	1.96	mg/kg wet					
Cadmium	0.196	U	0.196	mg/kg wet					
Calcium	98.0	U	98.0	mg/kg wet					
Chromium	0.196	U	0.196	mg/kg wet					
Cobalt	1.96	U	1.96	mg/kg wet					
Copper	0.980	U	0.980	mg/kg wet					
Iron	19.6	U	19.6	mg/kg wet					
Lead	0.490	U	0.490	mg/kg wet					
Magnesium	1.21	B	73.5	mg/kg wet					
Manganese	4.90	U	4.90	mg/kg wet					
Molybdenum	1.96	U	1.96	mg/kg wet					
Nickel	3.92	U	3.92	mg/kg wet					
Potassium	392	U	392	mg/kg wet					
Selenium	0.294	U	0.294	mg/kg wet					
Silicon	1.96	U	1.96	mg/kg wet					
Silver	0.196	U	0.196	mg/kg wet					
Sodium	49.0	U	49.0	mg/kg wet					
Vanadium	2.45	U	2.45	mg/kg wet					
Zinc	9.80	U	9.80	mg/kg wet					

<b>Duplicate (L209198-DUP2)</b>					<b>Source: 1209069-01</b>					Prepared: 09/26/2012 Analyzed: 09/28/2012	
Aluminum	5000		12.8	mg/kg dry			5020		0.285	20	
Antimony	1.54	U	1.54	mg/kg dry			1.68 U			20	
Arsenic	1.81	B	2.57	mg/kg dry			1.66		8.75	20	
Barium	56.2		1.28	mg/kg dry			46.6		18.6	20	
Beryllium	0.220	B	0.514	mg/kg dry			0.212		3.58	20	
Boron	5.14	U	5.14	mg/kg dry			5.61 U			20	
Cadmium	0.514	U	0.514	mg/kg dry			0.561 U			20	
Calcium	6400		257	mg/kg dry			6250		2.34	20	
Chromium	4.59		0.514	mg/kg dry			4.88		6.13	20	
Cobalt	9.72		5.14	mg/kg dry			9.82		0.946	20	
Copper	15.5		2.57	mg/kg dry			15.8		1.45	20	



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WC-Hanford, Inc.  
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 Richland WA, 99354

Project: RC-189  
 Project Number: K3992  
 Project Manager: Joan Kessner

Reported:  
 10/01/2012 13:32

**Metals by SW846 6000/7000 series - Quality Control**

**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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**Batch L209198 - SW 3050B**

Duplicate (L209198-DUP2)		Source: 1209069-01		Prepared: 09/26/2012		Analyzed: 09/28/2012	
Iron	30200	51.4	mg/kg dry	30500		1.25	20
Lead	2.53	1.28	mg/kg dry	2.45		2.94	20
Magnesium	4750	193	mg/kg dry	5070		6.61	20
Manganese	364	12.8	mg/kg dry	343		5.78	20
Molybdenum	5.14 U	5.14	mg/kg dry	5.61 U			20
Nickel	8.30 B	10.3	mg/kg dry	9.83		17.0	20
Potassium	638 B	1030	mg/kg dry	601		6.08	20
Selenium	0.770 U	0.770	mg/kg dry	0.842 U			20
Silicon	375	5.14	mg/kg dry	584		43.6*	20
Silver	0.514 U	0.514	mg/kg dry	0.561 U			20
Sodium	322	128	mg/kg dry	390		19.1	20
Vanadium	91.4	6.42	mg/kg dry	89.7		1.86	20
Zinc	53.4	25.7	mg/kg dry	52.3		2.06	20

Matrix Spike (L209198-MS2)		Source: 1209069-01		Prepared: 09/26/2012		Analyzed: 09/28/2012	
Aluminum	6070	13.3	mg/kg dry	177.17	5020	594*	75-125
Antimony	15.3	1.59	mg/kg dry	44.293	1.68 U	34.6*	75-125
Arsenic	155	2.66	mg/kg dry	177.17	1.66	86.6	75-125
Barium	221	1.33	mg/kg dry	177.17	46.6	98.2	75-125
Beryllium	4.10	0.532	mg/kg dry	4.4293	0.212	87.7	75-125
Boron	75.7	5.32	mg/kg dry	88.587	5.61 U	85.5	75-125
Cadmium	3.77	0.532	mg/kg dry	4.4293	0.561 U	85.0	75-125
Calcium	8890	266	mg/kg dry	2214.7	6250	119	75-125
Chromium	18.8	0.532	mg/kg dry	17.717	4.88	78.5	75-125
Cobalt	49.0	5.32	mg/kg dry	44.293	9.82	88.5	75-125
Copper	36.5	2.66	mg/kg dry	22.147	15.8	93.6	75-125
Iron	30500	53.2	mg/kg dry	88.587	30500	-15.0*	75-125
Lead	39.7	1.33	mg/kg dry	44.293	2.45	84.2	75-125
Magnesium	6480	199	mg/kg dry	2214.7	5070	63.4*	75-125
Manganese	489	13.3	mg/kg dry	44.293	343	329*	75-125
Molybdenum	78.0	5.32	mg/kg dry	88.587	5.61 U	88.0	75-125
Nickel	46.0	10.6	mg/kg dry	44.293	9.83	81.7	75-125
Potassium	2600	1060	mg/kg dry	2214.7	601	90.3	75-125
Selenium	150	0.797	mg/kg dry	177.17	0.842 U	84.5	75-125
Silicon	528	5.32	mg/kg dry	88.587	584	-62.9*	75-125
Silver	3.70	0.532	mg/kg dry	4.4293	0.561 U	83.6	75-125
Sodium	2500	133	mg/kg dry	2214.7	390	95.3	75-125

000000042

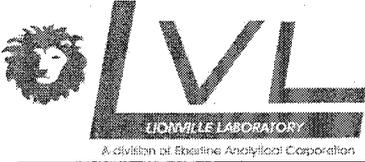


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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/01/2012 13:32
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**Metals by SW846 6000/7000 series - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209198 - SW 3050B</b>									
<b>Matrix Spike (L209198-MS2)</b>		<b>Source: 1209069-01</b>		<b>Prepared: 09/26/2012 Analyzed: 09/28/2012</b>					
Vanadium	130	6.64	mg/kg dry	44.293	89.7	89.8	75-125		
Zinc	94.6	26.6	mg/kg dry	44.293	52.3	95.4	75-125		
<b>Reference (L209198-SRM1)</b>		<b>Prepared: 09/26/2012 Analyzed: 09/27/2012</b>							
Aluminum	9370	13.9	mg/kg wet	6670.0		140	0-200.89		
Antimony	24.9	1.67	mg/kg wet	53.000		47.0	0-235.8		
Arsenic	111	2.78	mg/kg wet	114.00		97.4	82.8-117.54		
Barium	295	1.39	mg/kg wet	307.00		96.1	79.8-120.2		
Beryllium	102	0.556	mg/kg wet	108.00		94.2	82.8-117.6		
Boron	76.5	5.56	mg/kg wet	85.100		89.9	67.5-132.8		
Cadmium	219	0.556	mg/kg wet	225.00		97.2	83.6-116.4		
Calcium	3060	278	mg/kg wet	3360.0		90.9	83.3-116.9		
Chromium	74.9	0.556	mg/kg wet	77.200		97.1	73.3-126.4		
Cobalt	158	5.56	mg/kg wet	166.00		95.2	80.7-118.7		
Copper	267	2.78	mg/kg wet	271.00		98.7	80.8-119.2		
Iron	7930	55.6	mg/kg wet	8420.0		94.2	78.6-121.1		
Lead	172	1.39	mg/kg wet	190.00		90.6	81.6-118.4		
Magnesium	7310	208	mg/kg wet	8570.0		85.2	83.2-116.7		
Manganese	869	13.9	mg/kg wet	965.00		90.0	69.3-130.5		
Molybdenum	221	5.56	mg/kg wet	235.00		94.2	76.2-123.8		
Nickel	213	11.1	mg/kg wet	221.00		96.3	79.6-120.8		
Potassium	13500	1110	mg/kg wet	14400		93.8	81.9-118.1		
Selenium	185	0.833	mg/kg wet	187.00		98.9	75.9-124.6		
Silicon	386	5.56	mg/kg wet	807.00		47.8	0-219.3		
Silver	79.0	0.556	mg/kg wet	83.500		94.6	82.7-117.1		
Sodium	9120	139	mg/kg wet	9730.0		93.8	82.5-117.2		
Vanadium	97.3	6.94	mg/kg wet	98.700		98.6	75.9-123.6		
Zinc	193	27.8	mg/kg wet	199.00		97.1	78.4-121.6		



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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/01/2012 13:32
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**Metals by SW846 6000/7000 series - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209202 - SW 7471A Prep</b>									
<b>Blank (L209202-BLK1)</b>				Prepared: 09/26/2012 Analyzed: 09/28/2012					
Mercury	0.0290 U	0.0290	mg/kg wet						
<b>Duplicate (L209202-DUP4)</b>				Source: 1209069-01 Prepared: 09/26/2012 Analyzed: 09/28/2012					
Mercury	0.0233 U	0.0233	mg/kg dry		0.0239 U				20
<b>Matrix Spike (L209202-MS4)</b>				Source: 1209069-01 Prepared: 09/26/2012 Analyzed: 09/28/2012					
Mercury	0.142	0.0239	mg/kg dry	0.13288	0.0239 U	107	75-125		20
<b>Reference (L209202-SRM1)</b>				Prepared: 09/26/2012 Analyzed: 09/28/2012					
Mercury	1.26	0.0281	mg/kg wet	1.2900		97.7	62.6-138		

SAMPLE DIGESTION RECORD

Digestion Batch #: L209198 *w-e pm 9/26/12*  
 Date/Time Initiated: 9/26/12 1445 1730  
 Date/Time Completed: 9/26/12 2205  
 Analyst: MM/Kup  
 Matrix (circle): Soil Water Other  
 Method (circle one): 3005A 3010A 3050 200.7 (1994)  
 pH/Turbidity: N/A for Solids.

Digested / Undigested (circle one)  
 Balance #: 014  
 Balance Cal Verification: Ⓢ NA  
 Temp: 95°  
 BLOCK 1 2 (circle one)

NOTE: All temperatures are recorded as corrected temperatures

Work Order #	Spike Vol (mL)	Initial Wt/Vol (g/mL)	Final Vol (mL)	pH <	Type: To/Sol/TC	Texture	Color / Appearance	Artifact	Turb
1209067-01		0.57	50		TD	fine	light brown/sandy	rocks	
L209198-DUP1		0.50	50						
MS1	0.5	0.57	50						
1209069-01		0.54	50			not fine	gray tan/granular	rocks	
L209198-DUP2		0.59	50						
MS2	0.5	0.57	50						
BKH		0.51	50			coarse	boiling chips		
SAMI		0.54	50			fine	pink sandy		

*MM 9/26/12*

Spiking IDs / Expiration Date:

MS#: 1200457

LCS#: Ⓢ 1201014

Reagent IDs:

HNO<sub>3</sub> L08023

HCl L13029

H<sub>2</sub>O<sub>2</sub> R09A03

1:1 HNO<sub>3</sub> 637-066-02

1:1 HCl

File ID#:

Data Review By/Date:

AM 9/27/12

R:\group\QA\SOP\

Signed\SPR\Metals Digestion log.doc

Page #:

Analyst: M. J. L.  
 Date: 9/26/12 - 9/27/12  
 Start Time/Temp: 1820/94°  
 End Time/Temp: 1855/95°

Instrument ID: HG3.1  
 Balance #: B14 /NA  
 Pipette Calibration (Daily) (Y)

Logbook # 1153  
 Prep Batch: L209202  
 Worksheet: HG-092801  
 SOP No. ME-HgCVAA  
 BLOCK 1 (3) 2 (circle one)

NOTE: All temperatures are recorded as corrected temperatures.

LVL Work Order#	pH < 2 (Liq)	Spike Vol (mL)	Spike Conc. (µg/L)	Initial Wt. or Vol (g or mL)	Final Sample Vol (mL)	Comments, % Solids, etc.
Blank				10ml	50	
0.2 µg/L		0.100		10ml	50	
1.0 µg/L		0.500		10ml	50	
2.0 µg/L		1.000		10ml	50	
5.0 µg/L		2.500		10ml	50	
10.0 µg/L		5.000		10ml	50	
ICW		0.125	2.5	10ml	50	
CCW		0.250	5.0	10ml	50	
ICB/CCB				10ml	50	
L209202-BLK1				0.31	50	
SRM1				0.32	50	
1209061-01				0.32	50	
L209202-DUP1				0.33	50	
MS1		0.500	1.0	0.32	50	
1209061-02				0.32	50	
1209067-01				0.34	50	
L209202-DUP2				0.36	50	
MS2		0.500	1.0	0.36	50	
1209068-01				0.37	50	
L209202-DUP3				0.39	50	
MS3		0.500	1.0	0.37	50	
1209069-01				0.38	50	
L209202-DUP4				0.39	50	
MS4		0.500	1.0	0.38	50	
1209071-01				0.36	50	
L209202-DUP5				0.37	50	
MS5		0.500	1.0	0.38	50	

Standard:	ID	Prep Date/Time
ICAL/MS	BI 120582	9/27/12 1300
ICV/CCV/LCS	(I.V. 120582)	

Reviewed By/Date: ajm 9/28/12

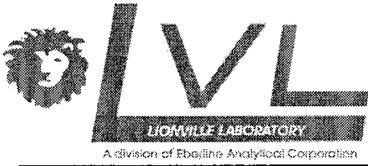
Soil LCS True Value = 1.29 mg/Kg  
 Standard # 1201019

see book # 1153 for std traceability information

Water Matrix Spiking Solution Concentration = 0.1 µg/ml  
 after LCS Spiking Concentration: 1.0 µg/ml



# WET CHEMISTRY

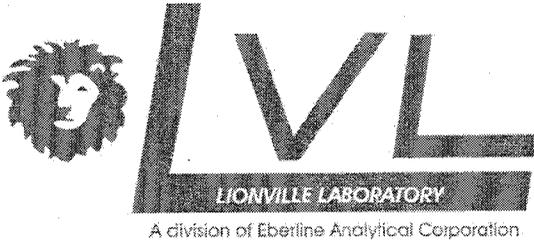


Lionville Laboratory, PADEP Lab ID# 15-00009  
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WC-Hanford, Inc. 2620 Fermi Avenue Richland WA, 99354	Project: RC-189 Project Number: K3992 Project Manager: Joan Kessner	Reported: 10/05/2012 11:48
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**Analytical Report for Wet Chemistry**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
J1R299	1209069-01	Soil	09/19/2012 10:55	09/21/2012 09:45



264 Welsh Pool Road  
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## Case Narrative

**Client:** WC-HANFORD RC-189 K3992  
**LVL#:** 1209069

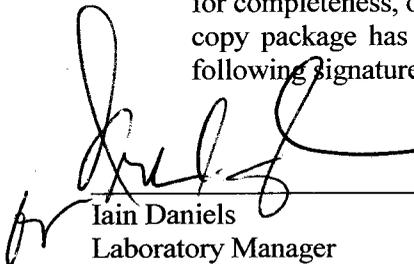
**Date Received:** 09-21-12

### INORGANIC NARRATIVE

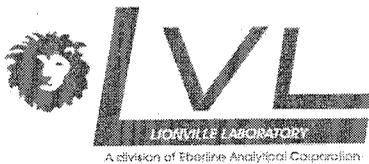
1. This narrative covers the analyses of 1 soil sample.
2. The sample was prepared and analyzed in accordance with the methods indicated on the data summary report.

Lionville Lab (LvL) is NELAP accredited by the State of Pennsylvania. For a complete list of accrediting authorities and the corresponding analytes/methods, please contact your Project Manager. LvL certifies that all test results meet the requirements of NELAC with any exception noted in the following statements.

3. Sample holding times as required by the method and/or contract were met.
4. The results presented in this report are derived from a sample that met LvL's sample acceptance policy.
5. The method blank for Oil and Grease (HEM) were within the method criteria.
6. The Laboratory Control Samples (LCS) for Oil and Grease (HEM) were within the laboratory control limits.
7. The matrix spike recovery for Oil and Grease (HEM) was within the 75-125% control limits.
8. The replicate analysis for Percent Solids was within the 20% Relative Percent Difference (RPD) control limit however Oil and Grease (HEM) was at 30% where one result was above and the other below the limit of quantitation.
9. Results for soil samples are reported on a dry weight basis.
10. I certify that this sample data package is in compliance with SOW requirements, both technically and for completeness, other than the conditions detailed above. Release of the data contained in this hard copy package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

  
\_\_\_\_\_  
Iain Daniels  
Laboratory Manager  
Lionville Laboratory  
npj\09-069

10/11/12  
Date



Lionville Laboratory, PADEP Lab ID# 15-00009  
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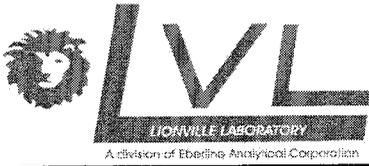
WC-Hanford, Inc.  
2620 Fermi Avenue  
Richland WA, 99354

Project: RC-189  
Project Number: K3992  
Project Manager: Joan Kessner

Reported:  
10/05/2012 11:48

### Notes and Definitions

- U Analyte included in the analysis, but not detected
- B Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
- \* Value outside QC acceptance criteria
- 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
- Wet Sample results reported on a wet weight basis
- RPD Relative Percent Difference
- LOD Limit of Detection (LOD): the minimum estimated concentration of a target analyte that can be detected reliably. Concentrations at the LOD or between the LOD and LOQ are flagged estimated with either a 'J' qualifier or client-specific qualifier.
- LOQ Limit of Quantitation (LOQ): the minimum concentration of a target analyte that can be quantified reliably

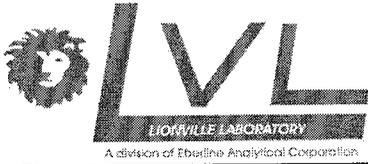


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**Wet Chemistry**  
**Lionville Laboratory**

Analyte	Result and Qualifier	LOD	LOQ	Units	Dilution	Batch	Prepared	Analyzed	Method
<b>J1R299 (1209069-01) Soil</b>									
<b>Oil &amp; Grease (HEM)</b>	<b>38.5 B</b>	17.9	51.2	mg/kg dry	1	L210036	10/04/2012 22:30	10/04/2012 23:50	EPA 1664A
<b>%Solids</b>	<b>99.0</b>		0.1	% by Weight	1	L209177	09/24/2012 17:10	09/24/2012 17:10	SM2540G



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2620 Fermi Avenue  
Richland WA, 99354

Project: RC-189  
Project Number: K3992  
Project Manager: Joan Kessner

Reported:  
10/05/2012 11:48

**Wet Chemistry - Quality Control**  
**Lionville Laboratory**

Analyte	Result and Qualifiers	LOD	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L209177 - % Solids</b>										
<b>Duplicate (L209177-DUP2)</b>		<b>Source: 1209069-01</b>		<b>Prepared: 09/24/2012 17:10 Analyzed: 09/24/2012 17:10</b>						
%Solids	99.1		0.1	% by Weight		99.0			0.03	20
<b>Batch L210036 - Default Prep GenChem</b>										
<b>Blank (L210036-BLK1)</b>		<b>Prepared: 10/04/2012 22:30 Analyzed: 10/04/2012 23:50</b>								
Oil & Grease (HEM)	17.9 U	17.9	51.2	mg/kg wet						
<b>LCS (L210036-BS1)</b>		<b>Prepared: 10/04/2012 22:30 Analyzed: 10/04/2012 23:50</b>								
Oil & Grease (HEM)	1310	17.0	51.2	mg/kg wet	1315.2		99	80-120		
<b>LCS (L210036-BS2)</b>		<b>Prepared: 10/04/2012 22:30 Analyzed: 10/04/2012 23:50</b>								
Oil & Grease (HEM)	1380	17.5	51.2	mg/kg wet	1354.1		102	80-120		
<b>Duplicate (L210036-DUP1)</b>		<b>Source: 1209069-01</b>		<b>Prepared: 10/04/2012 22:30 Analyzed: 10/04/2012 23:50</b>						
Oil & Grease (HEM)	52.1	15.7	51.2	mg/kg dry		38.5			30*	20
<b>Matrix Spike (L210036-MS1)</b>		<b>Source: 1209069-01</b>		<b>Prepared: 10/04/2012 22:30 Analyzed: 10/04/2012 23:50</b>						
Oil & Grease (HEM)	2440	15.4	51.2	mg/kg dry	2390.6	38.5	100	75-125		