

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

COMPLETE COPY OF FINAL VALIDATION PACKAGE TO:

Kathy Wendt H4-21

COMMENTS:

SDG K4000 SAF-RC-189

Sample Location: UPR-100-N-31/ UPR-100-N-4 / UPR-100-N-8

Date: 28 January 2013
To: Washington Closure Hanford Inc. (technical representative)
From: ELR Consulting
Project: 100N Field Remediation – Soil Full Protocol – Waste Site UPR-100-N-31,
UPR-100-N-4 and UPR-100-N-8
Subject: Wet Chemistry - Data Package No. K4000-LLI

INTRODUCTION

This memo presents the results of data validation on Data Package No. K4000 prepared by Lionville Laboratories Inc. (LLI). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analyte
J1R2V0	10/10/12	Soil	C	See note 1
J1R2V1	10/10/12	Soil	C	See note 1
J1R2V2	10/10/12	Soil	C	See note 1
J1R2V3	10/10/12	Soil	C	See note 1
J1R2V4	10/10/12	Soil	C	See note 1
J1R2V5	10/10/12	Soil	C	See note 1
J1R2V6	10/10/12	Soil	C	See note 1
J1R2V7	10/10/12	Soil	C	See note 1
J1R2V8	10/10/12	Soil	C	See note 1
J1R2V9	10/10/12	Soil	C	See note 1
J1R2W0	10/10/12	Soil	C	See note 1
J1R2W1	10/10/12	Soil	C	See note 1

1 – Hexavalent chromium (7196A) & nitrate/nitrite by 353.2.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites (DOE/RL-2005-92, Rev. 0, October 2006). Appendices 1 through 6 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Documentation Requested by Client

DATA QUALITY PARAMETERS

Holding Times

Analytical holding times for metals are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 30 days for chromium VI and 28 days for nitrate/nitrite.

If holding times are exceeded, but not by greater than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detectable sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

All holding times were acceptable.

- **Method Blanks**

Method Blanks

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. All blank results must fall below the contract required detection limit (CRQL) to be acceptable.

All method blank results were acceptable.

Field Blanks

No field blanks were submitted for analysis.

- **Accuracy**

Matrix Spike and Laboratory Control Sample

Matrix spike (MS) and laboratory control sample (LCS) analyses are used to assess the analytical accuracy of the reported data. The matrix spike is used to assess the effect of the matrix on the ability to accurately quantify sample concentrations. Recoveries must fall within the range of 70% to 130%. Samples with a recovery of less than 30% and a sample result below the IDL are rejected and flagged "UR". Samples with a recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a recovery greater than 130% and a sample result less than the IDL, no qualification is required.

All accuracy results were acceptable.

- **Precision**

Laboratory Duplicate Samples

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of matrix spike duplicate (MSD) analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the CRDL and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All laboratory duplicate results were acceptable.

Field Duplicate

One set of field duplicates (J1R2V0/J1R2W1) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. All field duplicate results were acceptable.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against the required quantitation limits (RQLs) to ensure that laboratory detection levels meet the required criteria. All analytes met the RQL.

- **Completeness**

Data package K4000 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

None found.

REFERENCES

Washington Closure Hanford Contract #S00W307A00 (March 2008), *Data Validation Services*.

DOE/RL-2005-92, Rev. 0, 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites, U.S. Department of Energy, October 2006.

Appendix 1
Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with WCH validation SOW are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

Appendix 2
Summary of Data Qualification

WET CHEMISTRY DATA QUALIFICATION SUMMARY*

SDG: K4000	REVIEWER: ELR	Project: UPR-100-N- 31, UPR-100-N-4 and UPR-100-N-8	PAGE <u>1</u> OF <u>1</u>
COMMENTS: No qualifiers assigned			

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3
Annotated Laboratory Reports



Lionville Laboratory, PADEP Lab ID# 15-00009
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: K4000
Project Manager: Joan Kessner

Reported:
10/27/2012 14:27

V\12/3

Wet Chemistry
Lionville Laboratory

Analyte	Result and Qualifier	LOD	LOQ	Units	Dilution	Batch	Prepared	Analyzed	Method
J1R2V0 (1210043-01) Soil									
%Solids	99.3		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.10 U	0.10	0.49	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:40	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V1 (1210043-02) Soil									
%Solids	99.2		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.19 B	0.10	0.48	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:42	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V2 (1210043-03) Soil									
%Solids	99.5		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.54	0.10	0.48	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:43	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V3 (1210043-04) Soil									
%Solids	99.3		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.22 B	0.10	0.50	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:45	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V4 (1210043-05) Soil									
%Solids	99.0		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.29 B	0.10	0.48	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:46	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V5 (1210043-06) Soil									
%Solids	98.7		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.63	0.10	0.51	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:47	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.51	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A



Lionville Laboratory, PADEP Lab ID# 15-00009
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: K4000
Project Manager: Joan Kessner

Reported:
10/27/2012 14:27

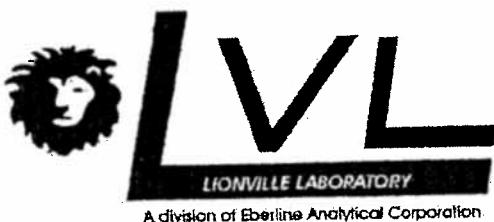
V.1(27/13)

Wet Chemistry
Lionville Laboratory

Analyte	Result and Qualifier	LOD	LOQ	Units	Dilution	Batch	Prepared	Analyzed	Method
J1R2V6 (1210043-07) Soil									
%Solids	99.2		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.55	0.10	0.48	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:49	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V7 (1210043-08) Soil									
%Solids	99.2		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.17 B	0.10	0.49	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:50	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V8 (1210043-09) Soil									
%Solids	99.4		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.25 B	0.09	0.45	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:54	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2V9 (1210043-10) Soil									
%Solids	99.0		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.22 B	0.10	0.49	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:55	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.51	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2W1 (1210043-11) Soil									
%Solids	99.3		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G
Nitrate/Nitrite as N	0.16 B	0.10	0.49	mg/kg dry	1	L210222	10/22/2012 15:30	10/23/2012 13:56	EPA 353.2
Hexavalent Chromium	0.20 U	0.20	0.50	mg/kg dry	1	L210110	10/15/2012 12:34	10/18/2012 15:25	SW846 7196A
J1R2W2 (1210043-12) Soil									
%Solids	100		0.1	% by Weight	1	L210117	10/15/2012 16:40	10/15/2012 16:40	SM2540G

Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation



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

Case Narrative

Client: WC HANFORD SAF# RC-189
LVL#: 1210043

W.O.#:
Date Received: 10-12-2012

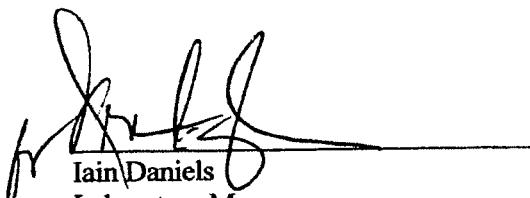
INORGANIC NARRATIVE

1. This narrative covers the analyses of 12 soil samples.
2. The samples were 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 samples that met LvL's sample acceptance policy as noted on the Sample Receipt Checklist.
5. The method blanks were within the method criteria.
6. The Laboratory Control Samples (LCS) were within the laboratory control limits.
7. The matrix spike recoveries were within the applicable control limits as noted in the Analytical Report.
8. The replicate analyses were within the 20% Relative Percent Difference (RPD) control limit or less than 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

mld/i10-043



10/27/12

Date

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CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				RC-189-125	Page 2 of 3
Washington Closure Hanford	Company Contact John Kosner	Telephone No. 375-4688	Project Coordinator KESNER, JH	Price Code 8K	Data Turnaround <u>21 Days</u> <u>10/10/12</u>
Collector Q. Slowe	Sampling Location UPR10N31 Verification-Deep Zone	SAP No. RC-189	Method of Shipment Hand Deliver (Fed Ex)	Date/Time <u>10/10/12</u>	
Project Description 100N Field Remediation - Soil Pull Protocol	Field Logbook No. EI-1652-07	COA RJ0N312000	Bill of Lading/Air Bill No.	<u>See OSPC</u>	
Ice Chest No. <u>WCH - 11-014</u>	Offsite Property No. <u>A110 541</u>				
POSSIBLE SAMPLE HAZARDS/REMARKS <i>Potentially Rad & DOT L1 m⁷⁻⁸ AD 10-10-12</i>					
Special Handling and/or Storage <i>Cool 4°C None 10/10/12</i>					
SAMPLE ANALYSIS					
Sample No.	Matrix *	Sample Date	Sample Time	SPECIAL INSTRUCTIONS Cool 4C	
J1R2V5	SOIL	10-10-12	0915	X	X
J1R2V6	SOIL	10-10-12	0931	Y	Y
J1R2V7	SOIL	10-10-12	0947	Y	Y
J1R2V8	SOIL	10-10-12	1006	Y	Y
J1R2V9	SOIL	10-10-12	0957	X	X
SPECIAL INSTRUCTIONS Cool 4C					
CHAIN OF POSSESSION					
Retained By/Removed From <i>Randy Strode</i>	Date/Time <u>10/10/12</u>	Received By/Stored In <i>D. Dennis Ahern</i>	Date/Time <u>10/10/12</u>	(1) ICP Metal - 6010TR (Close-out Lab) (Aluminum, Antimony, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7471 - (CV) (2) ICP-Arson - 2000 (Boronate ester/amine, Nitrate-Nitrite Phosphater, Sulfate); NOD/N03 - 3532; pH (200) - 3046 - <u>10/10/12</u>	
Retained By/Removed From <i>D. Dennis Ahern</i>	Date/Time <u>10/10/12</u>	Received By/Stored In <i>A. Freier</i>	Date/Time <u>10/10/12</u>	(3) Gamma Spec (Client Lab) (Americium-241, Calcium-137, Cobalt-60, Europium-152, Europium-155, Radium-226)	
Retained By/Removed From <i>A. Freier</i>	Date/Time <u>10/10/12</u>	Received By/Stored In <i>J.A. Zavv</i>	Date/Time <u>10/10/12</u>	Sample J.A. Zavv - only one 60mL sample container present - Please analyze material for ICP Metals Hex Chrom & NOD/Hg	
Retained By/Removed From <i>FedEx</i>	Date/Time <u>10/10/12</u>	Received By/Stored In <i>J.P. Strode</i>	Date/Time <u>10/10/12</u>	REVIEWED BY <i>J.P. Strode</i> <u>10/10/12</u>	
Retained By/Removed From <i>J.P. Strode</i>	Date/Time <u>10/10/12</u>	Received By/Stored In <i>J.P. Strode</i>	Date/Time <u>10/10/12</u>	Reviewed By/Storage Title <u>10/10/12</u>	
LABORATORY Received By SECTION	Disposal Method	Date/Time			
FINAL SAMPLE DISPOSITION		Date/Time			

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CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST						RC-189-125	Page 3 of 3
Washington Closure Hanford	Company Contact John Keane	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code JK	Data Turnaround 21 Days min./max.		
Q. Stowe Project Designation 100N Field Remediation - Soil Poll Protocol	Sampling Location UPR100N31 Verification-Deep Zone	SAF No. RC-189	Method of Shipment Hand Delivered/Fed Ex	DW			
Ice Chest No. WCH-11-014	Field Logbook No. BL-1652-07	COA R10N312000	Bill of Lading/Air Bill No.	S-ee OSPC			
Shipped To EBERLINE SERVICES (LIONVILLE)	Offsite Property No. A110541	Preservation	Cool 4C	None	None		
POSSIBLE SAMPLE HAZARDS/REMARKS Potential Rad & DOT Laramie A3 10-10-12.	Type of Container	GFP	GFP	GFP	GFP		
Special Handling and/or Storage None	No. of Container(s)	1	1	1	0		
Temp Cool m/10/12	Volume	60mL	60mL	500mL	500mL		
SAMPLE ANALYSIS							
Sample No.	Matrix *	Sample Date	Sample Time	SPECIAL INSTRUCTIONS			
J1R2W0	SOIL	10-10-12	0902	Cool 4C			
J1R2W1	SOIL	10-10-12	0902	34590			
J1R2W2	SOIL	10-10-12	0828	D. 10/10/12			
CHAIN OF POSSESSION							
Relinquished By/Removed From D. Freier	Date/Time 10/10/12	Received By/Stored In Dennis A. Freier	Date/Time 10/10/12	1/35			
Relinquished By/Removed From D. Freier	Date/Time 10/10/12	Received By/Stored In A. Freier	Date/Time 10/10/12	1/35			
Relinquished By/Removed From A. Freier	Date/Time 10/10/12	Received By/Stored In Fed Ex	Date/Time 10/10/12	1/35			
Relinquished By/Removed From F. D. S.	Date/Time 10/12/12	Received By/Stored In Kathy Hecht	Date/Time 10/12/12	1/35			
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time	1/35			
LABORATORY SECTION	Received By			Date/Time			
FINAL SAMPLE DISPOSITION	Disposal Method			Disposed By			

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Appendix 5
Data Validation Supporting Documentation

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 31,4+8 (UPR)					
VALIDATOR: ELP	LAB: LLT			DATE: 1/27/13	
		SDG: K4000			
ANALYSES PERFORMED					
Anions/IC	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI	pH	NO ₃ /NO ₂
Sulfate	TDS	TKN	Phosphate		
SAMPLES/MATRIX					
JIR2V0	JIR2V1	JIR2V2	JIR2V3		
JIR2V4	JIR2V5	JIR2V6	JIR2V7		
JIR2V8	JIR2V9	JIR2W1			
					5.1

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A
 Comments: _____

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments? Yes No N/A
 Initial calibrations acceptable? Yes No N/A
 ICV and CCV checks performed on all instruments? Yes No N/A
 ICV and CCV checks acceptable? Yes No N/A
 Standards traceable? Yes No N/A
 Standards expired? Yes No N/A
 Calculation check acceptable? Yes No N/A
 Comments: _____

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST**3. BLANKS (Levels B, C, D, and E)**

- ICB and CCB checks performed for all applicable analyses? (Levels D, E)..... Yes No N/A
 Yes No N/A
- ICB and CCB results acceptable? (Levels D, E) Yes No N/A
 Yes No N/A
- Laboratory blanks analyzed? Yes No N/A
 Yes No N/A
- Laboratory blank results acceptable?..... Yes No N/A
 Yes No N/A
- Field blanks analyzed? (Levels C, D, E) Yes No N/A
 Yes No N/A
- Field blank results acceptable? (Levels C, D, E) Yes No N/A
 Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A
 Yes No N/A

Comments:

4. ACCURACY (Levels C, D, and E)

- Spike samples analyzed? Yes No N/A
 Yes No N/A
- Spike recoveries acceptable? Yes No N/A
 Yes No N/A
- Spike standards NIST traceable? (Levels D, E)..... Yes No N/A
 Yes No N/A
- Spike standards expired? (Levels D, E)..... Yes No N/A
 Yes No N/A
- LCS/BSS samples analyzed? Yes No N/A
 Yes No N/A
- LCS/BSS results acceptable?..... Yes No N/A
 Yes No N/A
- Standards traceable? (Levels D, E)..... Yes No N/A
 Yes No N/A
- Standards expired? (Levels D, E) Yes No N/A
 Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A
 Yes No N/A
- Performance audit sample(s) analyzed? Yes No N/A
 Yes No N/A
- Performance audit sample results acceptable?..... Yes No N/A
 Yes No N/A

Comments:

No Pass

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST**5. PRECISION (Levels C, D, and E)**

- Duplicate RPD values acceptable? Yes No N/A
- Duplicate results acceptable? Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A
- MS/MSD standards expired? (Levels D, E) Yes No N/A
- Field duplicate RPD values acceptable? Yes No N/A
- Field split RPD values acceptable? Yes No N/A
- Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: _____

VO/wt
_____**6. HOLDING TIMES (all levels)**

- Samples properly preserved? Yes No N/A
- Sample holding times acceptable? Yes No N/A
- Comments: _____

GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST

7. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

- Results reported for all requested analyses? Yes No N/A
- Results supported in the raw data? (Levels D, E)..... Yes No N/A
- Samples properly prepared? (Levels D, E)..... Yes No N/A
- Detection limits meet RDL?..... Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A
- Comments: _____

Appendix 6
Additional Documentation Requested by Client



Lionville Laboratory, PADEP Lab ID# 15-00009
 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: K4000
 Project Manager: Joan Kessner

Reported:
 10/27/2012 14:27

Wet Chemistry - Quality Control
Lionville Laboratory

Analyte	Result and Qualifiers		LOD	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch L210110 - Default Prep GenChem											
Blank (L210110-BLK1)							Prepared: 10/17/2012 10:20	Analyzed: 10/18/2012 15:25			
Hexavalent Chromium	0.20	U	0.20	0.50	mg/kg wet						
LCS (L210110-BS1)											
Hexavalent Chromium	3.91		0.20	0.50	mg/kg wet	4.0000	98	80-120			
LCS (L210110-BS2)											
Hexavalent Chromium	1120	D	20.0	50.0	mg/kg wet	1242.9	90	80-120			
Duplicate (L210110-DUP4)											
Hexavalent Chromium	0.20	U	0.20	0.50	mg/kg dry		0.20 U				20
Matrix Spike (L210110-MS7)											
Hexavalent Chromium	4.04		0.20	0.50	mg/kg dry	4.0272	0.20 U	100	75-125		
Matrix Spike (L210110-MS8)											
Hexavalent Chromium	969	D	20.1	50.3	mg/kg dry	1102.2	0.20 U	88	75-125		
Batch L210117 - % Solids											
Duplicate (L210117-DUP2)			Source: 1210043-11			Prepared & Analyzed: 10/15/2012 16:40					
%Solids	99.3			0.1	% by Weight		99.3			0.06	20
Batch L210222 - Default Prep GenChem											
Blank (L210222-BLK1)						Prepared: 10/22/2012 15:30	Analyzed: 10/23/2012 13:27				
Nitrate/Nitrite as N	0.10	U	0.10	0.50	mg/kg wet						



Lionville Laboratory, PADEP Lab ID# 15-00009
264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
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WC-Hanford, Inc.
2620 Fermi Avenue
Richland WA, 99354

Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/27/2012 14:27

Wet Chemistry - Quality Control
Lionville Laboratory

Analyte	Result and Qualifiers	LOD	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch L210222 - Default Prep GenChem

LCS (L210222-BS1)						Prepared: 10/22/2012 15:30	Analyzed: 10/23/2012 13:25			
Nitrate/Nitrite as N	5.11		0.10	0.50	mg/kg wet	5.0000		102	90-110	
Duplicate (L210222-DUP2)		Source: 1210043-01				Prepared: 10/22/2012 15:30	Analyzed: 10/23/2012 13:41			
Nitrate/Nitrite as N	0.18	B	0.10	0.48	mg/kg dry		0.10 U			20
Matrix Spike (L210222-MS2)		Source: 1210043-01				Prepared: 10/22/2012 15:30	Analyzed: 10/23/2012 14:10			
Nitrate/Nitrite as N	4.99		0.10	0.49	mg/kg dry	4.9337	0.10 U	101	75-125	

Date: 28 January 2013
To: Washington Closure Hanford Inc. (technical representative)
From: ELR Consulting
Project: 100N Field Remediation – Soil Full Protocol – Waste Site UPR-100-N-31,
UPR-100-N-4 and UPR-100-N-8
Subject: Radiochemistry - Data Package No. K4000-LLI

INTRODUCTION

This memo presents the results of data validation on Data Package No. K4000 prepared by Eberline Services (EB). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analyte
J1R2V0	10/10/12	Soil	C	See note 1
J1R2V1	10/10/12	Soil	C	See note 1
J1R2V2	10/10/12	Soil	C	See note 1
J1R2V3	10/10/12	Soil	C	See note 1
J1R2V4	10/10/12	Soil	C	See note 1
J1R2V5	10/10/12	Soil	C	See note 1
J1R2V6	10/10/12	Soil	C	See note 1
J1R2V7	10/10/12	Soil	C	See note 1
J1R2V8	10/10/12	Soil	C	See note 1
J1R2V9	10/10/12	Soil	C	See note 1
J1R2W0	10/10/12	Soil	C	See note 1
J1R2W1	10/10/12	Soil	C	See note 1

1 – Alpha spectroscopy, carbon-14, tritium, nickel-63, total strontium and gamma spectroscopy.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites (DOE/RL-2005-92, Rev. 0, October 2006). Appendices 1 through 6 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Data Requested by Client

DATA QUALITY PARAMETERS

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analysis is 6 months.

All holding times were acceptable.

- **Preparation (Method) Blanks**

- Laboratory Blanks

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the minimum detectable activity (MDA), the following qualifiers are applied: All positive sample results less than five times the highest blank concentration are qualified as estimates and flagged "J"; sample results below the MDA are qualified as undetected and flagged "U"; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

All laboratory blank results were acceptable.

- Field (Equipment) Blank

No field blanks were submitted for analysis.

- **Accuracy**

Accuracy is evaluated from laboratory control sample (LCS) or blank spike sample (BSS) batch samples and spiked samples from the analytical batch. Measured activities are compared to the known added amounts. The acceptable LCS or BSS and matrix spike (MS) recovery range is 70-130%. In addition, samples may be spiked with a radiochemical tracer to assist in isolating the radioisotope of interest with the yield of the tracer being used in calculating sample activity. The acceptable range for tracer recovery is 20% to 105%. Spike sample results outside the above ranges result in associated sample results being qualified as estimates, or not qualified, depending on the activity of the individual sample. Results are rejected for LCS/BSS recoveries of less than 30% and tracer recoveries of less than 20%, and tracer recoveries of greater than 115% for detected results.

Due to the lack of an LCS analysis, all uranium-235 (aspec) results were qualified as estimates and flagged "J".

Due to the lack of a matrix spike analysis, all carbon-14 and tritium results were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

- **Laboratory Duplicates**

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the contract required detection limit (CRDL) and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All duplicate results were acceptable.

- **Field Duplicates**

One set of field duplicates (J1R2V0/J1R2W1) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. All field duplicate results were acceptable.

- **Detection Levels**

Reported analytical detection levels for undetected analytes are compared against the remaining waste sites RQLs to ensure that laboratory detection levels meet the required criteria. Sixteen analytes exceeded the RQL. Under the WCH statement of work, no qualification is required. All other analytes met the RQLs.

- **Completeness**

Data package No. K4000 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

The following minor deficiencies were noted:

- Due to the lack of an LCS analysis, all uranium-235 (aspec) results were qualified as estimates and flagged "J".

- Due to the lack of a matrix spike analysis, all carbon-14 and tritium results were qualified as estimates and flagged "J".

Data flagged "J" indicates that the associated concentration is an estimate, but under the WCH statement of work, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

Sixteen analytes exceeded the RQL. Under the WCH statement of work, no qualification is required.

REFERENCES

Washington Closure Hanford Contract #S00W307A00 (March 2008), *Data Validation Services*.

DOE/RL-2005-92, Rev. 0, 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites, U.S. Department of Energy, October 2006.

Appendix 1
Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with the WCH statement of work are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.
- UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.

Appendix 2
Summary of Data Qualification

RADIOCHEMISTRY DATA QUALIFICATION SUMMARY*

SDG: K4000	REVIEWER: ELR	Project: UPR-100-N-31, UPR-100-N-4 and UPR-100-N-8	PAGE <u>1</u> OF <u>1</u>
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Uranium-235 (aspec)	J	All	No LCS analysis
Carbon-14 Tritium	J	All	No MS analysis

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3
Annotated Laboratory Reports

E B E R L I N E A N A L Y T I C A L - R I C H M O N D
SAMPLE DELIVERY GROUP K4000

7779-001

J1R2V0

D A T A S H E E T

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-01</u>	Client sample id <u>J1R2V0</u>	
Dept sample id <u>7779-001</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:02 1018 g</u>	
% solids <u>98.9</u>	Custody/SAF No <u>RC-189-125 RC-189</u>	

✓ 112713

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	1.52	2.0	3.29	10.0	U J	H
Carbon 14	14762-75-5	0.579	0.49	0.801	1.00	U J	C
Nickel 63	13981-37-8	1.14	1.8	3.00	30.0	U	NI_L
Total Strontium	SR-RAD	0.231	0.12	0.199	1.00		SR
Uranium 233/234	U-233/234	0.534	0.24	0.227	1.00		U
Uranium 235	15117-96-1	0.036	0.072	0.275	1.00	U J	U
Uranium 238	U-238	0.564	0.24	0.227	1.00		U
Plutonium 238	13981-16-3	0.005	0.026	0.045	1.00	U	PU
Plutonium 239/240	PU-239/240	0.003	0.015	0.028	1.00	U	PU
Potassium 40	13966-00-2	9.52	0.42	0.167			GAM
Cobalt 60	10198-40-0	U		0.028	0.050	U	GAM
Cesium 137	10045-97-3	0.076	0.018	0.020	0.100		GAM
Radium 226	13982-63-3	0.312	0.036	0.034	0.100		GAM
Radium 228	15262-20-1	0.523	0.089	0.082	0.200		GAM
Europium 152	14683-23-9	U		0.048	0.100	U	GAM
Europium 154	15585-10-1	U		0.055	0.100	U	GAM
Europium 155	14391-16-3	U		0.067	0.100	U	GAM
Thorium 228	14274-82-9	0.470	0.028	0.025			GAM
Thorium 232	TH-232	0.523	0.089	0.082			GAM
Uranium 235	15117-96-1	U		0.129	0.300	U	GAM
Uranium 238	U-238	U		1.91	10.0	U	GAM
Americium 241	14596-10-2	U		0.081	0.300	U	GAM

100N Field Remediation - Soil

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Lab id <u>EBRLNE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DS</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

E B E R L I N E A N A L Y T I C A L - R I C H M O N D
 SAMPLE DELIVERY GROUP K4000

7779-002

J1R2V1

D A T A S H E E T

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG K4000
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-02</u>	Client sample id <u>J1R2V1</u>	
Dept sample id <u>7779-002</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 10:15 969 g</u>	
% solids <u>99.0</u>	Custody/SAF No <u>RC-189-125 RC-189</u>	

V1(271)

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	0.226	1.9	3.30	10.0	U J	H
Carbon 14	14762-75-5	0.940	0.49	0.798	1.00	J	C
Nickel 63	13981-37-8	1.07	1.8	3.03	30.0	U	NI_L
Total Strontium	SR-RAD	0.206	0.15	0.267	1.00	U	SR
Uranium 233/234	U-233/234	0.523	0.21	0.200	1.00		U
Uranium 235	15117-96-1	0	0.063	0.242	1.00	U J	U
Uranium 238	U-238	0.706	0.27	0.200	1.00		U
Plutonium 238	13981-16-3	-0.003	0.013	0.036	1.00	U	PU
Plutonium 239/240	PU-239/240	0.036	0.019	0.025	1.00		PU
Potassium 40	13966-00-2	10.8	0.64	0.352			GAM
Cobalt 60	10198-40-0	0.066	0.040	0.041	0.050		GAM
Cesium 137	10045-97-3	0.421	0.037	0.032	0.100		GAM
Radium 226	13982-63-3	0.437	0.061	0.056	0.100		GAM
Radium 228	15262-20-1	0.488	0.13	0.136	0.200		GAM
Europium 152	14683-23-9	U		0.085	0.100	U	GAM
Europium 154	15585-10-1	U		0.099	0.100	U	GAM
Europium 155	14391-16-3	U		0.072	0.100	U	GAM
Thorium 228	14274-82-9	0.641	0.044	0.041			GAM
Thorium 232	TH-232	0.488	0.13	0.136			GAM
Uranium 235	15117-96-1	U		0.166	0.300	U	GAM
Uranium 238	U-238	U		3.16	10.0	U	GAM
Americium 241	14596-10-2	U		0.040	0.300	U	GAM

100N Field Remediation - Soil Full Protocol

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Lab id <u>EBERLINE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DS</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-003

J1R2V2

DATA SHEET

SDG 7779	Client/Case no Hanford	SDG K4000
Contact Joseph Verville	Contract No. S00W235A01	
Lab sample id S210028-03	Client sample id J1R2V2	
Dept sample id 7779-003	Location/Matrix UPR100N31 Verif-DeepZone SOIL	
Received 10/12/12	Collected/Weight 10/10/12 09:50 1041 g	
% solids 99.2	Custody/SAF No RC-189-125 RC-189	

10/12/12

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	1.16	2.0	3.37	10.0	U J	H
Carbon 14	14762-75-5	0.908	0.50	0.806	1.00	J	C
Nickel 63	13981-37-8	2.29	1.8	2.96	30.0	U	NI_L
Total Strontium	SR-RAD	0.018	0.14	0.281	1.00	U	SR
Uranium 233/234	U-233/234	0.937	0.32	0.199	1.00	U	U
Uranium 235	15117-96-1	0.032	0.063	0.241	1.00	U J	U
Uranium 238	U-238	0.963	0.32	0.199	1.00	U	U
Plutonium 238	13981-16-3	0.021	0.028	0.054	1.00	U	PU
Plutonium 239/240	PU-239/240	0.025	0.021	0.027	1.00	U	PU
Potassium 40	13966-00-2	11.4	0.55	0.236		GAM	
Cobalt 60	10198-40-0	U		0.063	0.050	U	GAM
Cesium 137	10045-97-3	0.200	0.031	0.030	0.100	U	GAM
Radium 226	13982-63-3	0.527	0.057	0.054	0.100	U	GAM
Radium 228	15262-20-1	0.880	0.13	0.116	0.200	U	GAM
Europium 152	14683-23-9	U		0.073	0.100	U	GAM
Europium 154	15585-10-1	U		0.099	0.100	U	GAM
Europium 155	14391-16-3	U		0.095	0.100	U	GAM
Thorium 228	14274-82-9	0.727	0.036	0.032		GAM	
Thorium 232	TH-232	0.880	0.13	0.116		GAM	
Uranium 235	15117-96-1	U		0.158	0.300	U	GAM
Uranium 238	U-238	U		3.52	10.0	U	GAM
Americium 241	14596-10-2	U		0.102	0.300	U	GAM

100N Field Remediation - Soil Full Protocol

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Lab id EBERLINE
Protocol RC-189
Version Ver 1.0
Form DVD-DS
Version 3.06
Report date 11/01/12

EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-004

J1R2V3

DATA SHEET

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-04</u>	Client sample id <u>J1R2V3</u>	
Dept sample id <u>7779-004</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:24 1050 g</u>	
& solids <u>99.0</u>	Custody/SAF No <u>RC-189-125 RC-189</u>	

1/27/13

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	0.771	2.0	3.46	10.0	U J	H
Carbon 14	14762-75-5	1.34	0.51	0.823	1.00	J	C
Nickel 63	13981-37-8	4.29	2.0	3.04	30.0		NI_L
Total Strontium	SR-RAD	0.466	0.16	0.223	1.00		SR
Uranium 233/234	U-233/234	0.507	0.24	0.228	1.00		U
Uranium 235	15117-96-1	0.036	0.072	0.276	1.00	U J	U
Uranium 238	U-238	0.657	0.30	0.228	1.00		U
Plutonium 238	13981-16-3	0.004	0.022	0.049	1.00	U	PU
Plutonium 239/240	PU-239/240	0.040	0.029	0.028	1.00		PU
Potassium 40	13966-00-2	8.87	0.75	0.364			GAM
Cobalt 60	10198-40-0	U		0.046	0.050	U	GAM
Cesium 137	10045-97-3	0.220	0.046	0.044	0.100		GAM
Radium 226	13982-63-3	0.316	0.071	0.072	0.100		GAM
Radium 228	15262-20-1	0.423	0.15	0.160	0.200		GAM
Europium 152	14683-23-9	U		0.108	0.100	U	GAM
Europium 154	15585-10-1	U		0.135	0.100	U	GAM
Europium 155	14391-16-3	U		0.132	0.100	U	GAM
Thorium 228	14274-82-9	0.578	0.066	0.065			GAM
Thorium 232	TH-232	0.423	0.15	0.160			GAM
Uranium 235	15117-96-1	U		0.240	0.300	U	GAM
Uranium 238	U-238	U		4.15	10.0	U	GAM
Americium 241	14596-10-2	U		0.336	0.300	U	GAM

100N Field Remediation - Soil Full Protocol

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Lab id <u>EBRLNE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DS</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-005

J1R2V4

DATA SHEET

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-05</u>	Client sample id <u>J1R2V4</u>	
Dept sample id <u>7779-005</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 10:11</u> <u>940 g</u>	
% solids <u>98.6</u>	Custody/SAF No <u>RC-189-125</u>	<u>RC-189</u>

11/21/13

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	1.28	2.0	3.41	10.0	U J	H
Carbon 14	14762-75-5	0.567	0.49	0.800	1.00	U J	C
Nickel 63	13981-37-8	0.442	1.7	2.96	30.0	U	NI_L
Total Strontium	SR-RAD	0.192	0.14	0.231	1.00	U	SR
Uranium 233/234	U-233/234	0.682	0.30	0.227	1.00	U	
Uranium 235	15117-96-1	0.072	0.072	0.275	1.00	U J	U
Uranium 238	U-238	0.475	0.24	0.227	1.00	U	
Plutonium 238	13981-16-3	-0.003	0.022	0.045	1.00	U	PU
Plutonium 239/240	PU-239/240	0	0.017	0.034	1.00	U	PU
Potassium 40	13966-00-2	9.30	0.47	0.164		GAM	
Cobalt 60	10198-40-0	U		0.020	0.050	U	GAM
Cesium 137	10045-97-3	0.093	0.022	0.022	0.100	U	GAM
Radium 226	13982-63-3	0.304	0.039	0.036	0.100	U	GAM
Radium 228	15262-20-1	0.437	0.088	0.090	0.200	U	GAM
Europium 152	14683-23-9	U		0.056	0.100	U	GAM
Europium 154	15585-10-1	U		0.064	0.100	U	GAM
Europium 155	14391-16-3	U		0.057	0.100	U	GAM
Thorium 228	14274-82-9	0.454	0.028	0.025		GAM	
Thorium 232	TH-232	0.437	0.088	0.090		GAM	
Uranium 235	15117-96-1	U		0.119	0.300	U	GAM
Uranium 238	U-238	U		2.53	10.0	U	GAM
Americium 241	14596-10-2	U		0.037	0.300	U	GAM

100N Field Remediation - Soil Full Protocol

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EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-006

J1R2V5

DATA SHEET

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-06</u>	Client sample id <u>J1R2V5</u>	
Dept sample id <u>7779-006</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:15 1024 g</u>	
% solids <u>99.1</u>	Custody/SAF No <u>RC-189-125 RC-189</u>	

✓ 1/27/13

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	1.38	2.5	4.24	10.0	U J	H
Carbon 14	14762-75-5	1.14	0.51	0.819	1.00	J	C
Nickel 63	13981-37-8	1.40	1.8	2.96	30.0	U	NI_L
Total Strontium	SR-RAD	0.068	0.15	0.283	1.00	U	SR
Uranium 233/234	U-233/234	0.788	0.29	0.215	1.00		U
Uranium 235	15117-96-1	0.034	0.068	0.261	1.00	U J	U
Uranium 238	U-238	0.535	0.23	0.215	1.00		U
Plutonium 238	13981-16-3	0.009	0.024	0.046	1.00	U	PU
Plutonium 239/240	PU-239/240	0.021	0.024	0.033	1.00	U	PU
Potassium 40	13966-00-2	12.2	0.58	0.213			GAM
Cobalt 60	10198-40-0	U		0.049	0.050	U	GAM
Cesium 137	10045-97-3	0.651	0.043	0.034	0.100		GAM
Radium 226	13982-63-3	0.435	0.064	0.063	0.100		GAM
Radium 228	15262-20-1	0.741	0.12	0.104	0.200		GAM
Europium 152	14683-23-9	U		0.073	0.100	U	GAM
Europium 154	15585-10-1	U		0.090	0.100	U	GAM
Europium 155	14391-16-3	U		0.089	0.100	U	GAM
Thorium 228	14274-82-9	0.624	0.042	0.039			GAM
Thorium 232	TH-232	0.741	0.12	0.104			GAM
Uranium 235	15117-96-1	U		0.166	0.300	U	GAM
Uranium 238	U-238	U		3.03	10.0	U	GAM
Americium 241	14596-10-2	U		0.162	0.300	U	GAM

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EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-007

J1R2V6

DATA SHEET

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-07</u>	Client sample id <u>J1R2V6</u>	
Dept sample id <u>7779-007</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:31</u> <u>679 g</u>	
% solids <u>98.5</u>	Custody/SAF No <u>RC-189-125</u>	<u>RC-189</u>

✓ 1/27/13

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	7.24	1.9	2.63	10.0	J	H
Carbon 14	14762-75-5	3.56	0.61	0.930	1.00	J	C
Nickel 63	13981-37-8	9.47	2.0	2.84	30.0		NI_L
Total Strontium	SR-RAD	11.5	0.52	0.214	1.00		SR
Uranium 233/234	U-233/234	0.492	0.20	0.188	1.00		U
Uranium 235	15117-96-1	0.030	0.060	0.228	1.00	U J	U
Uranium 238	U-238	0.713	0.25	0.188	1.00		U
Plutonium 238	13981-16-3	0.244	0.053	0.043	1.00		PU
Plutonium 239/240	PU-239/240	1.88	0.15	0.020	1.00		PU
Potassium 40	13966-00-2	10.6	0.57	0.324			GAM
Cobalt 60	10198-40-0	5.37	0.12	0.049	0.050		GAM
Cesium 137	10045-97-3	127	0.40	0.112	0.100		GAM
Radium 226	13982-63-3	0.381	0.13	0.172	0.100		GAM
Radium 228	15262-20-1	0.629	0.19	0.234	0.200		GAM
Europium 152	14683-23-9	U		0.379	0.100	U	GAM
Europium 154	15585-10-1	0.323	0.10	0.121	0.100		GAM
Europium 155	14391-16-3	U		0.337	0.100	U	GAM
Thorium 228	14274-82-9	0.481	0.15	0.212			GAM
Thorium 232	TH-232	0.629	0.19	0.234			GAM
Uranium 235	15117-96-1	U		0.702	0.300	U	GAM
Uranium 238	U-238	U		6.54	10.0	U	GAM
Americium 241	14596-10-2	0.663	0.26	0.400	0.300		GAM

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EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-008

J1R2V7

DATA SHEET

SDG <u>7779</u> Contact <u>Joseph Verville</u>	Client/Case no <u>Hanford</u> Contract No. <u>S00W235A01</u>	SDG <u>K4000</u>
Lab sample id <u>S210028-08</u>	Client sample id <u>J1R2V7</u>	
Dept sample id <u>7779-008</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:42</u> <u>924 g</u>	
% solids <u>98.9</u>	Custody/SAF No <u>RC-189-125</u> <u>RC-189</u>	

✓1/21/13

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	0.231	2.0	3.38	10.0	U J	H
Carbon 14	14762-75-5	1.14	0.51	0.818	1.00	J	C
Nickel 63	13981-37-8	0.559	1.7	2.94	30.0	U	NI_L
Total Strontium	SR-RAD	0.733	0.19	0.252	1.00		SR
Uranium 233/234	U-233/234	0.562	0.27	0.205	1.00		U
Uranium 235	15117-96-1	0.032	0.065	0.248	1.00	U J	U
Uranium 238	U-238	0.562	0.27	0.205	1.00		U
Plutonium 238	13981-16-3	0.009	0.029	0.053	1.00	U	PU
Plutonium 239/240	PU-239/240	0.012	0.017	0.032	1.00	U	PU
Potassium 40	13966-00-2	8.59	0.98	0.437			GAM
Cobalt 60	10198-40-0	U		0.067	0.050	U	GAM
Cesium 137	10045-97-3	4.17	0.15	0.069	0.100		GAM
Radium 226	13982-63-3	0.318	0.083	0.086	0.100		GAM
Radium 228	15262-20-1	0.511	0.22	0.211	0.200		GAM
Europium 152	14683-23-9	U		0.198	0.100	U	GAM
Europium 154	15585-10-1	U		0.162	0.100	U	GAM
Europium 155	14391-16-3	U		0.173	0.100	U	GAM
Thorium 228	14274-82-9	0.446	0.082	0.097			GAM
Thorium 232	TH-232	0.511	0.22	0.211			GAM
Uranium 235	15117-96-1	U		0.395	0.300	U	GAM
Uranium 238	U-238	U		6.01	10.0	U	GAM
Americium 241	14596-10-2	U		0.163	0.300	U	GAM

100N Field Remediation - Soil Full Protocol

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EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-009

J1R2V8

DATA SHEET

SDG <u>7779</u> Contact <u>Joseph Verville</u>	Client/Case no <u>Hanford</u> Contract No. <u>S00W235A01</u>	SDG <u>K4000</u>
Lab sample id <u>S210028-09</u>	Client sample id <u>J1R2V8</u>	
Dept sample id <u>7779-009</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 10:06</u> <u>920 g</u>	
% solids <u>99.1</u>	Custody/SAF No <u>RC-189-125</u>	<u>RC-189</u>

1/27/13

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	0.055	1.8	3.19	10.0	U	H
Carbon 14	14762-75-5	1.12	0.50	0.805	1.00	J	C
Nickel 63	13981-37-8	1.92	1.9	3.14	30.0	U	NI_L
Total Strontium	SR-RAD	1.30	0.23	0.241	1.00		SR
Uranium 233/234	U-233/234	0.470	0.20	0.189	1.00		U
Uranium 235	15117-96-1	0	0.060	0.229	1.00	U	J
Uranium 238	U-238	0.494	0.20	0.189	1.00		U
Plutonium 238	13981-16-3	0.043	0.048	0.073	1.00	U	PU
Plutonium 239/240	PU-239/240	0.186	0.058	0.037	1.00		PU
Potassium 40	13966-00-2	12.7	0.65	0.330			GAM
Cobalt 60	10198-40-0	0.337	0.041	0.032	0.050		GAM
Cesium 137	10045-97-3	11.6	0.14	0.052	0.100		GAM
Radium 226	13982-63-3	0.399	0.066	0.071	0.100		GAM
Radium 228	15262-20-1	0.693	0.16	0.147	0.200		GAM
Europium 152	14683-23-9	U		0.174	0.100	U	GAM
Europium 154	15585-10-1	U		0.103	0.100	U	GAM
Europium 155	14391-16-3	U		0.106	0.100	U	GAM
Thorium 228	14274-82-9	0.744	0.061	0.078			GAM
Thorium 232	TH-232	0.693	0.16	0.147			GAM
Uranium 235	15117-96-1	U		0.268	0.300	U	GAM
Uranium 238	U-238	U		3.69	10.0	U	GAM
Americium 241	14596-10-2	U		0.053	0.300	U	GAM

100N Field Remediation - Soil Full Protocol

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EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-010

J1R2V9

DATA SHEET

SDG <u>7779</u> Contact <u>Joseph Verville</u>	Client/Case no <u>Hanford</u> Contract No. <u>S00W235A01</u>	SDG <u>K4000</u>
Lab sample id <u>S210028-10</u>	Client sample id <u>J1R2V9</u>	
Dept sample id <u>7779-010</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:57</u> <u>47 g</u>	
% solids <u>98.9</u>	Custody/SAF No <u>RC-189-125</u> <u>RC-189</u>	

V 1(27)3

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	1.90	2.1	3.37	10.0	U <u>J</u>	H
Carbon 14	14762-75-5	2.36	0.55	0.863	1.00	<u>J</u>	C
Nickel 63	13981-37-8	2.36	2.0	3.22	30.0	U	NE_L
Total Strontium	SR-RAD	931	6.5	0.359	1.00		SR
Uranium 233/234	U-233/234	0.619	0.24	0.182	1.00		U
Uranium 235	15117-96-1	0	0.058	0.220	1.00	U <u>J</u>	U
Uranium 238	U-238	0.523	0.24	0.182	1.00		U
Plutonium 238	13981-16-3	0.092	0.038	0.046	1.00		PU
Plutonium 239/240	PU-239/240	0.529	0.084	0.024	1.00		PU
Potassium 40	13966-00-2	13.4	5.7	3.14			GAM
Cobalt 60	10198-40-0	2.30	0.59	<u>0.561</u>	0.050		GAM
Cesium 137	10045-97-3	115	2.3	<u>0.660</u>	0.100		GAM
Radium 226	13982-63-3	U		<u>1.14</u>	0.100	U	GAM
Radium 228	15262-20-1	U		<u>1.93</u>	0.200	U	GAM
Europium 152	14683-23-9	U		<u>2.14</u>	0.100	U	GAM
Europium 154	15585-10-1	U		<u>1.36</u>	0.100	U	GAM
Europium 155	14391-16-3	U		<u>2.20</u>	0.100	U	GAM
Thorium 228	14274-82-9	U		1.16		U	GAM
Thorium 232	TH-232	U		1.93		U	GAM
Uranium 235	15117-96-1	U		<u>4.29</u>	0.300	U	GAM
Uranium 238	U-238	U		<u>49.0</u>	10.0	U	GAM
Americium 241	14596-10-2	U		<u>2.44</u>	0.300	U	GAM

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EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-011

J1R2W1

DATA SHEET

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-11</u>	Client sample id <u>J1R2W1</u>	
Dept sample id <u>7779-011</u>	Location/Matrix <u>UFR100N31 Verif-DeepZone SOIL</u>	
Received <u>10/12/12</u>	Collected/Weight <u>10/10/12 09:02</u> <u>760 g</u>	
% solids <u>98.7</u>	Custody/SAF No <u>RC-189-125</u> <u>RC-189</u>	

V1(271.3)

ANALYTE	CAS NO	RESULT pCi/g	2σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	3.36	1.7	2.66	10.0	J	H
Carbon 14	14762-75-5	3.33	0.73	1.14	1.00	J	C
Nickel 63	13981-37-8	2.11	1.9	3.17	30.0	U	NI_L
Total Strontium	SR-RAD	0.052	0.15	0.290	1.00	U	SR
Uranium 233/234	U-233/234	0.418	0.26	0.246	1.00		U
Uranium 235	15117-96-1	0	0.078	0.298	1.00	U	J U
Uranium 238	U-238	0.322	0.20	0.246	1.00		U
Plutonium 238	13981-16-3	0.026	0.030	0.050	1.00	U	PU
Plutonium 239/240	PU-239/240	0.011	0.022	0.036	1.00	U	PU
Potassium 40	13966-00-2	10.1	0.47	0.186			GAM
Cobalt 60	10198-40-0	U		0.025	0.050	U	GAM
Cesium 137	10045-97-3	0.184	0.028	0.024	0.100		GAM
Radium 226	13982-63-3	0.361	0.043	0.037	0.100		GAM
Radium 228	15262-20-1	0.544	0.098	0.090	0.200		GAM
Europium 152	14683-23-9	U		0.060	0.100	U	GAM
Europium 154	15585-10-1	U		0.072	0.100	U	GAM
Europium 155	14391-16-3	U		0.078	0.100	U	GAM
Thorium 228	14274-82-9	0.527	0.033	0.030			GAM
Thorium 232	TH-232	0.544	0.098	0.090			GAM
Uranium 235	15117-96-1	U		0.141	0.300	U	GAM
Uranium 238	U-238	U		2.63	10.0	U	GAM
Americium 241	14596-10-2	U		0.139	0.300	U	GAM

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Appendix 4
Laboratory Narrative and Chain-of-Custody Documentation

1.0 GENERAL

Washington Closure Hanford (WCH) Sample Delivery Group K4000 was composed of eleven solid (soil) samples designated under SAF No. RC-189 with a Project Designation of: 100N Field Remediation-Soil Full Protocol.

The samples were received as stated on the Chain-of-Custody documents. Any discrepancies are noted on the Eberline Analytical Sample Receipt Checklist. The results were transmitted to WCH via e-mail on October 29, 2012.

2.0 ANALYSIS NOTES

2.1 Tritium Analysis, Low Level

No problems were encountered during the course of the analyses.

2.2 Carbon-14 Analysis, Low Level

No problems were encountered during the course of the analyses.

2.3 Nickel-63 Analysis

No problems were encountered during the course of the analyses.

2.4 Total Strontium Analysis

No problems were encountered during the course of the analyses.

2.5 Isotopic Uranium Analysis

No problems were encountered during the course of the analyses.

2.6 Isotopic Plutonium Analysis

The original analysis was rejected due to excessive Pu activity observed in the QC blank sample. The analyses were repeated with new QC samples. No problems were encountered during the course of the reanalyses.

2.7 Gamma Spectroscopy

No problems were encountered during the course of the analyses.

3.0 Case Narrative Certification Statement

"I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data obtained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature."

Joseph Verville
Client Services Manager

11/1/12

Date

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				RC-189-125	Page 1 of 2
Collector Q. Sloane	Company Contact Joan Kessner 375-4688	Telephone No. (7779)	Project Coordinator KESSNER, JH	Price Code 8L 8K	Data Turnaround 15 Days
Project Designation 100N Field Remediation - Soil Full Protocol	Sampling Location UPR100N31 Verification-Deep Zone	SAF No. RC-189	Method of Shipment Hand Delivery /Fed Ex		
Ice Chest No. 1CC-08-022	Field Logbook No. EL-1652-07	COA R10N312000	Bill of Lading/Air Bill No.	Sec. OSPC	
Shipped To EBERLINE SERVICES LIONVILLE	Offsite Property No. A110560				
POSSIBLE SAMPLE HAZARDS/REMARKS Potentially Rad & DOT Limited As 10-10-12					
Special Handling and/or Storage None					
SAMPLE ANALYSIS					
Sample No.	Matrix *	Sample Date	Sample Time	SPECIAL INSTRUCTIONS	
J1R2V0	SOIL	10-10-12	0902	344669	34590
J1R2V1	SOIL	10-10-12	1015	345946	34591
J1R2V2	SOIL	10-10-12	0950	34599	34592
J1R2V3	SOIL	10-10-12	0924	34598	34593
J1R2V4	SOIL	10-10-12	1011	34595	34594
Sign/Print Names A. Feier A. Feier					
CHAIN OF POSSESSION					
Relinquished By/Removed From Quality Sloane	Date/Time 10/10/12	Received By/Stored In Dennis Neumann	Date/Time 10/10/12	S-Cell Stainless Steel Stainless Steel Steel	
Relinquished By/Removed From Dennis Neumann	Date/Time 10/10/12	Received By/Stored In A. Feier A. Feier	Date/Time 10/10/12	W = Water O = Oil A = Acid D = Detergent T = Toluene W/W = L = Liquid V/V = Vapour X = Other	
Relinquished By/Removed From A. Feier A. Feier	Date/Time 10/10/12	Received By/Stored In Fed Ex	Date/Time 10/10/12	Reviewed CHAB DATE 10-11-12	
Relinquished By/Removed From FED EX	Date/Time	Received By/Stored In	Date/Time	Reviewed CHAB DATE 10-11-12	
Relinquished By/Removed From REVIEWED	Date/Time	Received By/Stored In	Date/Time	Reviewed CHAB DATE 10-11-12	
LABORATORY SECTION	Received By	Title			
FINAL SAMPLE DEPOSITION	Disposal Method	Date/Time			

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				RC-189-125	Page 2 of 2							
Washington Closure Hanford	Company Contact Joan Kessner Q. Stove	Telephone No. (7779) 375-4688	Project Coordinator KESSNER, JH	Price Code 8L 8L	Data Turnaround 21 Days 15 days							
Project Designation 100N Field Remediation - Soil Full Protocol	Sampling Location UPR100N31 Verification-Deep Zone	SAF No. RC-189										
Ice Chest No. ACC-08-022	Field Logbook No. EL-1652-07	COA R10N312000	Method of Shipment Hand-Delivered (Fed Ex)	10/07/07								
Shipped To BERLINE SERVICES PLANTVILLE 10/07/07	Offsite Property No. A110 560	Bill of Lading/Air Bill No. Sec OSPC										
POSSIBLE SAMPLE HAZARDS/REMARKS <i>Potential Rad & Do T L/m² m/s A & 10-10-12</i>				Preservation	Cool 4C	Cool 4C	Cool 4C	None	None	None	None	None
				Type of Container	G/P	G/P	G/P	G/P	G	G/P	G/P	G/P
				No. of Container(s)	1	1	1	0	0	1	0	0
				Volume	60mL	60mL	500mL	500mL	60mL	500mL	500mL	500mL
				See item (1) in Special Instructions.	See item (2) in Special Instructions.	See item (3) in Special Instructions.	Isotopic Uranium	Isotopic Plutonium	Carbon-14 Low Level	Tritium- Low Level Soil	Nickel-63	Strontium- 89/90 - Total Sr
				10/07/07								
				SAMPLE ANALYSIS								Matrix *
Sample No.	Matrix *	Sample Date	Sample Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	
JIR2V5	SOIL	10-10-12	0915	34590	34595	X	X	X	X	X	X	
JIR2V6	SOIL	10-10-12	0931	34593	34596	X	X	X	X	X	X	
JIR2V7	SOIL	10-10-12	0947	34591	34598	X	X	X	X	X	X	
JIR2V8	SOIL	10-10-12	1006	34594	34599	X	X	X	X	X	X	
JIR2V9	SOIL	10-10-12	0957	34592	34637	X	X	X	X	X	X	
A# 10-10-12 SPECIAL INSTRUCTIONS												
Cool 4C												
1) ICP Metals - 60 (ICP (Close-out List) (Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7411 - (CV) (2) IC Anions - 300.0 (Bromide, Chloride, Fluoride, Nitrate, Nitrite, Phosphate, Sulfate); NO2/NOS - 353.2; pH (Soil) - 9045 (3) Gamma Spec (Close List) (Americium-241, Cobalt-60, Europium-152, Cerium-137, Cobalt-60, Europium-152, Europium-155, Radium-226) * Sample JIR2V9 - only one 60mL sample container present - please analyze material for Gamma Spec, Ni-63, Sr-89/90												
Retinished By/Removed From <i>Danny Stove</i>	Date/Time 10/10/12	Received By/Stored In <i>Dennis Newman</i>	Date/Time 10/10/12	Reviewed By/Removed From <i>A. Freier</i>								Reviewed By/Removed From <i>A. Freier</i>
Retinished By/Removed From <i>Dennis Newman</i>	Date/Time 10/10/12	Received By/Stored In <i>A. Freier</i>	Date/Time 10/10/12	Reviewed By/Removed From <i>A. Freier</i>								Reviewed By/Removed From <i>A. Freier</i>
Retinished By/Removed From <i>A. Freier</i>	Date/Time 10/10/12	Received By/Stored In <i>A. Freier</i>	Date/Time 10/10/12	Reviewed By/Removed From <i>A. Freier</i>								Reviewed By/Removed From <i>A. Freier</i>
Retinished By/Removed From <i>A. Freier</i>	Date/Time 10/10/12	Received By/Stored In <i>A. Freier</i>	Date/Time 10/10/12	Reviewed By/Removed From <i>A. Freier</i>								Reviewed By/Removed From <i>A. Freier</i>
LABORATORY SECTION	Received By	Title										
FINAL SAMPLE DISPOSITION	Disposal Method	Date/Time										

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				RC-189-125		Page 2 of 2																																									
Collector Q. Stowe	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH SAF No.: RC-189	Price Code 8K 8K 10/10/12	Data Turnaround 41 Days 10/10/12																																										
Project Designation 100N Field Remediation - Soil Full Protocol	Sampling Location UPR100N31 Verification-Deep Zone																																														
Ice Chest No. <i>RCC-08-022</i>	Field Logbook No. EL-1652-07	COA RION312000	Method of Shipment Hand Delivered/Fed Ex <i>10/10/12</i>																																												
Shipped To <i>BERLINE SERVICES</i> HENTZEL	Offsite Property No. <i>A110 560</i>	Bill of Lading/Air Bill No.		See OSPC																																											
POSSIBLE SAMPLE HAZARDS/REMARKS <i>Potentiat Rad & DOT L1m-15 A# 10-10-12</i>																																															
Special Handling and/or Storage <i>None</i>																																															
<table border="1"> <thead> <tr> <th colspan="2">Preservation</th> <th>Cool 4C</th> <th>Cool 4C</th> <th>None</th> <th>None</th> <th>None</th> <th>None</th> </tr> <tr> <th>Type of Container</th> <td>Off</td> <td>Off</td> <td>Off</td> <td>Off</td> <td>Off</td> <td>Off</td> <td>Off</td> </tr> <tr> <th>No. of Container(s)</th> <td>1</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <th>Volume</th> <td>60ml.</td> <td>60ml.</td> <td>500ml.</td> <td>500ml.</td> <td>500ml.</td> <td>60ml.</td> <td>500ml.</td> </tr> </thead> <tbody> <tr> <td colspan="2">Specimen Item (1) in Special Instructions. <i>Specimen Item 7196 10/10/12</i></td> <td colspan="2">Specimen Item (2) in Special Instructions. <i>Specimen Item 7196 10/10/12</i></td> <td colspan="2">Spec Item (3) in Special Instructions.</td> <td colspan="2">Spec Item (4) in Special Instructions.</td> </tr> </tbody> </table>								Preservation		Cool 4C	Cool 4C	None	None	None	None	Type of Container	Off	No. of Container(s)	1	1	1	1	0	0	0	Volume	60ml.	60ml.	500ml.	500ml.	500ml.	60ml.	500ml.	Specimen Item (1) in Special Instructions. <i>Specimen Item 7196 10/10/12</i>		Specimen Item (2) in Special Instructions. <i>Specimen Item 7196 10/10/12</i>		Spec Item (3) in Special Instructions.		Spec Item (4) in Special Instructions.							
Preservation		Cool 4C	Cool 4C	None	None	None	None																																								
Type of Container	Off	Off	Off	Off	Off	Off	Off																																								
No. of Container(s)	1	1	1	1	0	0	0																																								
Volume	60ml.	60ml.	500ml.	500ml.	500ml.	60ml.	500ml.																																								
Specimen Item (1) in Special Instructions. <i>Specimen Item 7196 10/10/12</i>		Specimen Item (2) in Special Instructions. <i>Specimen Item 7196 10/10/12</i>		Spec Item (3) in Special Instructions.		Spec Item (4) in Special Instructions.																																									
SAMPLE ANALYSIS																																															
Sample No.	Matrix *	Sample Date	Sample Time	Date/Time	Date/Time	Date/Time	Date/Time																																								
J1F2W0 D. <i>10/10/12</i>	SOIL	10-10-12	0907	X	X	X	X																																								
J1F2W1	SOIL	10-10-12	0907	34590	X	X	X																																								
J1F2W2 <i>D. M. 10/10/12</i>	SOIL	10-10-12	0820																																												
SPECIAL INSTRUCTIONS Cool 4C																																															
<p>Matrix *</p> <p>Soil Soil Medium Soil Sludge W = Water Amair DIA/Drain Solids T-Tissue Whiting Loam Vegetation Soil Other</p> <p>(1) ICP Metals - 6010TR (Close-out List) (Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7471 - (CV) (2) IC Anions - 3000 (Bromide, Chloride, Fluoride, Nitrate, Nitrite, Phosphate, Sulfate); NO20/NO3 - 353.2; pH (Soil) - 9045 (3) Gamma Spec (Client List) (Americium-241, Cerium-137, Cobalt-60, Europium-152, Europium-154, Europium-155, Radium-226)</p>																																															
CHAIN OF POSSESSION				Sign/Print Names																																											
Relinquished By/Removed From <i>Glancy, Stowe</i>	Date/Time <i>10/10/12</i>	Received By/Stored In <i>Dennis Ahrens</i>	Date/Time <i>10/10/12</i>	Sign/Print Name <i>Dennis Ahrens</i>	Date/Time <i>10/10/12</i>	Sign/Print Name <i>Dennis Ahrens</i>	Date/Time <i>10/10/12</i>																																								
Relinquished By/Removed From <i>Dennis Ahrens</i>	Date/Time <i>10/10/12</i>	Received By/Stored In <i>A. Freier A. Freier</i>	Date/Time <i>10-10-12 1520</i>	Sign/Print Name <i>A. Freier A. Freier</i>	Date/Time <i>10-10-12 1520</i>	Sign/Print Name <i>A. Freier A. Freier</i>	Date/Time <i>10-10-12 1520</i>																																								
Relinquished By/Removed From <i>A. Freier A. Freier</i>	Date/Time <i>10-11-12 1110</i>	Received By/Stored In <i>John C. Johnson</i>	Date/Time <i>10-11-12 0930</i>	Sign/Print Name <i>John C. Johnson</i>	Date/Time <i>10-11-12 0930</i>	Sign/Print Name <i>John C. Johnson</i>	Date/Time <i>10-11-12 0930</i>																																								
Relinquished By/Removed From <i>John C. Johnson</i>	Date/Time	Received By/Stored In	Date/Time	Sign/Print Name	Date/Time	Sign/Print Name	Date/Time																																								
LABORATORY SECTION	Received By																																														
FINAL SAMPLE DISPOSITION	Disposal Method																																														

Appendix 5
Data Validation Supporting Documentation

APPENDIX A
RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: UPR-100-N-3174/8			DATA PACKAGE: K4000		
VALIDATOR: ELR	LAB: EB			DATE: 11/27/13	
		SDG: K4000			
ANALYSES PERFORMED					
<input type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90	<input type="checkbox"/> Technetium-99	<input checked="" type="checkbox"/> Alpha Spectroscopy	<input checked="" type="checkbox"/> Gamma Spectroscopy	
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input checked="" type="checkbox"/> Tritium	<input checked="" type="checkbox"/> C14	<input checked="" type="checkbox"/> K41-63	
SAMPLES/MATRIX					
JIR2U0	JIR2U1	JIR2U2	JIR2U3	JIR2U4	
JIR2U5	JIR2U6	JIR2U7	JIR2U8	JIR2U9	
JIR2W1					
SOL					

1. Completeness N/A

Technical verification forms present? Yes No N/A

Comments: _____

2. Initial Calibration (Levels D, E) N/A

Instruments/detectors calibrated? Yes No N/A

Initial calibration acceptable? Yes No N/A

Standards NIST traceable? Yes No N/A

Standards Expired? Yes No N/A

Calculation check acceptable? Yes No N/A

Comments: _____

3. Continuing Calibration (Levels D, E)

N/A

Calibration checked within required frequency? Yes No N/A

Calibration check acceptable? Yes No N/A

Calibration check standards traceable? Yes No N/A

Calibration check standards expired? Yes No N/A

Calculation check acceptable? Yes No N/A

Comments: _____

4. Background Counts (Levels D, E)

N/A

Background Counts checked within required frequency? Yes No N/A

Background Counts acceptable? Yes No N/A

Calculation check acceptable? Yes No N/A

Comments: _____

5. Blanks (Levels B, C, D, E) N/A

Method blank analyzed within required frequency? Yes No N/A

Method blank results acceptable? Yes No N/A

Analytes detected in method blank? Yes No N/A

Field blank(s) analyzed? Yes No N/A

Field blank results acceptable? Yes No N/A

Analytes detected in field blank(s)? Yes No N/A

Transcription/Calculation Errors? (Levels D, E) Yes No N/A

Comments: 5 over RQL

no FB

6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E) N/A

LCS /BSS analyzed within required frequency? Yes No N/A

LCS/BSS recoveries acceptable? Yes No N/A

LCS/BSS traceable? (Levels D,E) Yes No N/A

LCS/BSS expired? (Levels D,E) Yes No N/A

LCS/BSS levels correct? (Levels D,E) Yes No N/A

Transcription/Calculation Errors? (Levels D, E) Yes No N/A

Comments: no power cos - Jaef
U-235

7. Chemical Carrier Recovery (Levels C, D, E) N/A

Chemical carrier added? Yes No N/A

Chemical recovery acceptable?..... Yes No N/A

Chemical carrier traceable? (Levels D, E)..... Yes No N/A

Chemical carrier expired? (Levels D, E) Yes No N/A

Transcription/Calculation errors? (Levels D, E) Yes No N/A

Comments: _____

8. Tracer Recovery (Levels C, D, E) N/A

Tracer added? Yes No N/A

Tracer recovery acceptable? Yes No N/A

Tracer traceable? (Levels D, E) Yes No N/A

Tracer expired? (Levels D, E) Yes No N/A

Transcription/Calculation errors? (Levels D, E) Yes No N/A

Comments: _____

9. Matrix Spikes (Levels C, D, E) N/A

Matrix spike analyzed? Yes No N/A

Spike recoveries acceptable? Yes No N/A

Spike source traceable? (Levels D, E) Yes No N/A

Spike source expired? Levels D, E) Yes No N/A

Transcription/Calculation Errors? (Levels D, E) Yes No N/A

Comments: No MS 3H or C-(4 - T all)

10. Duplicates (Levels C, D, E) N/A

Duplicates Analyzed at required frequency? Yes No N/A

RPD Values Acceptable? Yes No N/A

Transcription/Calculation Errors? (Levels D, E) Yes No N/A

Comments: _____

11. Field QC Samples (Levels C, D E) N/A

Field duplicate sample(s) analyzed? Yes No N/A

Field duplicate RPD values acceptable? Yes No N/A

Field split sample(s) analyzed? Yes No N/A

Field split RPD values acceptable? Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable? Yes No N/A

Comments: VO/wi no PS -> DS

12. Holding Times (All levels)

Are sample holding times acceptable? Yes No N/A

Comments: _____

13. Results and Detection Limits (All Levels)..... N/A
- Results reported for all required sample analyses?.....
Yes No N/A
- Results supported in raw data?(Levels D, E).....
Yes No N/A
- Results Acceptable? (Levels D, E)
Yes No N/A
- Transcription/Calculation errors? (Levels D, E).....
Yes No N/A
- MDA's meet required detection limits?
- Transcription/calculation errors? (Levels D, E).....
Yes No N/A
- Comments: 16 over
-
-
-
-

Appendix 6
Additional Documentation Requested by Client

EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-013

Method Blank

METHOD BLANK

SDG <u>7779</u> Contact <u>Joseph Verville</u>	Client/Case no <u>Hanford</u> Contract No. <u>S00W235A01</u>	SDG K4000
Lab sample id <u>S210028-13</u> Dept sample id <u>7779-013</u>	Client sample id <u>Method Blank</u> Material/Matrix <u>SOIL</u> SAF No <u>RC-189</u>	

ANALYTE	CAS NO	RESULT pCi/g	2 σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Tritium	10028-17-8	-0.200	1.7	2.93	10.0	U	H
Carbon 14	14762-75-5	0.258	0.54	0.886	1.00	U	C
Nickel 63	13981-37-8	0.474	1.7	2.91	30.0	U	NI_L
Total Strontium	SR-RAD	-0.006	0.14	0.289	1.00	U	SR
Uranium 233/234	U-233/234	0	0.063	0.239	1.00	U	U
Uranium 235	15117-96-1	0	0.076	0.289	1.00	U	U
Uranium 238	U-238	0	0.063	0.239	1.00	U	U
Potassium 40	13966-00-2	U		6.50		U	GAM
Cobalt 60	10198-40-0	U		<u>0.676</u>	0.050	U	GAM
Cesium 137	10045-97-3	U		<u>0.515</u>	0.100	U	GAM
Radium 226	13982-63-3	U		<u>1.25</u>	0.100	U	GAM
Radium 228	15262-20-1	U		<u>2.17</u>	0.200	U	GAM
Europium 152	14683-23-9	U		<u>1.69</u>	0.100	U	GAM
Europium 154	15585-10-1	U		<u>1.66</u>	0.100	U	GAM
Europium 155	14391-16-3	U		<u>1.38</u>	0.100	U	GAM
Thorium 228	14274-82-9	U		<u>0.822</u>		U	GAM
Thorium 232	TH-232	U		<u>2.17</u>		U	GAM
Uranium 235	15117-96-1	U		<u>3.03</u>	0.300	U	GAM
Uranium 238	U-238	U		<u>71.0</u>	10.0	U	GAM
Americium 241	14596-10-2	U		<u>0.812</u>	0.300	U	GAM

QC-BLANK #82733

METHOD BLANKS
Page 1
SUMMARY DATA SECTION
Page 10

Lab id <u>EBRLNE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DS</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

EBERLINE ANALYTICAL - RICHMOND
SAMPLE DELIVERY GROUP K4000

7779-016

Method Blank

METHOD BLANK

SDG <u>7779</u> Contact <u>Joseph Verville</u>	Client/Case no <u>Hanford</u> Contract No. <u>S00W235A01</u>	SDG <u>K4000</u>
Lab sample id <u>S210028-16</u> Dept sample id <u>7779-016</u>	Client sample id <u>Method Blank</u> Material/Matrix <u>SOIL</u> SAF No <u>RC-189</u>	

ANALYTE	CAS NO	RESULT pCi/g	2 σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- FIERS	TEST
Plutonium 238	13981-16-3	-0.010	0.027	0.057	1.00	U	PU
Plutonium 239/240	PU-239/240	-0.010	0.013	0.041	1.00	U	PU

QC-BLANK #82826

METHOD BLANKS

Page 2

SUMMARY DATA SECTION

Page 11

Lab id <u>EBRLNE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DS</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

EBERLINE ANALYTICAL-RICHMOND

SAMPLE DELIVERY GROUP K4000

7779-012

Lab Control Sample

LAB CONTROL SAMPLE

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG K4000
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
Lab sample id <u>S210028-12</u>	Client sample id <u>Lab Control Sample</u>	
Dept sample id <u>7779-012</u>	Material/Matrix <u>SOIL</u>	
	SAF No <u>RC-189</u>	

ANALYTE	RESULT pCi/g	2 σ ERR (COUNT)	MDA pCi/g	RDL pCi/g	QUALI- PIERS	TEST	ADDED pCi/g	2 σ ERR pCi/g	REC	3 σ LMTS (TOTAL)	PROTOCOL LIMITS
Tritium	120	5.6	3.54	10.0	H		128	5.1	94	83-117	80-120
Carbon 14	1010	20	<u>4.87</u>	1.00	C		1060	42	95	84-116	80-120
Nickel 63	236	6.3	2.89	30.0	NI_L		258	10	91	83-117	80-120
Total Strontium	8.01	0.49	0.242	1.00	SR		8.40	0.34	95	82-118	80-120
Uranium 233/234	11.8	1.6	0.327	1.00	U		11.8	0.47	100	76-124	80-120
Uranium 238	13.6	1.8	0.327	1.00	U		11.8	0.47	115	73-127	80-120
Cobalt 60	14.8	1.6	<u>0.974</u>	0.050	GAM		16.9	0.68	88	82-118	80-120
Cesium 137	17.5	1.5	<u>0.977</u>	0.100	GAM		20.2	0.81	87	84-116	80-120

QC-LCS #82732

LAB CONTROL SAMPLES

Page 1

SUMMARY DATA SECTION

Page 12

Lab id EBERLINE
Protocol RC-189
Version Ver 1.0
Form DVD-LCS
Version 3.06
Report date 11/01/12

EBERLINE ANALYTICAL-RICHMOND

SAMPLE DELIVERY GROUP K4000

7779-015

Lab Control Sample

LAB CONTROL SAMPLE

SDG 7779 Contact Joseph Verville	Client/Case no Hanford Contract No. S00W235A01	SDG K4000
Lab sample id S210028-15 Dept sample id 7779-015	Client sample id Lab Control Sample Material/Matrix SOIL	SAF No RC-189

ANALYTE	RESULT	2 σ ERR	MDA	RDL	QUALI-	ADDED	2 σ ERR	RSC	3 σ LMTS	PROTOCOL
	pCi/g	(COUNT)	pCi/g	pCi/g	FIEBS TEST	pCi/g	pCi/g	%	(TOTAL)	LIMITS
Plutonium 238	12.9	0.58	0.056	1.00		PU	13.6	0.54	95	86-114 80-120
Plutonium 239/240	15.3	0.65	0.030	1.00		PU	15.8	0.63	97	86-114 80-120

QC-LCS #82825

LAB CONTROL SAMPLES

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SUMMARY DATA SECTION

Page 13

Lab id EBERLINE
Protocol RC-189
Version Ver 1.0
Form DVD-LCS
Version 3.06
Report date 11/01/12

EBERLINE ANALYTICAL - RICHMOND

SAMPLE DELIVERY GROUP K4000

7779-014

J1R2V0

DUPLICATE

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG <u>K4000</u>
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
DUPLICATE		
Lab sample id <u>S210028-14</u>	Lab sample id <u>S210028-01</u>	Client sample id <u>J1R2V0</u>
Dept sample id <u>7779-014</u>	Dept sample id <u>7779-001</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>
Received <u>10/12/12</u>		Collected/Weight <u>10/10/12 09:02 1018 g</u>
# solids <u>98.9</u>	# solids <u>98.9</u>	Custody/SAF No <u>RC-189-125 RC-189</u>

ANALYTE	DUPLICATE	2 σ ERR	MDA	RDL	QUALI-	TEST	ORIGINAL	2 σ ERR	MDA	QUALI-	RPD	3 σ	DER
	pCi/g	(COUNT)	pCi/g	pCi/g	FIEIS		pCi/g	(COUNT)	pCi/g	FIEIS	%	TOT	σ
Tritium	0.110	1.9	3.20	10.0	U	H	1.52	2.0	3.29	U	-	1.0	
Carbon 14	0.604	0.47	0.769	1.00	U	C	0.579	0.49	0.801	U	-	0.1	
Nickel 63	0.928	1.7	2.85	30.0	U	NI_L	1.14	1.8	3.00	U	-	0.2	
Total Strontium	0.276	0.14	0.221	1.00		SR	0.231	0.12	0.199		18	111	0.5
Uranium 233/234	0.684	0.33	0.249	1.00		U	0.534	0.24	0.227		25	102	0.7
Uranium 235	0.039	0.079	0.302	1.00	U	U	0.036	0.072	0.275	U	-	0.1	
Uranium 238	0.587	0.27	0.249	1.00		U	0.564	0.24	0.227		4	96	0.1
Potassium 40	9.23	0.43	0.192			GAM	9.52	0.42	0.167		3	18	0.5
Cobalt 60	U		0.020	0.050	U	GAM	U		0.028	U	-	0.5	
Cesium 137	0.088	0.020	0.021	0.100		GAM	0.076	0.018	0.020		15	51	0.9
Radium 226	0.342	0.034	0.030	0.100		GAM	0.312	0.036	0.034		9	27	1.0
Radium 228	0.444	0.093	0.089	0.200		GAM	0.523	0.089	0.082		16	43	1.2
Europium 152	U		0.047	0.100	U	GAM	U		0.048	U	-	0	
Europium 154	U		0.057	0.100	U	GAM	U		0.055	U	-	0.1	
Europium 155	U		0.063	0.100	U	GAM	U		0.067	U	-	0.1	
Thorium 228	0.448	0.026	0.024			GAM	0.470	0.028	0.025		5	19	0.7
Thorium 232	0.444	0.093	0.089			GAM	0.523	0.089	0.082		16	43	1.2
Uranium 235	U		0.115	0.300	U	GAM	U		0.129	U	-	0.2	
Uranium 238	U		2.00	10.0	U	GAM	U		1.91	U	-	0.1	
Americium 241	U		0.107	0.300	U	GAM	U		0.081	U	-	0.4	

QC-DUP#1 82734

100N Field Remediation - Soil

DUPPLICATES
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SUMMARY DATA SECTION
Page 14

Lab id <u>EBERLINE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DUP</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

EBERLINE ANALYTICAL - RICHMOND

SAMPLE DELIVERY GROUP K4000

7779-017

JIR2V0

DUPLICATE

SDG <u>7779</u>	Client/Case no <u>Hanford</u>	SDG K4000
Contact <u>Joseph Verville</u>	Contract No. <u>S00W235A01</u>	
DUPLICATE		
Lab sample id <u>S210028-17</u>	Lab sample id <u>S210028-01</u>	Client sample id <u>JIR2V0</u>
Dept sample id <u>7779-017</u>	Dept sample id <u>7779-001</u>	Location/Matrix <u>UPR100N31 Verif-DeepZone SOIL</u>
Received <u>10/12/12</u>	# solids <u>98.9</u>	Collected/Weight <u>10/10/12 09:02 1018 g</u>
		Custody/SAF No <u>RC-189-125 RC-189</u>

ANALYTE	DUPPLICATE	2 σ ERR	MDA	RDL	QUALI-	ORIGINAL	2 σ ERR	MDA	QUALI-	RPD	3 σ	DER
	pCi/g	(COUNT)	pCi/g	pCi/g	FIEBS	TEST	pCi/g	(COUNT)	pCi/g	FIEBS	#	TOT
Plutonium 238	0.032	0.032	0.046	1.00	U	PU	0.005	0.026	0.045	U	-	1.3
Plutonium 239/240	0.013	0.013	0.024	1.00	U	PU	0.003	0.015	0.028	U	-	1.0

QC-DUP#1 82827

100N Field Remediation - Soil

DUPLICATES

Page 2

SUMMARY DATA SECTION

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Lab id <u>EBERLINE</u>
Protocol <u>RC-189</u>
Version <u>Ver 1.0</u>
Form <u>DVD-DUP</u>
Version <u>3.06</u>
Report date <u>11/01/12</u>

Date: 28 January 2013
To: Washington Closure Hanford Inc. (technical representative)
From: ELR Consulting
Project: 100N Field Remediation – Soil Full Protocol – Waste Site UPR-100-N-31,
 UPR-100-N-4 and UPR-100-N-8
Subject: Inorganics - Data Package No. K4000-LLI

INTRODUCTION

This memo presents the results of data validation on Data Package No. K4000 prepared by Lionville Laboratories Inc. (LLI). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analyte
J1R2V0	10/10/12	Soil	C	See note 1
J1R2V1	10/10/12	Soil	C	See note 1
J1R2V2	10/10/12	Soil	C	See note 1
J1R2V3	10/10/12	Soil	C	See note 1
J1R2V4	10/10/12	Soil	C	See note 1
J1R2V5	10/10/12	Soil	C	See note 1
J1R2V6	10/10/12	Soil	C	See note 1
J1R2V7	10/10/12	Soil	C	See note 1
J1R2V8	10/10/12	Soil	C	See note 1
J1R2V9	10/10/12	Soil	C	See note 1
J1R2W0	10/10/12	Soil	C	See note 1
J1R2W1	10/10/12	Soil	C	See note 1
J1R2W2	10/10/12	Soil	C	See note 1

1 – ICP metals (6010B) and mercury (7471A).

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites (DOE/RL-2005-92, Rev. 0, October 2006). Appendices 1 through 6 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation
- Appendix 6. Additional Documentation Requested by Client

DATA QUALITY PARAMETERS

Holding Times

Analytical holding times for metals are assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Soil samples must be analyzed within 28 days for mercury and 6

months for ICP metals.

All holding times were acceptable.

- **Preparation (Method) Blanks**

Preparation Blanks

At least one preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure, must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with digestate concentrations less than five times the preparation blank value have had their associated values qualified as non-detected and flagged "UJ". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

In the case of negative blank results, if the absolute value exceeds the contract required detection limit (CRDL), all nondetects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the instrument detection limit (IDL) and less than or equal to the CRDL, all nondetects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

All preparation blank results were acceptable.

Field (Equipment) Blank

One field blank (J1R2W2) was submitted for analysis. Fourteen analytes were detected in the field blank. Under the WCH statement of work, no qualification is required.

- **Accuracy**

Matrix Spike and Laboratory Control Sample

Matrix spike (MS) and laboratory control sample (LCS) analyses are used to assess the analytical accuracy of the reported data. The matrix spike is used to assess the effect of the matrix on the ability to accurately quantify sample concentrations. Recoveries must fall within the range of 70% to 130%. Samples with a recovery of less than 30% and a sample result below the IDL are rejected and flagged "UR". Samples with a recovery of 30% to 69% and a sample result less than the IDL are qualified "UJ". Samples with a recovery of greater than 130% or less than 70% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with

a recovery greater than 130% and a sample result less than the IDL, no qualification is required.

Due to matrix spike recoveries outside QC limits, all antimony (41.8%) and calcium (131%) results were qualified as estimates and flagged "J".

Due to LCS recoveries outside QC limits, all aluminum (182%) results were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

- **Precision**

Laboratory Duplicate Samples

Analytical precision is expressed by the relative percent differences (RPD) between the recoveries of matrix spike duplicate (MSD) analyses performed on a sample in the analytical batch. Precision may alternatively be assessed using unspiked duplicate analyses performed on a sample in the analytical batch. If both sample and replicate activities (concentrations) are greater than five times the CRDL and the RPD is less than 30%, no qualification is required. If either activity (concentration) is less than five times the CRDL, the RPD control limit is less than or equal to two times the CRDL. If the RPD is outside the applicable control limit, associated results are qualified as estimated detects or estimated non-detects.

All laboratory duplicate results were acceptable.

Field Duplicate

One set of field duplicates (J1R2V0/J1R2W1) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. All field duplicate results were acceptable.

- **Analytical Detection Levels**

Reported analytical detection levels are compared against the 300 Area RQLs to ensure that laboratory detection levels meet the required criteria. All results met the RQL.

- **Completeness**

Data package No. K4000 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

The following minor deficiencies were noted:

- Due to matrix spike recoveries outside QC limits, all antimony (41.8%) and calcium (131%) results were qualified as estimates and flagged "J".
- Due to LCS recoveries outside QC limits, all aluminum (182%) results were qualified as estimates and flagged "J".

Data flagged "J" indicates that the associated concentration is an estimate, but under the WCH statement of work, the data may be usable for decision-making purposes. All other validated results are considered accurate within the standard error associated with the methods.

REFERENCES

Washington Closure Hanford Contract #S00W307A00 (March 2008), *Data Validation Services*, March 2008.

DOE/RL-2005-92, Rev. 0, 100-N Area Sampling and Analysis Plan for CERCLA Waste Sites, U.S. Department of Energy, October 2006.

Appendix 1
Glossary of Data Reporting Qualifiers

Qualifiers which may be applied by data validators in compliance with WCH validation SOW are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a minor QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a minor QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified major QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified major QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

Appendix 2
Summary of Data Qualification

INORGANICS DATA QUALIFICATION SUMMARY*

SDG: K4000	REVIEWER: ELR	Project: UPR-100-N- 31, UPR-100-N-4 and UPR-100-N-8	PAGE <u>1</u> OF <u>1</u>
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Antimony	J	All	Matrix spike recovery
Calcium			
Aluminum	J	All	LCS recovery

* - The Qualified Data Summary Table includes laboratory applied "U" qualifiers not specifically identified here. The laboratory applied "U" qualifiers are included to minimize misinterpretation of results contained in the table.

Appendix 3
Annotated Laboratory Reports



264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
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WC-Hanford, Inc.
2620 Fermi Avenue
Richland WA, 99354

Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

J1R2V0
1210043-01 (Soil)

V1127143

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

Metals by SW846 6000/7000 series

Aluminum	5560	U	14.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.74	U	1.74	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.75	B	2.90	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	62.8		1.45	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.239	B	0.581	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.81	U	5.81	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.581	U	0.581	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	7220	U	290	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	5.13		0.581	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	9.99		5.81	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	13.8		2.90	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	30900		58.1	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.66		1.45	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	5070		218	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	426		14.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	5.81	U	5.81	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	7.40	B	11.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	684	B	1160	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.871	U	0.871	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	422		5.81	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.581	U	0.581	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	432		145	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	88.5		7.26	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	51.3		29.0	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0232	U	0.0232	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

000000015



264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
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WC-Hanford, Inc.
2620 Fermi Avenue
Richland WA, 99354

Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

V.11271.3

J1R2V1
1210043-02 (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

Aluminum	4900	J	10.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.26	U J	1.26	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.80	B	2.10	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	56.0		1.05	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.203	B	0.420	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	4.20	U	4.20	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.420	U	0.420	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	6080	J	210	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	5.54		0.420	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	8.64		4.20	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	13.3		2.10	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	28300		42.0	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.44		1.05	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4720		157	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	331		10.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	0.654	B	4.20	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	7.65	B	8.40	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	642	B	840	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.630	U	0.630	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	379		4.20	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.420	U	0.420	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	386		105	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	85.7		5.25	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	48.7		21.0	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0267	U	0.0267	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

000000016



264 Welsh Pool Road
Exton, PA 19341
Phone: 610-280-3000
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WC-Hanford, Inc.
2620 Fermi Avenue
Richland WA, 99354

Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

11/27/13

J1R2V2
1210043-03 (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

Aluminum	6530	J	12.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.53	U J	1.53	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	2.54	B	2.56	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	55.3		1.28	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.252	B	0.511	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.11	U	5.11	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.511	U	0.511	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	5400	J	256	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	13.4		0.511	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	8.10		5.11	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	12.4		2.56	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	26700		51.1	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	3.62		1.28	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4490		192	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	344		12.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	5.11	U	5.11	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	10.4		10.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	1060		1020	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.767	U	0.767	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	565		5.11	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.511	U	0.511	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	276		128	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	77.7		6.39	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	43.6		25.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0292	U	0.0292	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

000000017



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Exton, PA 19341
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WC-Hanford, Inc.
2620 Fermi Avenue
Richland WA, 99354

Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

V, 1/21/13

J1R2V3
1210043-04 (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

Aluminum	4810	J	12.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.54	U J	1.54	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.56	B	2.56	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	39.7		1.28	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.232	B	0.512	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.12	U	5.12	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.512	U	0.512	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	6690	J	256	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	4.51		0.512	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	9.67		5.12	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	14.5		2.56	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	31300		51.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.20		1.28	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4830		192	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	389		12.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	0.711	B	5.12	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	6.80	B	10.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	589	B	1020	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.768	U	0.768	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	403		5.12	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.512	U	0.512	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	443		128	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	90.2		6.40	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	53.4		25.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0283	U	0.0283	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A



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WC-Hanford, Inc.
2620 Fermi Avenue
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Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

1/12/13

J1R2V4
1210043-05 (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

Aluminum	4780	J	13.3	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.59	UJ	1.59	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.43	B	2.66	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	62.5		1.33	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.225	B	0.532	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.32	U	5.32	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.532	U	0.532	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	6510	J	266	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	8.60		0.532	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	10.2		5.32	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	14.5		2.66	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	31900		53.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.18		1.33	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	5470		199	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	358		13.3	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	0.609	B	5.32	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	14.0		10.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	537	B	1060	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.797	U	0.797	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	385		5.32	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.532	U	0.532	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	491		133	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	96.5		6.64	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	55.8		26.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0284	U	0.0284	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A



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Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

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10/19/2012 08:42

V11/27/13 J1R2V5
1210043-06 (Soil)

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

Metals by SW846 6000/7000 series

Aluminum	6780	J	12.9	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.55	UJ	1.55	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	2.52	B	2.58	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	56.2		1.29	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.260	B	0.515	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.15	U	5.15	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.515	U	0.515	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	7600	J	258	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	9.23		0.515	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	8.77		5.15	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	16.2		2.58	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	27000		51.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	3.65		1.29	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4970		193	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	340		12.9	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	0.532	B	5.15	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	10.5		10.3	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	977	B	1030	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.773	U	0.773	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	572		5.15	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.515	U	0.515	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	373		129	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	75.8		6.44	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	49.6		25.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0261	U	0.0261	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

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Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

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10/19/2012 08:42

V11271.3

J1R2V6
1210043-07 (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

Aluminum	5890	J	12.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.54	U J	1.54	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.74	B	2.56	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	67.1		1.28	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.241	B	0.513	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.13	U	5.13	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.513	U	0.513	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	6640	J	256	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	5.72		0.513	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	10.6		5.13	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	16.4		2.56	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	31000		51.3	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	3.03		1.28	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4830		192	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	430		12.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	0.528	B	5.13	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	8.11	B	10.3	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	884	B	1030	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.769	U	0.769	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	518		5.13	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.513	U	0.513	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	393		128	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	90.1		6.41	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	57.2		25.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0252	U	0.0252	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

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Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

11/27/13

J1R2V7
1210043-08 (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

Aluminum	5430	J	12.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.46	U J	1.46	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.66	B	2.44	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	50.7		1.22	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.237	B	0.488	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	4.88	U	4.88	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.488	U	0.488	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	7350	J	244	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	7.44		0.488	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	9.90		4.88	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	15.2		2.44	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	30800		48.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.52		1.22	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4790		183	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	436		12.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	0.494	B	4.88	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	8.17	B	9.75	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	726	B	975	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.731	U	0.731	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	453		4.88	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.488	U	0.488	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	390		122	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	93.3		6.10	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	53.2		24.4	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0245	U	0.0245	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A



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Project: RC-189
Project Number: K4000
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V11271.3

J1R2V8
1210043-09 (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

Aluminum	5550	J	11.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.39	U J	1.39	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.64	B	2.32	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	50.7		1.16	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.224	B	0.464	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	4.64	U	4.64	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.464	U	0.464	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	5490	J	232	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	6.81		0.464	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	8.07		4.64	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	16.1		2.32	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	26200		46.4	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.63		1.16	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4470		174	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	292		11.6	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	4.64	U	4.64	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	8.18	B	9.29	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	757	B	929	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.697	U	0.697	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	398		4.64	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.464	U	0.464	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	332		116	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	71.6		5.81	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	45.8		23.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0252	U	0.0252	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

000000023



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Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

V11271.3

J1R2V9
1210043-10 (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

Aluminum	4720	J	12.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.47	U J	1.47	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.63	B	2.44	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	75.3		1.22	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.231	B	0.489	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	4.89	U	4.89	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.489	U	0.489	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	6380	J	244	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	4.64		0.489	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	10.7		4.89	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	17.1		2.44	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	32000		48.9	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.54		1.22	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4800		183	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	380		12.2	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	4.89	U	4.89	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	6.07	B	9.78	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	420	B	978	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.733	U	0.733	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	336		4.89	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.489	U	0.489	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	447		122	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	77.8		6.11	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	53.6		24.4	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0253	U	0.0253	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A



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: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

W112713

J1R2W1
1210043-11 (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

Aluminum	5310	5	13.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Antimony	1.62	U 5	1.62	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Arsenic	1.74	B	2.70	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Barium	57.3		1.35	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.205	B	0.540	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Boron	5.40	U	5.40	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.540	U	0.540	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Calcium	6520	5	270	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Chromium	4.89		0.540	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Cobalt	9.67		5.40	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Copper	14.6		2.70	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Iron	29700		54.0	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Lead	2.45		1.35	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Magnesium	4780		202	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Manganese	369		13.5	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	5.40	U	5.40	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Nickel	6.86	B	10.8	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Potassium	670	B	1080	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.809	U	0.809	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silicon	429		5.40	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Silver	0.540	U	0.540	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Sodium	430		135	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Vanadium	81.0		6.75	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Zinc	50.7		27.0	mg/kg dry	3	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0232	U	0.0232	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A



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: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

V1(221)

J1R2W2
1210043-12 (Soil)

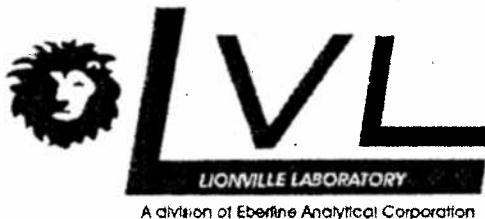
Analyte	Result and Qualifier	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
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Lionville Laboratory

Metals by SW846 6000/7000 series

Aluminum	246	J	3.29	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Antimony	0.395	U J	0.395	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Arsenic	0.286	B	0.658	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Barium	2.45		0.329	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Beryllium	0.04400	B	0.132	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Boron	1.32	U	1.32	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Cadmium	0.132	U	0.132	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Calcium	36.8	B J	65.8	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Chromium	0.165		0.132	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Cobalt	1.32	U	1.32	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Copper	0.658	U	0.658	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Iron	696		13.2	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Lead	0.738		0.329	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Magnesium	26.2	B	49.4	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Manganese	23.9		3.29	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Molybdenum	1.32	U	1.32	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Nickel	2.63	U	2.63	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Potassium	50.7	B	263	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Selenium	0.197	U	0.197	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Silicon	114		1.32	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Silver	0.132	U	0.132	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Sodium	32.9	U	32.9	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Vanadium	0.560	B	1.65	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Zinc	2.00	B	6.58	mg/kg dry	1	L210120	10/15/2012	10/17/2012	6010B
Mercury	0.0250	U	0.0250	mg/kg dry	1	L210123	10/16/2012	10/16/2012	7471A

Appendix 4
Laboratory Narrative and Chain-of-Custody Documentation



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

Case Narrative

Client: WC-HANFORD RC-189
LVL#: 1210043
SDG/SAF#: K4000/RC-189

W.O.#: 60049-001-001-0001-00
Date Received: 10-12-12

METALS

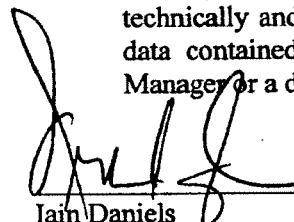
The following is a summary of the QC results accompanying the sample results. Lionville Laboratory (LvL) certifies that all test results meet the requirements of NELAC except as noted below.

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 analyses of 12 soil samples.
2. The samples were prepared and analyzed in accordance with methods listed on the data report forms.

All samples with the exception of sample J1R2W2 were analyzed and reported with 3-fold dilutions 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: Aluminum, Calcium, Iron, Manganese, Antimony, and Silicon.
12. All duplicate analyses were within the 20% Relative Percent Difference (RPD) control limits. The \pm 20% RPD control limit applies to sample results greater than ten times the MDL. The sample results for Arsenic and Chromium were less 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

10/19/12
Date

alm/10-043hg%

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Washington Closure Hanford		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST						RC-189-125		Page 1 of 2	
Collector Q. Stowe	Company Contact John Klemmer	Telephone No. 375-4688	Project Coordinator KESSENER, JH			SAP No. RC-189	Price Code 8L	8C	μg/l/t	Data Turnaround <i>5 1/4/12</i>	
Project Description 100N Field Remediation - Soil Pull Protocol		Sampling Location UPR100N31 Verification-Deep Zone			Method of Shipment Hand Delivery (Fed Ex)			21 Days			
Ice Chest No. <i>JNCH-11-014</i>	Field Logbook No. EL-1632-07	COA R10N312000	Offsite Property No. <i>A110541</i>			Bill of Lading/Air Bill No.			<i>See OSPC</i>		
POSSIBLE SAMPLE HAZARDS/REMARKS <i>Potentiometer</i> <i>DOT L1m1t3</i> <i>A-10-10-12</i>		Preservation CP	Cool AC CP	Cool AC CP	Cool AC CP	None	None	None	None	None	
Special Handling and/or Storage <i>Cool 4°C</i> <i>W/10/12</i>		Type of Container No. of Container(s)	1	1	1	1	0	0	1	0	
		Volume	60mL	60mL	500mL	500mL	500mL	60mL	500mL	500mL	
SAMPLE ANALYSIS											
Sample No.	Matrix *	Sample Date <i>10-10-12</i>	Sample Time <i>0902</i>	Date/Time <i>10/10/12 09:05</i>	Date/Time <i>10/10/12 09:50</i>	Date/Time <i>10/10/12 09:24</i>	Date/Time <i>10/10/12 10:11</i>	Date/Time <i>10/10/12 10:12</i>	Date/Time <i>10/10/12 10:12</i>	Date/Time <i>10/10/12 10:12</i>	
J1R2V0	SOIL	<i>10-10-12</i>	<i>0902</i>	X	X	X	X	<i>34599</i>	<i>34590</i>	<i>34590</i>	
J1R2V1	SOIL	<i>10-10-12</i>	<i>10:15</i>	X	X	X	X	<i>34594</i>	<i>34591</i>	<i>34591</i>	
J1R2V2	SOIL	<i>10-10-12</i>	<i>0950</i>	X	X	X	X	<i>34599</i>	<i>34592</i>	<i>34592</i>	
J1R2V3	SOIL	<i>10-10-12</i>	<i>0924</i>	X	X	X	X	<i>34599</i>	<i>34593</i>	<i>34593</i>	
J1R2V4	SOIL	<i>10-10-12</i>	<i>10:11</i>	X	X	X	X	<i>34595</i>	<i>34594</i>	<i>34594</i>	
SPECIAL INSTRUCTIONS Cool AC <i>At 10-10-12</i>											
CHAIN OF POSSESSION											
Retain/Released By/Removed From <i>Rickey Stone</i>	Date/Time <i>10/10/12</i>	Received By/Shared In <i>Dennis Klemmer</i>	Date/Time <i>10/10/12</i>	Matrix *							
Retain/Released By/Removed From <i>Dennis Klemmer</i>	Date/Time <i>10/10/12</i>	Received By/Shared In <i>A. Freier A. French</i>	Date/Time <i>10/10/12</i>	(1) ICP Metals - 601/MTB (Close-out List) (Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Vanadium, Zinc); Mercury - 7471 - (CV) (2) IC-Elements - 309-0-Random Chloride, Fluoride, Nitrate, Nitrite, Phosphate, Sulfate; NO2/NO3 - 353-2-PM-0609-0609 (3) Gamma Spec (Close List) (Americium-241, Cerium-137, Cobalt-60, Europium-152, Europium-154, Europium-155, Radium-226)							
Retain/Released By/Removed From <i>A. Freier A. French</i>	Date/Time <i>10/10/12</i>	Received By/Shared In <i>Fay E</i>	Date/Time <i>10/10/12</i>								
Retain/Released By/Removed From <i>Fay E</i>	Date/Time <i>10/10/12</i>	Received By/Shared In <i>Lone Headman</i>	Date/Time <i>10-10-12 09:55</i>								
Retain/Released By/Removed From	Date/Time	Received By/Shared In	Date/Time								
LABORATORY SECTION	Received By	Title			Date/Time			Date/Time			
FINAL SAMPLE DISPOSITION	Disposal Method	Title			Date/Time			Date/Time			



Disposed By

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CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST									
Collector Q. Stowe	Company Contact Joan Kiesner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code 8K	Date Turnaround <u>7/17/12</u>				
Project Designation 100N Field Remediation - Soil Full Protocol	Sampling Location UPR100N31 Verification-Deep Zone	SAF No. RC-189	Method of Shipment Hand Delivery (Food/Bulk)	<u>DR</u>	<u>7/17/12</u>				
Ice Chest No. <u>WCH-11-014</u>	Field Logbook No. EL 1652-07	COA R10N312000	Method of Lading/Air Bill No.	<u>WHA</u>	<u>7/17/12</u>				
Shipped To <u>LVL Environmental Services (LONVILLE)</u> <u>10/10/12</u>	Offsite Property No. <u>WHA</u>	Offsite Date/ <u>10-10-12</u>	Bill of Lading/Air Bill No.	<u>WHA</u>	<u>7/17/12</u>				
POSSIBLE SAMPLE HAZARDS/REMARKS <u>None</u>		Preservation <u>None</u>	Cool AC <u>None</u>	None	Data Turnaround <u>7/17/12</u>				
Potential Rad & DOT Limits <u>Avg 10-10-12</u>	Type of Container <u>1</u>	COF <u>None</u>	COF <u>None</u>	COF	COF				
Special Handling and/or Storage <u>None</u>	No. of Container(s) <u>1</u>	1 <u>None</u>	1 <u>None</u>	0 <u>None</u>	0 <u>None</u>				
Volume <u>60mL</u>	Volume <u>60mL</u>	60mL <u>None</u>	500mL <u>None</u>	500mL <u>None</u>	500mL <u>None</u>				
SAMPLE ANALYSIS									
Sample No.	Matrix *	Sample Date	Sample Time	SPECIAL INSTRUCTIONS			Matrix *		
J1R2V6	SOIL	10-10-12	0915	X	X	Cool AC	SOIL	SOIL	SOIL
J1R2V8	SOIL	10-10-12	0931	Y	Y		SOIL	SOIL	SOIL
J1R2V7	SOIL	10-10-12	0942	Y	Y		SOIL	SOIL	SOIL
J1R2V8	SOIL	10-10-12	1006	Y	Y		SOIL	SOIL	SOIL
J1R2V9	SOIL	10-10-12	0957	X	Y		SOIL	SOIL	SOIL
CHAIN OF POSSESSION									
Retrieved By/Removed From <u>Q. Stowe</u>	Date/Time <u>10-10-12</u>	Received By/Stored In <u>Dennis Neff</u>	Date/Time <u>10-10-12</u>	Cobalt 60			Cobalt 60		
Retrieved By/Removed From <u>Dennis Neff</u>	Date/Time <u>10-10-12</u>	Received By/Stored In <u>Bircham</u>	Date/Time <u>10-10-12</u>	(1) ICP Metals - 6010TR (Close-out Lab) (Aluminum, Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7471- (CV) (2) Ag-Antimon - 3000 (Paratoluene, Chloride, Fluoride, Nitrate, Nitrite, Phosphate, Sulfate); NO2/NO3 - 3513-2; pH/Soil - 0046 - 2 N. (3) Gamma Spec (Chem Lab) (Americium-241, Cobalt-60, Europium-152, Gadolinium-155, Radium-226)			(1) ICP Metals - 6010TR (Close-out Lab) (Aluminum, Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7471- (CV) (2) Ag-Antimon - 3000 (Paratoluene, Chloride, Fluoride, Nitrate, Nitrite, Phosphate, Sulfate); NO2/NO3 - 3513-2; pH/Soil - 0046 - 2 N. (3) Gamma Spec (Chem Lab) (Americium-241, Cobalt-60, Europium-152, Gadolinium-155, Radium-226)		
Retrieved By/Removed From <u>Bircham</u>	Date/Time <u>10-10-12</u>	Received By/Stored In <u>W. Miller</u>	Date/Time <u>10-10-12</u>						
Retrieved By/Removed From <u>W. Miller</u>	Date/Time <u>10-10-12</u>	Received By/Stored In <u>A. Freier A. Freier</u>	Date/Time <u>0915</u>						
Retrieved By/Removed From <u>A. Freier A. Freier</u>	Date/Time <u>10-10-12</u>	Received By/Stored In <u>W. Miller</u>	Date/Time <u>10-10-12</u>						
Retrieved By/Removed From <u>W. Miller</u>	Date/Time <u>10-10-12</u>	Received By/Stored In <u>A. Freier A. Freier</u>	Date/Time <u>0915</u>						
LABORATORY Received By SECTION	Reviewed By DATE <u>10-11-12</u>								Date/Time
FINAL SAMPLE Disposal Method	Approved By DATE <u>10-11-12</u>								Date/Time

WCH-EE-011

Washington Closure Hanford		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST							RC-189-125		Page 2 of 2	
Collector Q. Stowc	Customer Contact John Kessner	Telephone No. 375-4688			Project Coordinator KESSNER, JH			Price Code <i>ML</i>		Data Turnaround <i>OK</i> <i>in 1-2 wks</i>		
Project Designation 100NN Field Remediation - Soil Full Protocol		Sampling Location UPR100NNJ1 Verification-Deep Zone						SAF No. RC-189		Method of Shipment Hand Delivered/Fed Ex		
Ice Chest No.	<i>WCH-11-014</i>	Field Logbook No. EL-1652-07		COA R10N312000								
Shipped To ASPHALT SERVICES (LIONVILLE)	<i>10/10/12</i>	Offsite Property No.		<i>A11D 541</i>		Bill of Lading/Air Bill No.		<i>See OSPC</i>				
POSSIBLE SAMPLE HAZARDS/REMARKS												
Potential Rad LD OTT Lim 7.5 <i>A.2 10-10-12</i>												
Special Handling and/or Storage None - Cool 4°C <i>10/10/12</i>												
SAMPLE ANALYSIS												
Sample No.	Matrix *	Sample Date	Sample Time	SPECIAL INSTRUCTIONS								Matrix *
J1R2W0	SOIL	<i>10/10/12</i>	<i>0902</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>As-Hg</i>
J1R2W1	SOIL	<i>10-10-12</i>	<i>0902</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>34590</i>
J1R2W2	SOIL	<i>10-10-12</i>	<i>0828</i>	<i>X</i>								<i>10/10/12</i>
CHAIN OF POSSESSION												
Relinquished By/Removed From <i>John Stowc</i>	Date/Time <i>10/10/12</i>	Received By/Stored In <i>Dennis Dennis</i>	Date/Time <i>10/10/12</i>	Date/Time <i>1/3/13</i> Cool 4°C								Matrix *
Relinquished By/Removed From <i>Dennis Dennis</i>	Date/Time <i>10/10/12</i>	Received By/Stored In <i>A. Freier A. Freier</i>	Date/Time <i>10-10-12</i>	Date/Time <i>1/5/13</i>								(1) ICP Metals - 6010TR (Close-out Lab) (Aluminum, Arsenic, Antimony, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Molybdenum, Nickel, Potassium, Selenium, Silicon, Silver, Sodium, Vanadium, Zinc); Mercury - 7471 - (CV) (2) ICP-AES - 38840 - (Bismuth, Cadmium, Cobalt, Nickel, Tellurium, Zinc); Nitrate - NO3/NO3- 553.2; pH (0-10) - 9852
Relinquished By/Removed From <i>A. Freier A. Freier</i>	Date/Time <i>10-10-12</i>	Received By/Stored In <i>Fred Heberle</i>	Date/Time <i>1/10</i>	Date/Time <i>1/10/13</i>								(3) Gamma Spec (Client Lab) (Americium-241, Cadmium-113, Cobalt-60, Europium-152, Europium-155, Radium-226)
Relinquished By/Removed From <i>Fred Heberle</i>	Date/Time <i>10-12-12</i>	Received By/Stored In <i>Karen Heberle</i>	Date/Time <i>1/2/12</i>	Date/Time <i>1/2/13</i>								REVIEWED BY <i>CMB</i> DATE <i>10-1-12</i>
Relinquished By/Removed From LABORATORY	Date/Time	Received By/Stored In	Date/Time	Date/Time								Date/Time
FINAL SAMPLE DISPOSITION SECTION	Received By	Disposal Method		Disposed By								Date/Time

Appendix 5
Data Validation Supporting Documentation

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: UPR 31,448				DATA PACKAGE: F4600	
VALIDATOR: ELR	LAB: LLI			DATE: 1/27/13	
			SDG:	K4000	
ANALYSES PERFORMED					
SW-846/ICP	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide		
SAMPLES/MATRIX					
JIR2U0	JIR2U1	JIR2U2	JIR2U3	JIR2U4	
JIR2U5	JIR2U6	JIR2U7	JIR2U8	JIR2U9	
JIR2W1	JIR2W2				
Soil					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present? Yes No N/A
 Comments: _____

2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments? Yes No N/A
 Initial calibrations acceptable? Yes No N/A
 ICP interference checks acceptable? Yes No N/A
 ICV and CCV checks performed on all instruments? Yes No N/A
 ICV and CCV checks acceptable? Yes No N/A
 Standards traceable? Yes No N/A
 Standards expired? Yes No N/A
 Calculation check acceptable? Yes No N/A

Comments: _____

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**3. BLANKS (Levels B, C, D, and E)**

- ICB and CCB checks performed for all applicable analyses? (Levels D, E)..... Yes No N/A
 Yes No N/A
- ICB and CCB results acceptable? (Levels D, E) Yes No N/A
 Yes No N/A
- Laboratory blanks analyzed? Yes No N/A
 Yes No N/A
- Laboratory blank results acceptable? Yes No N/A
 Yes No N/A
- Field blanks analyzed? (Levels C, D, E) Yes No N/A
 Yes No N/A
- Field blank results acceptable? (Levels C, D, E) Yes No N/A
 Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A
 Yes No N/A

Comments: _____

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- MS/MSD samples analyzed? Yes No N/A
 Yes No N/A
- MS/MSD results acceptable? Yes No N/A
 Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A
 Yes No N/A
- MS/MSD standards expired? (Levels D, E) Yes No N/A
 Yes No N/A
- LCS/BSS samples analyzed? Yes No N/A
 Yes No N/A
- LCS/BSS results acceptable? Yes No N/A
 Yes No N/A
- Standards traceable? (Levels D, E) Yes No N/A
 Yes No N/A
- Standards expired? (Levels D, E) Yes No N/A
 Yes No N/A
- Transcription/calculation errors? (Levels D, E)..... Yes No N/A
 Yes No N/A
- Performance audit sample(s) analyzed? Yes No N/A
 Yes No N/A
- Performance audit sample results acceptable?..... Yes No N/A
 Yes No N/A

Comments: MS - antimony (41.9%) calcn (131%) - J all
LCS - aluminum (182%) - J

 _____no PAJ

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**5. PRECISION (Levels C, D, and E)**

- Duplicate RPD values acceptable? Yes No N/A
- Duplicate results acceptable? Yes No N/A
- MS/MSD standards NIST traceable? (Levels D, E) Yes No N/A
- MS/MSD standards expired? (Levels D, E) Yes No N/A
- Field duplicate RPD values acceptable? Yes No N/A
- Field split RPD values acceptable? Yes No N/A
- Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: _____

_____**6. ICP QUALITY CONTROL (Levels D and E)**

- ICP serial dilution samples analyzed? Yes No N/A
- ICP serial dilution %D values acceptable? Yes No N/A
- ICP post digestion spike required? Yes No N/A
- ICP post digestion spike values acceptable? Yes No N/A
- Standards traceable? Yes No N/A
- Standards expired? Yes No N/A
- Transcription/calculation errors? Yes No N/A

Comments: _____

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**7. FURNACE AA QUALITY CONTROL (Levels D and E)**

Duplicate injections performed as required?	Yes	No	N/A
Duplicate injection %RSD values acceptable?	Yes	No	N/A
Analytical spikes performed as required?	Yes	No	N/A
Analytical spike recoveries acceptable?	Yes	No	N/A
Standards traceable?	Yes	No	N/A
Standards expired?	Yes	No	N/A
MSA performed as required?	Yes	No	N/A
MSA results acceptable?	Yes	No	N/A
Transcription/calculation errors?	Yes	No	N/A

Comments: _____

_____**8. HOLDING TIMES (all levels)**

Samples properly preserved?	Yes	No	N/A
Sample holding times acceptable?	Yes	No	N/A

Comments: _____

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

9. RESULT QUANTITATION AND DETECTION LIMITS (all levels)

- Results reported for all requested analyses? Yes No N/A
Results supported in the raw data? (Levels D, E) Yes No N/A
Samples properly prepared? (Levels D, E) Yes No N/A
Detection limits meet RDL? Yes No N/A
Transcription/calculation errors? (Levels D, E) Yes No N/A

Comments: _____

Appendix 6
Additional Documentation Requested by Client



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: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

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 L210120 - SW 3050B

Blank (L210120-BLK1)	Prepared: 10/15/2012 Analyzed: 10/17/2012									
Aluminum	4.81	U	4.81	mg/kg wet						
Antimony	0.577	U	0.577	mg/kg wet						
Arsenic	0.962	U	0.962	mg/kg wet						
Barium	0.481	U	0.481	mg/kg wet						
Beryllium	0.192	U	0.192	mg/kg wet						
Boron	1.92	U	1.92	mg/kg wet						
Cadmium	0.192	U	0.192	mg/kg wet						
Calcium	96.2	U	96.2	mg/kg wet						
Chromium	0.192	U	0.192	mg/kg wet						
Cobalt	1.92	U	1.92	mg/kg wet						
Copper	0.962	U	0.962	mg/kg wet						
Iron	19.2	U	19.2	mg/kg wet						
Lead	0.481	U	0.481	mg/kg wet						
Magnesium	72.1	U	72.1	mg/kg wet						
Manganese	4.81	U	4.81	mg/kg wet						
Molybdenum	1.92	U	1.92	mg/kg wet						
Nickel	3.85	U	3.85	mg/kg wet						
Potassium	385	U	385	mg/kg wet						
Selenium	0.288	U	0.288	mg/kg wet						
Silicon	1.92	U	1.92	mg/kg wet						
Silver	0.192	U	0.192	mg/kg wet						
Sodium	48.1	U	48.1	mg/kg wet						
Vanadium	2.40	U	2.40	mg/kg wet						
Zinc	9.62	U	9.62	mg/kg wet						

Duplicate (L210120-DUP1)	Source: 1210043-01		Prepared: 10/15/2012 Analyzed: 10/17/2012				
Aluminum	4740		14.0	mg/kg dry	5560		16.0
Antimony	1.68	U	1.68	mg/kg dry	1.74 U		20
Arsenic	1.43	B	2.80	mg/kg dry	1.75	20.1*	20
Barium	56.8		1.40	mg/kg dry	62.8	9.97	20
Beryllium	0.232	B	0.559	mg/kg dry	0.239	2.87	20
Boron	5.59	U	5.59	mg/kg dry	5.81 U		20
Cadmium	0.559	U	0.559	mg/kg dry	0.581 U		20
Calcium	6500		280	mg/kg dry	7220	10.5	20
Chromium	4.04		0.559	mg/kg dry	5.13	23.9*	20
Cobalt	10.1		5.59	mg/kg dry	9.99	0.774	20
Copper	13.6		2.80	mg/kg dry	13.8	1.75	20

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A division of Enviro Analytical Corporation

264 Welsh Pool Road
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WC-Hanford, Inc.
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Richland WA, 99354

Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

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 L210120 - SW 3050B

Duplicate (L210120-DUP1)	Source: 1210043-01	Prepared: 10/15/2012 Analyzed: 10/17/2012					
Iron	32600	55.9	mg/kg dry		30900	5.39	20
Lead	2.65	1.40	mg/kg dry		2.66	0.514	20
Magnesium	5410	210	mg/kg dry		5070	6.50	20
Manganese	376	14.0	mg/kg dry		426	12.4	20
Molybdenum	5.59	U	5.59	mg/kg dry	5.81 U		20
Nickel	8.21	B	11.2	mg/kg dry	7.40	10.4	20
Potassium	572	B	1120	mg/kg dry	684	17.8	20
Selenium	0.839	U	0.839	mg/kg dry	0.871 U		20
Silicon	405		5.59	mg/kg dry	422	4.19	20
Silver	0.559	U	0.559	mg/kg dry	0.581 U		20
Sodium	410		140	mg/kg dry	432	5.40	20
Vanadium	92.0		6.99	mg/kg dry	88.5	3.80	20
Zinc	53.6		28.0	mg/kg dry	51.3	4.21	20

Matrix Spike (L210120-MS1)	Source: 1210043-01	Prepared: 10/15/2012 Analyzed: 10/17/2012					
Aluminum	6210	14.2	mg/kg dry	189.96	5560	342*	75-125
Antimony	19.9	1.71	mg/kg dry	47.490	1.74 U	41.8*	75-125
Arsenic	168	2.85	mg/kg dry	189.96	1.75	87.5	75-125
Barium	234	1.42	mg/kg dry	189.96	62.8	90.3	75-125
Beryllium	4.56	0.570	mg/kg dry	4.7490	0.239	91.0	75-125
Boron	79.5	5.70	mg/kg dry	94.981	5.81 U	83.7	75-125
Cadmium	3.88	0.570	mg/kg dry	4.7490	0.581 U	81.7	75-125
Calcium	10300	285	mg/kg dry	2374.5	7220	131*	75-125
Chromium	22.4	0.570	mg/kg dry	18.996	5.13	91.1	75-125
Cobalt	52.7	5.70	mg/kg dry	47.490	9.99	89.9	75-125
Copper	36.0	2.85	mg/kg dry	23.745	13.8	93.6	75-125
Iron	32700	57.0	mg/kg dry	94.981	30900	1970*	75-125
Lead	44.9	1.42	mg/kg dry	47.490	2.66	89.0	75-125
Magnesium	7340	214	mg/kg dry	2374.5	5070	95.4	75-125
Manganese	440	14.2	mg/kg dry	47.490	426	29.9*	75-125
Molybdenum	82.4	5.70	mg/kg dry	94.981	5.81 U	86.8	75-125
Nickel	49.6	11.4	mg/kg dry	47.490	7.40	88.9	75-125
Potassium	2720	1140	mg/kg dry	2374.5	684	85.6	75-125
Selenium	162	0.855	mg/kg dry	189.96	0.871 U	85.1	75-125
Silicon	606	5.70	mg/kg dry	94.981	422	194*	75-125
Silver	4.25	0.570	mg/kg dry	4.7490	0.581 U	89.5	75-125
Sodium	2800	142	mg/kg dry	2374.5	432	99.8	75-125

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Project: RC-189
Project Number: K4000
Project Manager: Joan Kessner

Reported:
10/19/2012 08:42

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
Batch L210120 - SW 3050B									
Matrix Spike (L210120-MS1)									
Source: 1210043-01 Prepared: 10/15/2012 Analyzed: 10/17/2012									
Vanadium	140	7.12	mg/kg dry	47.490	88.5	108	75-125		
Zinc	96.8	28.5	mg/kg dry	47.490	51.3	95.7	75-125		
Post Spike (L210120-PS1)									
Source: 1210043-01 Prepared: 10/15/2012 Analyzed: 10/17/2012									
Aluminum	114000		ug/L	66000	57400	86.1	75-125		
Antimony	262		ug/L	300.00	1.96	86.7	75-125		
Calcium	127000		ug/L	62400	74600	83.6	75-125		
Iron	416000		ug/L	126000	319000	76.9	75-125		
Manganese	6940		ug/L	3000.0	4400	84.7	75-125		
Silicon	6970		ug/L	3300.0	4360	79.1	75-125		
Reference (L210120-SRM1)									
Prepared: 10/15/2012 Analyzed: 10/17/2012									
Aluminum	12100	14.4	mg/kg wet	6670.0		182	0-200.89		
Antimony	42.0	1.73	mg/kg wet	53.000		79.2	0-235.8		
Arsenic	116	2.88	mg/kg wet	114.00		102	82.8-117.54		
Barium	312	1.44	mg/kg wet	307.00		102	79.8-120.2		
Beryllium	106	0.577	mg/kg wet	108.00		98.0	82.8-117.6		
Boron	81.6	5.77	mg/kg wet	85.100		95.9	67.5-132.8		
Cadmium	226	0.577	mg/kg wet	225.00		100	83.6-116.4		
Calcium	3410	288	mg/kg wet	3360.0		101	83.3-116.9		
Chromium	85.2	0.577	mg/kg wet	77.200		110	73.3-126.4		
Cobalt	164	5.77	mg/kg wet	166.00		98.7	80.7-118.7		
Copper	267	2.88	mg/kg wet	271.00		98.5	80.8-119.2		
Iron	8860	57.7	mg/kg wet	8420.0		105	78.6-121.1		
Lead	191	1.44	mg/kg wet	190.00		101	81.6-118.4		
Magnesium	8510	216	mg/kg wet	8570.0		99.3	83.2-116.7		
Manganese	1050	14.4	mg/kg wet	965.00		108	69.3-130.5		
Molybdenum	233	5.77	mg/kg wet	235.00		99.2	76.2-123.8		
Nickel	224	11.5	mg/kg wet	221.00		101	79.6-120.8		
Potassium	15000	1150	mg/kg wet	14400		104	81.9-118.1		
Selenium	190	0.865	mg/kg wet	187.00		102	75.9-124.6		
Silicon	937	5.77	mg/kg wet	807.00		116	0-219.3		
Silver	82.4	0.577	mg/kg wet	83.500		98.7	82.7-117.1		
Sodium	9520	144	mg/kg wet	9730.0		97.9	82.5-117.2		
Vanadium	111	7.21	mg/kg wet	98.700		112	75.9-123.6		
Zinc	200	28.8	mg/kg wet	199.00		101	78.4-121.6		

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Metals by SW846 6000/7000 series - Quality Control
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Analyte	Result and Qualifiers		Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit		
Batch L210123 - SW 7471A Prep												
Blank (L210123-BLK1)												
Mercury	0.0290	U	0.0290	mg/kg wet								
Duplicate (L210123-DUP1)												
Mercury	0.0267	U	0.0267	mg/kg dry		0.0232 U				20		
Matrix Spike (L210123-MS1)												
Mercury	0.155		0.0252	mg/kg dry	0.13983	0.0232 U 111	75-125			20		
Reference (L210123-SRM1)												
Mercury	1.38		0.0290	mg/kg wet	1.2900		107	62.6-138				