

0095452

**SAF-RC-173**  
**Groundwater Sampling –**  
**100-HR-3 Decision Unit**  
**FINAL VALIDATION PACKAGE**

**COMPLETE COPY OF FINAL VALIDATION PACKAGE TO:**

No Distribution Required

**COMMENTS:**

**SDG K2574**

**SAF-RC-173**

**Sample Location: C7627**



Date: 28 March 2011  
To: Washington Closure Hanford Inc. (technical representative)  
From: ELR Consulting  
Project: Groundwater Sampling – 100-HR-3 Decision Unit – Well ID C7627  
Subject: Wet Chemistry - Data Package No. K2574-LLI

## **INTRODUCTION**

This memo presents the results of data validation on Data Package No. K2574 prepared by Lionville Laboratory Inc. (LLI). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analyte</b>
B28N32	11/10/10	Water	C	See note 1

1 – pH by 9045D.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the Sampling and Analysis Plan for the 100-DR-1, 100-DR-2, 10-HR-1, 100-HR-2 and 100-HR-3 Operable Units Remedial Investigation/Feasibility Study (DOE/RL-2009-40, Rev. 0, March 2010). 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: Water samples must be analyzed immediately (24 hours) for pH.

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".

Due to the holding time being exceeded by greater than twice the limit, all pH results were qualified as estimates and flagged "J".

000001

## **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.

Method blank analysis is not applicable for pH.

### Field (Equipment) Blank

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.

000002

All laboratory duplicate results were acceptable.

Field Duplicate

No field duplicates were submitted for analysis.

**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. No RQL was specified.

**Completeness**

Data package K2574 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 deficiency was noted:

- Due to the holding time being exceeded by greater than twice the limit, all pH 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*.

DOE/RL-2009-40; Rev. 0, 100-DR-1, 100-DR-2, 10-HR-1, 100-HR-2 and 100-HR-3 *Operable Unites Remedial Investigation/Feasibility Study*, March 2010.

**Appendix 1**  
**Glossary of Data Reporting Qualifiers**

**000004**

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).

000005

**Appendix 2**  
**Summary of Data Qualification**

**000006**

WET CHEMISTRY DATA QUALIFICATION SUMMARY\*

<b>SDG: K2574</b>	<b>REVIEWER: ELR</b>	<b>Project: Well ID C7627</b>	<b>PAGE <u>1</u> OF <u>1</u></b>
<b>COMPOUND</b>	<b>QUALIFIER</b>	<b>SAMPLES AFFECTED</b>	<b>REASON</b>
pH	J	All	Hold time

\* - 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.

000007

**Appendix 3**  
**Annotated Laboratory Reports**

**000008**



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-173  
Project Number: K2574  
Project Manager: Joan Kessner

Reported:  
12/22/2010 14:48

Wet Chemistry  
Lionville Laboratory

✓  
3/26/14

Analyte	Result and Qualifier	LOD	LOQ	Units	Dilution	Batch	Prepared	Analyzed	Method
<b>B28N32 (1011110-01) Water</b>									
pH	7.78	J	0.10	pH Units	1	L011222	11/12/2010	11/12/2010	SW846 9040B

000009

**Appendix 4**

**Laboratory Narrative and Chain-of-Custody Documentation**

**000010**



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

## Case Narrative

**Client:** WC-HANFORD RC-173 K2574  
**LVL#:** 1011110

**Date Received:** 11-12-10

### INORGANIC NARRATIVE

1. This narrative covers the analysis of 1 water sample.
2. The sample was prepared and analyzed in accordance with the method 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 time as required by the method and/or contract was not met as the sample was received past hold.
4. The results presented in this report are derived from a sample that met LvL's sample acceptance policy with the exception noted on the Sample Receipt Checklist.
5. The Laboratory Control Sample (LCS) was within the method criteria.
6. The replicate analysis was within the 20% Relative Percent Difference (RPD) control limit.
7. 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

njp111-110

12/23/10  
Date

000011

COLLECTOR <i>MORON</i>		COMPANY CONTACT RADLOFF, AW	TELEPHONE NO. 376-4554	PROJECT COORDINATOR KESSNER, JH	PRICE CODE 7N	DATA TURNAROUND 45 Days / 45 Days
SAMPLING LOCATION C7627 (199-H3-7); I-010		PROJECT DESIGNATION Groundwater Sampling - 100-HR-3 Decslon Unit		SAF NO. RC-173	AIR QUALITY <input type="checkbox"/>	
ICE CHEST NO. <i>OWS - 315</i>		FIELD LOGBOOK NO. <i>HNF-N-58512 (Pg 25)</i>	ACTUAL SAMPLE DEPTH <i>49.5'</i>	COA 302509ES10	METHOD OF SHIPMENT FEDERAL EXPRESS	
SHIPPED TO Lionville Laboratory Incorporated		OFFSITE PROPERTY NO. SEE PTR		BILL OF LADING/AIR BILL NO. <i>794108065552</i>		

MATRIX* A=Air DL=Drum L=Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	POSSIBLE SAMPLE HAZARDS/ REMARKS Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 5400.5 (1990/1993)	PRESERVATION	HNO3 to pH <2	None	
		HOLDING TIME	6 Months	ASAP	
		TYPE OF CONTAINER	G/P	P	
		NO. OF CONTAINER(S)	1	1	
		VOLUME	500mL	125mL	
	SPECIAL HANDLING AND/OR STORAGE	SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS	pH (Water) - 9040 (100 Area RIFS);	
SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME		
B28N32	WATER	<i>11/10/10</i>	<i>144)</i>		

000012

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM <i>J. M... DW</i>	DATE/TIME <i>11/10/10 600</i>	RECEIVED BY/STORED IN <i>110473 SSUK 2</i>	DATE/TIME <i>11/10/11 1600</i>	** The laboratory is to analyze pH within 24 hours of receipt. (1) ICP Metals - 6010TR (100 Area RIFS Client List);
RELINQUISHED BY/REMOVED FROM <i>SSU-R2</i>	DATE/TIME <i>NOV 11 2010 10:00</i>	RECEIVED BY/STORED IN <i>DW Bro... B...</i>	DATE/TIME <i>NOV 11 2010 10:00</i>	
RELINQUISHED BY/REMOVED FROM <i>...</i>	DATE/TIME <i>NOV 11 2010 14:00</i>	RECEIVED BY/STORED IN <b>FEDEX</b>	DATE/TIME	
RELINQUISHED BY/REMOVED FROM <i>...</i>	DATE/TIME <i>11-12-10/1020</i>	RECEIVED BY/STORED IN <i>...</i>	DATE/TIME <i>11-12-10/1020</i>	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	

LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME

**Appendix 5**

**Data Validation Supporting Documentation**

**000013**

**GENERAL CHEMISTRY ANALYSIS DATA VALIDATION CHECKLIST**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT:	C7627		DATA PACKAGE: K2574		
VALIDATOR:	ELR	LAB:	LLI	DATE: 3/26/11	
			SDG:	K2574	
ANALYSES PERFORMED					
Anions/IC	TOC	TOX	TPH-418.1	Oil and Grease	Alkalinity
Ammonia	BOD/COD	Chloride	Chromium-VI	<b>pH</b>	NO <sub>3</sub> /NO <sub>2</sub>
Sulfate	TDS	TKN	Phosphate		
SAMPLES/MATRIX					
B28 U32					
Water					

**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  
ICB and CCB results acceptable? (Levels D, E) ..... Yes No N/A  
Laboratory blanks analyzed? ..... Yes No N/A  
Laboratory blank results acceptable? ..... Yes No N/A  
Field blanks analyzed? (Levels C, D, E) ..... Yes No N/A  
Field blank results acceptable? (Levels C, D, E) ..... Yes No N/A  
Transcription/calculation errors? (Levels D, E)..... Yes No N/A

Comments: no FB  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

Comments: no PAS  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**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: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**6. HOLDING TIMES (all levels)**

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

Comments: 72x HT - J ell  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**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**

**000018**



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-173 Project Number: K2574 Project Manager: Joan Kessner	Reported: 12/22/2010 14:48
---	---	-------------------------------

**Wet Chemistry - Quality Control  
 Lionville Laboratory**

Analyte	Result and Qualifiers	LOD	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L011222 - Default Prep GenChem</b>										
<b>Duplicate (L011222-DUP1)</b>		<b>Source: 1011110-01</b>			<b>Prepared &amp; Analyzed: 11/12/2010</b>					
pH	7.80		0.10	pH Units		7.78			0.257	20
<b>Reference (L011222-SRM1)</b>		<b>Prepared &amp; Analyzed: 11/12/2010</b>								
pH	4.00		0.10	pH Units	4.0000		100	99-101		
<b>Reference (L011222-SRM2)</b>		<b>Prepared &amp; Analyzed: 11/12/2010</b>								
pH	7.00		0.10	pH Units	7.0000		100	99-101		

000019

Date: 28 March 2011  
To: Washington Closure Hanford Inc. (technical representative)  
From: ELR Consulting  
Project: Groundwater Sampling – 100-HR-3 Decision Unit – Well ID C7627  
Subject: Inorganic - Data Package No. K2574-LLI

## **INTRODUCTION**

This memo presents the results of data validation on Data Package No. K2574 prepared by Lionville Laboratory Inc. (LLI). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analyte</b>
B28N32	11/10/10	Water	C	See note 1

1 - ICP metals (6010B).

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the Sampling and Analysis Plan for the 100-DR-1, 100-DR-2, 10-HR-1, 100-HR-2 and 100-HR-3 Operable Unites Remedial Investigation/Feasibility Study (DOE/RL-2009-40, Rev. 0, March 2010). 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 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,

000001

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.

Due to method blank contamination, the aluminum result was qualified as undetected and flagged "UJ".

All other preparation blank results were acceptable.

#### Field (Equipment) Blank

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 80% to 120%. 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 79% and a sample result less than the IDL are qualified "UJ". Samples with a recovery of greater than 120% or less than 80% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a recovery greater than 120% 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 20%, 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

No field duplicates were submitted for analysis

## **Analytical Detection Levels**

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

## **Completeness**

Data package No. K2574 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 deficiency was noted:

- Due to method blank contamination, the aluminum result was qualified as undetected and flagged "UJ".

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-2009-40, Rev. 0, *100-DR-1, 100-DR-2, 10-HR-1, 100-HR-2 and 100-HR-3 Operable Unites Remedial Investigation/Feasibility Study*, March 2010.

**Appendix 1**  
**Glossary of Data Reporting Qualifiers**

**000005**

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).

000006

**Appendix 2**  
**Summary of Data Qualification**

000007

METALS DATA QUALIFICATION SUMMARY\*

<b>SDG: K2574</b>	<b>REVIEWER: ELR</b>	<b>Project: Well ID C7627</b>	<b>PAGE <u>1</u> OF <u>1</u></b>
<b>COMPOUND</b>	<b>QUALIFIER</b>	<b>SAMPLES AFFECTED</b>	<b>REASON</b>
Aluminum	UJ	All	Method blank contamination

\* - 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**

**000009**



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-173  
 Project Number: K2574  
 Project Manager: Joan Kessner

Reported:  
 12/01/2010 12:13

B28N32  
 1011110-01 (Water)

✓  
 3/20/11

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

Lionville Laboratory

Metals by SW846 6000/7000 series

Aluminum	22.1 B <i>05</i>	50.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Antimony	15.0 U	15.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Arsenic	10.0 U	10.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Barium	51.4	2.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Beryllium	1.00 U	1.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Bismuth	20.0 U	20.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Boron	32.1	10.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Cadmium	1.00 U	1.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Calcium	59300	100	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Chromium	11.4	2.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Cobalt	2.00 U	2.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Copper	10.0 U	10.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Iron	84.2	50.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Lead	10.0 U	10.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Lithium	10.9 B	20.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Magnesium	15300	100	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Manganese	40.8	2.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Molybdenum	4.55	2.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Nickel	2.83 B	5.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Phosphorus	18.9 B	50.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Potassium	6160	500	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Selenium	10.0 U	10.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Silicon	15600	50.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Strontium	402	5.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Silver	5.00 U	5.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Thallium	5.00 U	5.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Sodium	20200	100	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Tin	5.00 U	5.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Vanadium	13.9	5.00	ug/L	1	L011256	11/17/2010	11/21/2010	6010B
Zinc	55.5	20.0	ug/L	1	L011256	11/17/2010	11/21/2010	6010B

000010

**Appendix 4**

**Laboratory Narrative and Chain-of-Custody Documentation**

**000011**



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

### Case Narrative

**Client:** WC-HANFORD RC-173  
**LVL#:** 1011110  
**SDG/SAF#:** K2574/RC-173

**W.O.#:** 60049-001-001-0001-00  
**Date Received:** 11-12-10

### METALS

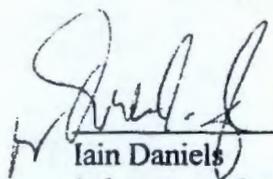
The following is a summary of the QC results accompanying the sample results. Lionville Laboratory (LvL) certifies that all test results meet the requirements of NELAC except as noted below.

1. This narrative covers the analysis of 1 water sample.
2. The sample was prepared and analyzed in accordance with methods listed on the data report forms.
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.
6. All Initial and Continuing Calibration Blanks (ICB/CCBs) were within control limits (less than the LOQ).
7. All preparation/method blanks (MB) were within method criteria {less than the Limit of Quantitation (3-10X the LOD), or samples greater than 20X MB value}.
8. All ICP Interference Check Standards were within control limits.
9. All laboratory control samples (LCS) were within the 80-120% control limits.
10. The matrix spike (MS) recovery for 1 analyte was 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 serial dilution is performed for Mercury. A PDS was prepared at meaningful concentration level for the following analytes:

<u>Sample ID</u>	<u>Element</u>	<u>PDS</u> <u>Concentration (ppb)</u>	<u>PDS</u> <u>% Recovery</u>
B28N32	Silicon	2,100	103.3

000012

12. All duplicate analyses were within the 20% Relative Percent Difference (RPD) control limit criteria. The  $\pm 20\%$  RPD control limit applies to sample results greater than ten times the MDL. The sample result for Aluminum was 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

12/4/10  
Date

ahm/11-110

000013

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			RC-173-023	PAGE 1 OF 1
COLLECTOR <i>Morgan</i>	COMPANY CONTACT RADLOFF, AW	TELEPHONE NO. 376-4554	PROJECT COORDINATOR KESSNER, JH		PRICE CODE 7N	DATA TURNAROUND 45 Days / 45 Days
SAMPLING LOCATION C7627 (199-H3-7); I-010	PROJECT DESIGNATION Groundwater Sampling - 100-HR-3 Decision Unit		SAF NO. RC-173	AIR QUALITY <input type="checkbox"/>		
ICE CHEST NO. <i>OWS-315</i>	FIELD LOGBOOK NO. <i>HNF-N-58512 (A920)</i>	ACTUAL SAMPLE DEPTH <i>49.5'</i>	COA 302509ES10	METHOD OF SHIPMENT FEDERAL EXPRESS		
SHIPPED TO Lonville Laboratory Incorporated	OFFSITE PROPERTY NO. SEE PTR	BILL OF LADING/AIR BILL NO. SEE PTR <b>7941080 65552</b>				

<b>MATRIX*</b> A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	<b>POSSIBLE SAMPLE HAZARDS/ REMARKS</b> Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 5400.5 (1990/1993)	<b>PRESERVATION</b>	HNO3 to pH <2	None	
		<b>HOLDING TIME</b>	6 Months	ASAP	
		<b>TYPE OF CONTAINER</b>	G/P	P	
		<b>NO. OF CONTAINER(S)</b>	1	1	
		<b>VOLUME</b>	500mL	125mL	
	<b>SPECIAL HANDLING AND/OR STORAGE</b>	<b>SAMPLE ANALYSIS</b>	SEE ITEM (1) IN SPECIAL INSTRUCTIONS	pH (Water) - 9040 (100 Area RIFS);	
<b>SAMPLE NO.</b>	<b>MATRIX*</b>	<b>SAMPLE DATE</b>	<b>SAMPLE TIME</b>		
B28N32	WATER	11/10/10	144)		

000014

<b>CHAIN OF POSSESSION</b>		<b>SIGN/ PRINT NAMES</b>		<b>SPECIAL INSTRUCTIONS</b>
RELINQUISHED BY/REMOVED FROM <i>J. Miller</i>	DATE/TIME 11/10/10 1600	RECEIVED BY/STORED IN <i>11043 SSUK 2</i>	DATE/TIME 11/10/11 1600	** The laboratory is to analyze pH within 24 hours of receipt. (1) ICP Metals - 6010TR (100 Area RIFS Client List);
RELINQUISHED BY/REMOVED FROM SSU-R2	DATE/TIME NOV 11 2010 10:00	RECEIVED BY/STORED IN <i>DW Brotherton</i>	DATE/TIME NOV 11 2010 10:00	
RELINQUISHED BY/REMOVED FROM <i>FEDEX</i>	DATE/TIME NOV 11 2010 14:00	RECEIVED BY/STORED IN <b>FEDEX</b>	DATE/TIME	
RELINQUISHED BY/REMOVED FROM <i>FEDEX</i>	DATE/TIME 11-12-10 11000	RECEIVED BY/STORED IN <i>all phone</i>	DATE/TIME 11-12-10 11000	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	

LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME

**Appendix 5**

**Data Validation Supporting Documentation**

**000015**

**INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT:	C7627		DATA PACKAGE: K2574		
VALIDATOR:	FLR	LAB:	LLI	DATE: 3/26/11	
			SDG:	K2574	
ANALYSES PERFORMED					
<b>SW-846/ICP</b>	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide		
SAMPLES/MATRIX					
B28132					
water					

**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  
ICB and CCB results acceptable? (Levels D, E) ..... Yes No  N/A  
Laboratory blanks analyzed? .....  Yes No N/A  
Laboratory blank results acceptable?..... Yes  No N/A  
Field blanks analyzed? (Levels C, D, E) ..... Yes  No N/A  
Field blank results acceptable? (Levels C, D, E)..... Yes No  N/A  
Transcription/calculation errors? (Levels D, E)..... Yes No  N/A  
Comments: aluminum - UT no FB

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

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

**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**

**000021**



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-173 Project Number: K2574 Project Manager: Joan Kessner	Reported: 12/01/2010 12:13
---	---	-------------------------------

**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 L011256 - SW 3005A**

Blank (L011256-BLK1)		Prepared: 11/17/2010 Analyzed: 11/21/2010							
Aluminum	15.9 B	50.0	ug/L						
Antimony	15.0 U	15.0	ug/L						
Arsenic	10.0 U	10.0	ug/L						
Barium	0.388 B	2.00	ug/L						
Beryllium	1.00 U	1.00	ug/L						
Bismuth	20.0 U	20.0	ug/L						
Boron	10.0 U	10.0	ug/L						
Cadmium	1.00 U	1.00	ug/L						
Calcium	100 U	100	ug/L						
Chromium	2.00 U	2.00	ug/L						
Cobalt	2.00 U	2.00	ug/L						
Copper	10.0 U	10.0	ug/L						
Iron	50.0 U	50.0	ug/L						
Lead	10.0 U	10.0	ug/L						
Lithium	20.0 U	20.0	ug/L						
Magnesium	100 U	100	ug/L						
Manganese	0.673 B	2.00	ug/L						
Molybdenum	2.00 U	2.00	ug/L						
Nickel	5.00 U	5.00	ug/L						
Phosphorus	50.0 U	50.0	ug/L						
Potassium	500 U	500	ug/L						
Selenium	10.0 U	10.0	ug/L						
Silicon	50.0 U	50.0	ug/L						
Strontium	5.00 U	5.00	ug/L						
Silver	5.00 U	5.00	ug/L						
Thallium	5.00 U	5.00	ug/L						
Sodium	100 U	100	ug/L						
Tin	5.00 U	5.00	ug/L						
Vanadium	5.00 U	5.00	ug/L						
Zinc	20.0 U	20.0	ug/L						

000022



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-173  
 Project Number: K2574  
 Project Manager: Joan Kessner

Reported:  
 12/01/2010 12:13

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

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L011256 - SW 3005A</b>									
<b>LCS (L011256-BS1)</b>				Prepared: 11/17/2010 Analyzed: 11/21/2010					
Aluminum	5040	50.0	ug/L	5000.0		101	80-120		
Antimony	3060	15.0	ug/L	3000.0		102	80-120		
Arsenic	10100	10.0	ug/L	10000		101	80-120		
Barium	5110	2.00	ug/L	5000.0		102	80-120		
Beryllium	255	1.00	ug/L	250.00		102	80-120		
Bismuth	5020	20.0	ug/L	5000.0		100	80-120		
Boron	5020	10.0	ug/L	5000.0		100	80-120		
Cadmium	257	1.00	ug/L	250.00		103	80-120		
Calcium	25400	100	ug/L	25000		101	80-120		
Chromium	506	2.00	ug/L	500.00		101	80-120		
Cobalt	2510	2.00	ug/L	2500.0		100	80-120		
Copper	1260	10.0	ug/L	1250.0		101	80-120		
Iron	5030	50.0	ug/L	5000.0		101	80-120		
Lead	2490	10.0	ug/L	2500.0		99	80-120		
Lithium	5080	20.0	ug/L	5000.0		102	80-120		
Magnesium	25500	100	ug/L	25000		102	80-120		
Manganese	764	2.00	ug/L	750.00		102	80-120		
Molybdenum	5060	2.00	ug/L	5000.0		101	80-120		
Nickel	2000	5.00	ug/L	2000.0		100	80-120		
Phosphorus	5110	50.0	ug/L	5000.0		102	80-120		
Potassium	25500	500	ug/L	25000		102	80-120		
Selenium	9950	10.0	ug/L	10000		100	80-120		
Silicon	4860	50.0	ug/L	5000.0		97	80-120		
Strontium	5140	5.00	ug/L	5000.0		103	80-120		
Silver	511	5.00	ug/L	500.00		102	80-120		
Thallium	9890	5.00	ug/L	10000		99	80-120		
Sodium	25800	100	ug/L	25000		103	80-120		
Tin	5020	5.00	ug/L	5000.0		100	80-120		
Vanadium	2520	5.00	ug/L	2500.0		101	80-120		
Zinc	1000	20.0	ug/L	1000.0		100	80-120		

000023



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-173  
 Project Number: K2574  
 Project Manager: Joan Kessner

Reported:  
 12/01/2010 12:13

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

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L011256 - SW 3005A</b>									
<b>Duplicate (L011256-DUP5)</b>		<b>Source: I011110-01</b>		<b>Prepared: 11/17/2010</b>		<b>Analyzed: 11/21/2010</b>			
Aluminum	41.5 B	50.0	ug/L		22.1			61*	20
Antimony	15.0 U	15.0	ug/L		15.0 U				20
Arsenic	10.0 U	10.0	ug/L		10.0 U				20
Barium	50.4	2.00	ug/L		51.4			2	20
Beryllium	1.00 U	1.00	ug/L		1.00 U				20
Bismuth	20.0 U	20.0	ug/L		20.0 U				20
Boron	31.4	10.0	ug/L		32.1			2	20
Cadmium	1.00 U	1.00	ug/L		1.00 U				20
Calcium	59100	100	ug/L		59300			0.4	20
Chromium	11.5	2.00	ug/L		11.4			0.7	20
Cobalt	0.610 B	2.00	ug/L		2.00 U				20
Copper	10.0 U	10.0	ug/L		10.0 U				20
Iron	79.4	50.0	ug/L		84.2			6	20
Lead	10.0 U	10.0	ug/L		10.0 U				20
Lithium	10.4 B	20.0	ug/L		10.9			5	20
Magnesium	15200	100	ug/L		15300			0.3	20
Manganese	40.0	2.00	ug/L		40.8			2	20
Molybdenum	3.86	2.00	ug/L		4.55			16	20
Nickel	2.67 B	5.00	ug/L		2.83			6	20
Phosphorus	20.7 B	50.0	ug/L		18.9			9	20
Potassium	6080	500	ug/L		6160			1	20
Selenium	3.20 B	10.0	ug/L		10.0 U				20
Silicon	15600	50.0	ug/L		15600			0.2	20
Strontium	396	5.00	ug/L		402			2	20
Silver	5.00 U	5.00	ug/L		5.00 U				20
Thallium	5.00 U	5.00	ug/L		5.00 U				20
Sodium	20000	100	ug/L		20200			1	20
Tin	5.00 U	5.00	ug/L		5.00 U				20
Vanadium	14.0	5.00	ug/L		13.9			0.6	20
Zinc	55.8	20.0	ug/L		55.5			0.4	20

000024



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-173  
 Project Number: K2574  
 Project Manager: Joan Kessner

Reported:  
 12/01/2010 12:13

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

Analyte	Result and Qualifiers	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch L011256 - SW 3005A</b>									
<b>Matrix Spike (L011256-MS5) Source: I011110-01 Prepared: 11/17/2010 Analyzed: 11/21/2010</b>									
Aluminum	2030	50.0	ug/L	2000.0	22.1	100	75-125		
Antimony	497	15.0	ug/L	500.00	15.0 U	99	75-125		
Arsenic	2010	10.0	ug/L	2000.0	10.0 U	101	75-125		
Barium	2090	2.00	ug/L	2000.0	51.4	102	75-125		
Beryllium	50.1	1.00	ug/L	50.000	1.00 U	100	75-125		
Bismuth	5000	20.0	ug/L	5000.0	20.0 U	100	75-125		
Boron	1030	10.0	ug/L	1000.0	32.1	100	75-125		
Cadmium	50.7	1.00	ug/L	50.000	1.00 U	101	75-125		
Calcium	83800	100	ug/L	25000	59300	98	75-125		
Chromium	210	2.00	ug/L	200.00	11.4	99	75-125		
Cobalt	486	2.00	ug/L	500.00	2.00 U	97	75-125		
Copper	241	10.0	ug/L	250.00	10.0 U	96	75-125		
Iron	1080	50.0	ug/L	1000.0	84.2	99	75-125		
Lead	483	10.0	ug/L	500.00	10.0 U	97	75-125		
Lithium	1040	20.0	ug/L	1000.0	10.9	103	75-125		
Magnesium	40000	100	ug/L	25000	15300	99	75-125		
Manganese	533	2.00	ug/L	500.00	40.8	99	75-125		
Molybdenum	997	2.00	ug/L	1000.0	4.55	99	75-125		
Nickel	489	5.00	ug/L	500.00	2.83	97	75-125		
Phosphorus	5160	50.0	ug/L	5000.0	18.9	103	75-125		
Potassium	32100	500	ug/L	25000	6160	104	75-125		
Selenium	1960	10.0	ug/L	2000.0	10.0 U	98	75-125		
Silicon	15700	50.0	ug/L	1000.0	15600	15*	75-125		
Strontium	1420	5.00	ug/L	1000.0	402	102	75-125		
Silver	49.8	5.00	ug/L	50.000	5.00 U	100	75-125		
Thallium	1920	5.00	ug/L	2000.0	5.00 U	96	75-125		
Sodium	45600	100	ug/L	25000	20200	102	75-125		
Tin	984	5.00	ug/L	1000.0	5.00 U	98	75-125		
Vanadium	514	5.00	ug/L	500.00	13.9	100	75-125		
Zinc	553	20.0	ug/L	500.00	55.5	99	75-125		

000025