

SAF-RC-232
100-IU-2 & 100-IU-6 Remaining
Waste Sites – Soil Full Protocol
FINAL DATA PACKAGE

COMPLETE COPY OF DATA PACKAGE TO:

Kathy Wendt

H4-21

KW 7/29/13
INITIAL/DATE

COMMENTS:

SDG X0006

SAF-RC-232

Rad only

Chem only

Rad & Chem

Complete

Partial

Sample Location: 600-331



July 25, 2013

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

Re: RC-232 Soil
Work Order: 329310
SDG: X0006

Dear Joan Kessner:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 11, 2013. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 1616.

Sincerely,

Orlette Johnson
Project Manager

Purchase Order: 1510
Chain of Custody: RC-232-035
Enclosures



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Case Narrative

**Receipt Narrative
for
WC-HANFORD, INC.
SDG: X0006
Work Order: 329310**

July 25, 2013

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 11, 2013 for analysis.

Sample Identification: The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
329310001	J1RR21
329310002	J1RRY7

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Metals.



Orlette Johnson
Project Manager

Chain of Custody and Supporting Documentation



SAMPLE RECEIPT & REVIEW FORM

Client: <u>WCHN</u>		SDG/AR/COC/Work Order: <u>329310</u>	
Received By: <u>H. Taylor</u>		Date Received: <u>07/1/13</u>	
Suspected Hazard Information		Yes	No
COC/Samples marked as radioactive?			<input checked="" type="checkbox"/>
Classified Radioactive II or III by RSO?			<input checked="" type="checkbox"/>
COC/Samples marked containing PCBs?			<input checked="" type="checkbox"/>
Package, COC, and/or Samples marked as beryllium or asbestos containing?			<input checked="" type="checkbox"/>
Shipped as a DOT Hazardous?			<input checked="" type="checkbox"/>
Samples identified as Foreign Soil?			<input checked="" type="checkbox"/>

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: <u>ice bags</u> Blue ice Dry ice None Other (describe) <u>3</u> *All temperatures are recorded in Celsius
2a Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>51050004</u> Secondary Temperature Device Serial # (If Applicable):
3 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			
4 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
5 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6 VOA vials free of headspace (defined as < 6mm bubble)?	<input checked="" type="checkbox"/>			Sample ID's and containers affected:
7 Are Encore containers present?	<input checked="" type="checkbox"/>			(If yes, immediately deliver to Volatiles laboratory)
8 Samples received within holding time?	<input checked="" type="checkbox"/>			ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			Sample ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			Sample ID's affected:
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Sample ID's affected:
12 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>			
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			
14 Carrier and tracking number.				Circle Applicable: FedEx Air FedEx Ground UPS Field Services Courier Other <u>7961 9923 6103</u>

Comments (Use Continuation Form if needed):

Laboratory Certifications

List of current GEL Certifications as of 25 July 2013

State	Certification
Alaska	UST-110
Arkansas	88-0651
CLIA	42D0904046
California NELAP	01151CA
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP A2LA ISO 17025	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-12-00283, P330-12-00284
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA130005
Maryland	270
Massachusetts	M-SC012
Nevada	SC000122011-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
Oklahoma	9904
Pennsylvania NELAP	68-00485
Plant Material Permit	PDEP-12-00260
South Carolina Chemistry	10120001
South Carolina Radiochemi	10120002
Tennessee	TN 02934
Texas NELAP	T104704235-13-8
Utah NELAP	SC000122013-8
Vermont	VT87156
Virginia NELAP	460202
Washington	C780-12
Wisconsin	999887790

Metals Analysis

Case Narrative

**Metals Fractional Narrative
WC-HANFORD, INC. (WCHN)
SDG X0006**

Sample Analysis

Sample ID	Client ID
329310001	J1RR21
329310002	J1RRY7
1202908069	Method Blank (MB) ICP
1202908070	Laboratory Control Sample (LCS)
1202908073	329310001(J1RR21L) Serial Dilution (SD)
1202908071	329310001(J1RR21D) Sample Duplicate (DUP)
1202908072	329310001(J1RR21S) Matrix Spike (MS)
1202913934	329310001(J1RR21PS) Post Spike (PS)
1202908571	Method Blank (MB) CVAA
1202908572	Laboratory Control Sample (LCS)
1202908581	329310001(J1RR21L) Serial Dilution (SD)
1202908576	329310001(J1RR21D) Sample Duplicate (DUP)
1202908580	329310001(J1RR21S) Matrix Spike (MS)

The samples in this SDG were analyzed on a "dry weight" basis.

Method/Analysis Information

Analytical Batch:	1314505 and 1314750
Prep Batch :	1314503 and 1314748
Standard Operating Procedures:	GL-MA-E-013 REV# 22, GL-MA-E-009 REV# 22 and GL-MA-E-010 REV# 26
Analytical Method:	SW846 3050B/6010C and SW846 7471B
Prep Method :	SW846 3050B and SW846 7471B Prep

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

System Configuration

The Metals analysis-ICP was performed on a PE 7300 Optima radial/axial-viewing inductively coupled plasma atomic emission spectrometer. The instrument is equipped with a Burgener nebulizer, cyclonic spray chamber, and yttrium or scandium internal standard. Operating conditions for the ICP are set at a power level of 1500 watts. The instrument has a peristaltic pump flow rate of 1.4L/min, argon gas flows of 15 L/min and 0.2 L/min for the torch and auxiliary gases, and a flow setting of 0.65L/min for the nebulizer.

The Metals analysis-Mercury was performed on a Perkin-Elmer Flow Injection Mercury System (FIMS-100) automated mercury analyzer. The instrument consists of a cold vapor atomic absorption spectrometer set to detect mercury at a wavelength of 253.7 nm. Sample introduction through the flow injection system is performed via a peristaltic pump at 9 mL/min and nitrogen carrier gas rate of 80 mL/min.

Calibration Information

Instrument Calibration

All initial calibration requirements have been met for this sample delivery group (SDG).

CRDL Requirements

All CRDL standards met the advisory control limits with the exception of potassium, lead, zinc, and antimony. PQL01 (analyzed at 07:33 on 07/23/13) recovered high for potassium, PQL06 (analyzed at 15:38 on 07/23/13) recovered low for potassium, and PQL07 (analyzed at 16:07 on 07/23/13) recovered low for potassium and high for lead and zinc; however, the sample results were 2x greater than the PQL for potassium, lead, and zinc, therefore the data is reported. PQL07 (analyzed at 16:05 on 07/24/13) recovered high for antimony; however, the sample results were 2x greater than the PQL, therefore the data is reported. CRDL01 (analyzed at 14:39 on 07/24/13) recovered outside of the advisory control limits of 70%-130%.

ICSA/ICSAB Statement

All interference check samples (ICSA and ICSAB) associated with this SDG met the established acceptance criteria.

Continuing Calibration Blank (CCB) Requirements

All continuing calibration blanks (CCB) bracketing this batch met the established acceptance criteria.

Continuing Calibration Verification (CCV) Requirements

All continuing calibration verifications (CCV) bracketing this SDG met the acceptance criteria.

Quality Control (QC) Information

Method Blank (MB) Statement

The MBs analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample (LCS) Recovery

The LCS spike recoveries met the acceptance limits.

Quality Control (QC) Sample Statement

The following sample was selected as the quality control (QC) sample for this SDG: 329310001 (J1RR21).

Matrix Spike (MS) Recovery Statement

The percent recoveries (%R) obtained from the MS analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The MS met the recommended quality control acceptance criteria for percent recoveries for all applicable analytes with the exception of antimony, manganese, potassium, silicon, and zinc.

Duplicate Relative Percent Difference (RPD) Statement

The relative percent difference (RPD) obtained from the designated sample duplicate (DUP) is evaluated based on acceptance criteria of 20% when the sample is >5X the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the contract required detection limit (RL), a control of +/-RL is used to evaluate the DUP results. All applicable analytes met these requirements with the exception of iron, manganese, and vanadium.

Post Spike (PS) Recovery Statement

The percent recoveries (%R) obtained from the PS analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The PS met the recommended quality control acceptance criteria for percent recoveries for all applicable analytes and verifies the presence of matrix interferences with the exception of silicon.

Serial Dilution % Difference Statement

The serial dilution is used to assess matrix suppression or enhancement. Raw element concentrations 25x the IDL/MDL for CVAA, 50X the IDL/MDL for ICP and 100X the IDL/MDL for ICP-MS analyses are applicable for serial dilution assessment. All applicable analytes met the established criteria of less than 10% difference (%D) with the exception of silicon.

Technical Information

Holding Time Specifications

GEL assigns holding times based on the associated methodology, which assigns the date and time from sample collection of sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration. All samples in this SDG met the specified holding time.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP. Method SW-846 3050B is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

Sample Dilutions

Dilutions are performed to minimize matrix interferences resulting from elevated mineral element concentrations present in solid samples and/or to bring over range target analyte concentrations into the linear calibration range of the instrument. Samples 329310001 and 329310002 required dilutions for arsenic and lead in order to bring over range concentrations within the linear calibration range of the instrument. Samples 329310001 and 329310002 required dilutions in order to bring raw values of titanium within the linear range of the instrument, and for the analytes antimony, cobalt, vanadium, and zinc that titanium interferes with, in order to ensure that the inter-element correction factors were valid on the ICP.

Preparation Information

The samples in this SDG were prepared exactly according to the cited SOP.

Miscellaneous Information

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative will include the data validator's signature and title. The signature page also includes the data qualifiers used in the fractional package. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Data Exception (DER) Documentation

Data exception reports are generated to document any procedural anomalies that may deviate from referenced SOP or contractual documents. The following DER was generated for this SDG: 1205220. A copy is included in the Miscellaneous Data section of this package.

Additional Comments

Additional comments were not required for this SDG.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer:  Date: 07/25/13

DATA EXCEPTION REPORT

Mo.Day Yr. 25-JUL-13	Division: Industrial	Quality Criteria: Specifications	Type: Process
Instrument Type: ICP	Test / Method: SW846 3050B/6010C	Matrix Type: Solid	Client Code: WCHN
Batch ID: 1314505	Sample Numbers: See Below		
Potentially affected work order(s)(SDG): 329310(X0006)			
Application Issues: Failed Recovery for MS/PS Failed RPD for DUP			
Specification and Requirements Exception Description:		DER Disposition:	
<p>1. Failed Recovery for MS/PS: QC 1202908072MS,1202913934PS</p> <p>2. Failed RPD for DUP: QC 1202908071DUP</p>		<p>1. The matrix spike recovery failed outside of the control limits for manganese,potassium,silicon,zinc and antimony. The post spike failed outside the required control limits for silicon but passed for all other analytes. This verifies the presence of a matrix interference for silicon and verifies the absence of a matrix interference for all the other analytes. Per GEL's accredited methods and SOPs, a corrective action is not required and the data is qualified and reported.</p> <p>2. The sample and sample duplicate % RPD failed outside the control limits for iron,manganese and vanadium due to possible sample non-homogeneity and/or matrix interference. Per GEL's accredited methods and SOPs, a corrective action is not required and the data is qualified and reported.</p>	

Originator's Name:

Helen Camello 25-JUL-13

Data Validator/Group Leader:

Jerry Wigfall 25-JUL-13

Sample Data Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Qualifier Definition Report for

WCHN001 WC-HANFORD, INC.

Client SDG: X0006 GEL Work Order: 329310 Project: RC-232 Soil

The Qualifiers in this report are defined as follows:

- * Duplicate analysis not within control limits
- B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).
- C Target analyte was detected in the sample and the associated blank, and the sample concentration was ≤ 5 times the blank concentration.
- D Results are reported from a diluted aliquot of sample.
- E Reported value is estimated due to interferences. See comment in narrative.
- M Duplicate precision not met.
- N Spike Sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the 'U' qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Orlette Johnson.

Reviewed by



07/25/13

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: July 25, 2013

Company : WC-Hanford, Inc.
 Address : 2620 Fermi Avenue
 MSIN H4-21
 Richland, Washington 99354
 Contact: Joan Kessner
 Project: RC-232 Soil

Client SDG: X0006

Client Sample ID: J1RR21	Project: WCHN00213
Sample ID: 329310001	Client ID: WCHN001
Matrix: SOIL	
Collect Date: 10-JUL-13 08:15	
Receive Date: 11-JUL-13	
Collector: Client	
Moisture: 1.01%	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Mercury Analysis-CVAA											
SW846 7471B Mercury in Solid "Dry Weight Corrected"											
Mercury		23.7	3.94	11.8	ug/kg	1	NOR1	07/24/13	1453	1314750	1
Metals Analysis-ICP											
ICP METALS 6010TR Close-out List "Dry Weight Corrected"											
Aluminum		5490000	6840	20100	ug/kg	1	HSC	07/23/13	1526	1314505	2
Barium		96500	101	503	ug/kg	1					
Beryllium	B	316	101	503	ug/kg	1					
Boron	B	1720	1010	5030	ug/kg	1					
Cadmium	B	321	101	503	ug/kg	1					
Calcium		3470000	8050	25200	ug/kg	1					
Chromium		8790	151	503	ug/kg	1					
Copper		27900	302	1010	ug/kg	1					
Iron	*	19500000	8050	25200	ug/kg	1					
Magnesium		3040000	8550	30200	ug/kg	1					
Manganese	*N	189000	201	1010	ug/kg	1					
Molybdenum	U	201	201	1010	ug/kg	1					
Nickel		7110	151	503	ug/kg	1					
Potassium	N	1400000	6440	25200	ug/kg	1					
Selenium	B	695	503	3020	ug/kg	1					
Silicon	MN	1100000	1510	10100	ug/kg	1					
Silver	U	101	101	503	ug/kg	1					
Sodium		114000	7040	25200	ug/kg	1					
Arsenic	D	2490000	2520	15100	ug/kg	5	HSC	07/23/13	1545	1314505	3
Cobalt	D	5280	755	2520	ug/kg	5					
Lead	D	9350000	1660	5030	ug/kg	5					
Vanadium	*D	49000	503	2520	ug/kg	5					
Zinc	DN	81600	2010	5030	ug/kg	5					
Antimony	DNU	1660	1660	5030	ug/kg	5	HSC	07/24/13	1547	1314505	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep for 6010C	AXG2	07/19/13	0700	1314503
SW846 7471B Prep	SW846 7471B Mercury Prep Soil	AXS5	07/23/13	1640	1314748

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: July 25, 2013

Company : WC-Hanford, Inc.
Address : 2620 Fermi Avenue
MSIN H4-21
Richland, Washington 99354
Contact: Joan Kessner
Project: RC-232 Soil

Client SDG: X0006

Client Sample ID: J1RR21
Sample ID: 329310001

Project: WCHN00213
Client ID: WCHN001

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 7471B	
2	SW846 3050B/6010C	
3	SW846 3050B/6010C	
4	SW846 3050B/6010C	

Notes:

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: July 25, 2013

Company : WC-Hanford, Inc.
Address : 2620 Fermi Avenue
MSIN H4-21
Richland, Washington 99354
Contact: Joan Kessner
Project: RC-232 Soil

Client SDG: X0006

Client Sample ID: J1RRY7
Sample ID: 329310002

Project: WCHN00213
Client ID: WCHN001

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 7471B	
2	SW846 3050B/6010C	
3	SW846 3050B/6010C	
4	SW846 3050B/6010C	

Notes:

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: July 25, 2013

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WC-Hanford, Inc.
2620 Fermi Avenue
MSIN H4-21
Richland, Washington
Contact: Joan Kessner

Workorder: 329310

Client SDG: X0006

Project Description: RC-232 Soil

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1314505										
	QC1202908071 329310001 DUP										
Aluminum		5490000		5880000	ug/kg	6.84		(0%-20%)	HSC	07/23/13	15:27
Antimony	DNU	1660	BD	1740	ug/kg	101	^	(+/-4590)		07/24/13	15:50
Arsenic	D	2490000	D	2960000	ug/kg	17.3		(0%-20%)		07/23/13	15:48
Barium		96500		98900	ug/kg	2.50		(0%-20%)		07/23/13	15:27
Beryllium	B	316	B	362	ug/kg	13.4	^	(+/-459)			
Boron	B	1720	B	2800	ug/kg	47.7	^	(+/-4590)			
Cadmium	B	321	B	312	ug/kg	2.84	^	(+/-459)			
Calcium		3470000		3850000	ug/kg	10.2		(0%-20%)			
Chromium		8790		9990	ug/kg	12.8		(0%-20%)			
Cobalt	D	5280	D	6480	ug/kg	20.4	^	(+/-2300)		07/23/13	15:48
Copper		27900		30200	ug/kg	8.09		(0%-20%)		07/23/13	15:27
Iron	*	19500000	*	25600000	ug/kg	27.0*		(0%-20%)			
Lead	D	9350000	D	10500000	ug/kg	11.2		(0%-20%)		07/23/13	15:48
Magnesium		3040000		3190000	ug/kg	4.85		(0%-20%)		07/23/13	15:27
Manganese	*N	189000	*	245000	ug/kg	25.5*		(0%-20%)			
Molybdenum	U	201	U	184	ug/kg	N/A	^				
Nickel		7110		8070	ug/kg	12.6		(0%-20%)			
Potassium	N	1400000		1520000	ug/kg	8.29		(0%-20%)			
Selenium	B	695	B	1220	ug/kg	54.9	^	(+/-2750)			
Silicon	MN	1100000		1070000	ug/kg	2.12		(0%-20%)			

GEL LABORATORIES LLC

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QC Summary

Workorder: 329310

Client SDG: X0006

Project Description: RC-232 Soil

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1314505										
Silver		U	101	U	91.8	ug/kg	N/A ^		HSC	07/23/13	15:27
Sodium			114000		105000	ug/kg	7.65 ^	(+/-23000)			
Vanadium		*D	49000	*D	62200	ug/kg	23.6*	(0%-20%)		07/23/13	15:48
Zinc		DN	81600	D	97000	ug/kg	17.2	(0%-20%)			
QC1202908070	LCS										
Aluminum	496000				468000	ug/kg	94.4	(80%-120%)		07/23/13	15:23
Antimony	49600				46600	ug/kg	93.9	(80%-120%)			
Arsenic	49600				49400	ug/kg	99.7	(80%-120%)			
Barium	49600				47800	ug/kg	96.4	(80%-120%)			
Beryllium	49600				49500	ug/kg	99.7	(80%-120%)			
Boron	49600				45400	ug/kg	91.6	(80%-120%)			
Cadmium	49600				50100	ug/kg	101	(80%-120%)			
Calcium	496000				502000	ug/kg	101	(80%-120%)			
Chromium	49600				46000	ug/kg	92.7	(80%-120%)			
Cobalt	49600				48000	ug/kg	96.8	(80%-120%)			
Copper	49600				46200	ug/kg	93.1	(80%-120%)			
Iron	496000				496000	ug/kg	100	(80%-120%)			
Lead	49600				49500	ug/kg	99.8	(80%-120%)			
Magnesium	496000				514000	ug/kg	104	(80%-120%)			
Manganese	49600				45900	ug/kg	92.4	(80%-120%)			
Molybdenum	49600				45600	ug/kg	91.9	(80%-120%)			
Nickel	49600				47000	ug/kg	94.7	(80%-120%)			

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QC Summary

Workorder: 329310

Client SDG: X0006

Project Description: RC-232 Soil

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1314505										
Potassium	496000			466000	ug/kg		94	(80%-120%)	HSC	07/23/13	15:23
Selenium	49600			48400	ug/kg		97.6	(80%-120%)			
Silicon	496000			426000	ug/kg		86	(80%-120%)			
Silver	49600			47000	ug/kg		94.7	(80%-120%)			
Sodium	496000			468000	ug/kg		94.4	(80%-120%)			
Vanadium	49600			46400	ug/kg		93.5	(80%-120%)			
Zinc	49600			47000	ug/kg		94.7	(80%-120%)			
QC1202908069	MB										
Aluminum			U	6760	ug/kg					07/23/13	15:20
Antimony			U	328	ug/kg						
Arsenic			B	1120	ug/kg						
Barium			U	99.4	ug/kg						
Beryllium			U	99.4	ug/kg						
Boron			U	994	ug/kg						
Cadmium			U	99.4	ug/kg						
Calcium			U	7950	ug/kg						
Chromium			B	155	ug/kg						
Cobalt			U	149	ug/kg						
Copper			U	298	ug/kg						
Iron			U	7950	ug/kg						
Lead			B	422	ug/kg						
Magnesium			U	8450	ug/kg						

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QC Summary

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Client SDG: X0006

Project Description: RC-232 Soil

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1314505										
Manganese			U	199	ug/kg				HSC	07/23/13	15:20
Molybdenum			U	199	ug/kg						
Nickel			B	159	ug/kg						
Potassium			U	6360	ug/kg						
Selenium			U	497	ug/kg						
Silicon			B	2330	ug/kg						
Silver			U	99.4	ug/kg						
Sodium			U	6960	ug/kg						
Vanadium			U	99.4	ug/kg						
Zinc			U	398	ug/kg						
QC1202908072 329310001 MS											
Aluminum	494000	5490000		7430000	ug/kg		N/A	(75%-125%)		07/23/13	15:29
Antimony	49400 DNU	1660 DN		36700	ug/kg		73.1 *	(75%-125%)		07/24/13	15:53
Arsenic	49400 D	2490000 D		2850000	ug/kg		N/A	(75%-125%)		07/23/13	15:52
Barium	49400	96500		144000	ug/kg		96.8	(75%-125%)		07/23/13	15:29
Beryllium	49400 B	316		47000	ug/kg		94.4	(75%-125%)			
Boron	49400 B	1720		43700	ug/kg		84.9	(75%-125%)			
Cadmium	49400 B	321		46900	ug/kg		94.2	(75%-125%)			
Calcium	494000	3470000		4960000	ug/kg		N/A	(75%-125%)			
Chromium	49400	8790		53400	ug/kg		90.4	(75%-125%)			
Cobalt	49400 D	5280 D		54700	ug/kg		100	(75%-125%)		07/23/13	15:52
Copper	49400	27900		80100	ug/kg		106	(75%-125%)		07/23/13	15:29

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1314505										
Iron	494000	*	19500000		23100000	ug/kg	N/A	(75%-125%)	HSC	07/23/13	15:29
Lead	49400	D	9350000	D	10100000	ug/kg	N/A	(75%-125%)		07/23/13	15:52
Magnesium	494000		3040000		3920000	ug/kg	N/A	(75%-125%)		07/23/13	15:29
Manganese	49400	*N	189000	N	277000	ug/kg	176*	(75%-125%)			
Molybdenum	49400	U	201		42900	ug/kg	86.6	(75%-125%)			
Nickel	49400		7110		52300	ug/kg	91.4	(75%-125%)			
Potassium	494000	N	1400000	N	2110000	ug/kg	144*	(75%-125%)			
Selenium	49400	B	695		43700	ug/kg	87	(75%-125%)			
Silicon	494000	MN	1100000	N	900000	ug/kg	0*	(75%-125%)			
Silver	49400	U	101		44700	ug/kg	90.4	(75%-125%)			
Sodium	494000		114000		587000	ug/kg	95.7	(75%-125%)			
Vanadium	49400	*D	49000	D	106000	ug/kg	115	(75%-125%)		07/23/13	15:52
Zinc	49400	DN	81600	DN	152000	ug/kg	142*	(75%-125%)			
QC1202913934 329310001 PS											
Antimony	500	DNU	1.13	D	496	ug/L	98.9	(80%-120%)		07/24/13	15:56
Manganese	500	*N	1880		2340	ug/L	92.1	(80%-120%)		07/23/13	15:30
Potassium	5000	N	13900		18600	ug/L	94.4	(80%-120%)			
Silicon	5000	MN	10900		17000	ug/L	122*	(80%-120%)			
Zinc	500	DN	162	D	674	ug/L	102	(80%-120%)		07/23/13	15:55
QC1202908073 329310001 SDILT											
Aluminum			54600	D	11300	ug/L	3.47	(0%-10%)		07/23/13	15:31
Antimony		DNU	1.13	D	4.52	ug/L	N/A	(0%-10%)		07/24/13	15:59
Arsenic		D	4950	CD	977	ug/L	1.23	(0%-10%)		07/23/13	15:58

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1314505										
Barium		959	D	199	ug/L	3.83		(0%-10%)	HSC	07/23/13	15:31
Beryllium	B	3.14	DU	503	ug/L	N/A		(0%-10%)			
Boron	B	17.1	DU	5030	ug/L	N/A		(0%-10%)			
Cadmium	B	3.19	DU	503	ug/L	N/A		(0%-10%)			
Calcium		34500	D	7130	ug/L	3.37		(0%-10%)			
Chromium		87.3	CD	17.6	ug/L	.838		(0%-10%)			
Cobalt	D	10.5	D	1.90	ug/L	9.6		(0%-10%)		07/23/13	15:58
Copper		277	D	55.6	ug/L	.345		(0%-10%)		07/23/13	15:31
Iron	*	194000	D	40200	ug/L	3.72		(0%-10%)			
Lead	D	18600	D	3680	ug/L	1.16		(0%-10%)		07/23/13	15:58
Magnesium		30200	D	6340	ug/L	4.93		(0%-10%)		07/23/13	15:31
Manganese	*N	1880	D	390	ug/L	3.57		(0%-10%)			
Molybdenum	U	0.987	DU	1010	ug/L	N/A		(0%-10%)			
Nickel		70.6	CD	15.0	ug/L	6.25		(0%-10%)			
Potassium	N	13900	D	2910	ug/L	4.65		(0%-10%)			
Selenium	B	6.91	DU	2520	ug/L	N/A		(0%-10%)			
Silicon	MN	10900	CDM	2490	ug/L	14.2*		(0%-10%)			
Silver	U	-3.04	DU	503	ug/L	N/A		(0%-10%)			
Sodium		1130	D	184	ug/L	18.7		(0%-10%)			
Vanadium	*D	97.4	D	18.9	ug/L	2.82		(0%-10%)		07/23/13	15:58
Zinc	DN	162	D	32.8	ug/L	1.19		(0%-10%)			

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-Mercury											
Batch	1314750										
QC1202908576	329310001	DUP									
Mercury		23.7		33.5	ug/kg	34.1 ^		(+/-12.1)	NOR1	07/24/13	14:54
QC1202908572	LCS										
Mercury	120		B	115	ug/kg		96.2	(80%-120%)		07/24/13	14:46
QC1202908571	MB										
Mercury			U	3.94	ug/kg					07/24/13	14:44
QC1202908580	329310001	MS									
Mercury	121	23.7		147	ug/kg		102	(80%-120%)		07/24/13	14:56
QC1202908581	329310001	SDILT									
Mercury		0.403	DU	19.7	ug/L	N/A		(0%-10%)		07/24/13	14:58

Notes:

The Qualifiers in this report are defined as follows:

- * Duplicate analysis not within control limits
- + Correlation coefficient for Method of Standard Additions (MSA) is < 0.995
- B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).
- C Target analyte was detected in the sample and the associated blank, and the sample concentration was <= 5 times the blank concentration.
- D Results are reported from a diluted aliquot of sample.
- E Reported value is estimated due to interferences. See comment in narrative.
- M Duplicate precision not met.
- N Spike Sample recovery is outside control limits.
- S Reported value determined by the Method of Standard Additions (MSA)
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- W Post-digestion spike recovery for GFAA out of control limit. Sample absorbency < 50% of spike absorbency.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.