

**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 3/5/14  
INITIAL/DATE

**COMMENTS:**

**SDG XP0051**

**SAF-RC-232**

Rad only

Chem only

Rad & Chem

Complete

Partial

**Sample Location: 100-B-35 (152-B1)**



February 27, 2014

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

Re: RC-232 Soil  
Work Order: 343419  
SDG: XP0051

Dear Joan Kessner:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 21, 2014. 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-232-076  
Enclosures



## Table of Contents

Case Narrative.....	1
Chain of Custody and Supporting Documentation.....	3
Laboratory Certifications.....	6
HPLC Polynuclear Aromatic Hydrocarbon Analysis.....	8
Sample Data Summary.....	15
QC Summary.....	18
Miscellaneous Data.....	23
FID Diesel Range Organics Analysis.....	25
Case Narrative.....	26
Sample Data Summary.....	32
Quality Control Summary.....	35
Miscellaneous.....	38
PCB Analysis.....	40
Case Narrative.....	41
Sample Data Summary.....	48
Quality Control Summary.....	51
Miscellaneous.....	54
Metals Analysis.....	56
Case Narrative.....	57
Sample Data Summary.....	64

Quality Control Summary.....70

Miscellaneous.....79

# Case Narrative

**Receipt Narrative  
for  
WC-HANFORD, INC.  
SDG: XP0051  
Work Order: 343419**

**February 27, 2014**

**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 February 21, 2014 for analysis.

**Sample Identification:** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
343419001	J1T9J6
343419002	J1T9J5

**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: Diesel Range Organics, GC Semivolatile PCB, HPLC Polynuclear Aromatic Hydrocarbon and Metals.



Orlette Johnson  
Project Manager

# **Chain of Custody and Supporting Documentation**

202714 / 343424

**Washington Closure Hanford**      **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

Collector: B. Johnson      Telephone No. 375-4688      Project Coordinator: KESSNER, JH      Price Code: -8C      Data Turnaround: 2/19/14 7/15 Days

Project Designation: 100-IU-2 & 100-IU-6 Remaining Waste Sites      Sampling Location: 100-B-35, (152-B1)      SAF No.: RC-232

Ice Chest No.: RCC-08-027      Field Logbook No.: EL-1667-01      COA: C10B35A000      Method of Shipment: fed EX

Shipped To: GEL Laboratories Charleston      Offsite Property No.: A131051      Bill of Lading/Air Bill No.: See OSCP

**Other Labs Shipped To**  
Eberline Services-Oak Ridge  
Radiological-Counting-Facility  
NA  
2-20-14  
CHMS

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
none

**Special Handling and/or Storage**  
COO14C

Sample No.	Matrix	Sample Date	Sample Time	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C	Freeze	Cool 4C	WOWE
JIT9J5	SOIL	2/20/14	0824	✓	✓	✓	✓	✓	5	1	1
JIT9J6	SOIL	2/20/14	0838	✓	✓	✓	✓	✓	40mL	125mL	125mL
JIT9J7	SOIL	2/20/14									
JIT9J8	SOIL	2/20/14									
JIT9J9	SOIL	2/20/14									

**Sample Analysis**

See item (1) in Special Instructions	PCBs - 8082	TPH-Diesel Range - WTPH-D +	VOA - 5035/8260 (TCL)	PAHs - 8310	ICP Metals (TCLP)
125mL	125mL	125mL	40mL	125mL	125mL
1	1	1	5	1	1
G/P	aG	aG	aGs*	aG	aG

**CHAIN OF POSSESSION**

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
<u>B. Johnson</u>	<u>2-20-14 0944</u>	<u>DWS HEA DWS hea</u>	<u>2/20/14 0944</u>
<u>DWS HEA</u>	<u>2/20/14 1135</u>	<u>fed EX</u>	<u>2-21-14 0855</u>
<u>fed EX</u>		<u>Off Jennifer Rekrini</u>	<u>0855</u>

**SPECIAL INSTRUCTIONS**

(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) (Mercury)

**CHAIN OF POSSESSION**

Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
<u>fed EX</u>		<u>Off Jennifer Rekrini</u>	<u>0855</u>



**XP0051**

**SAMPLE RECEIPT & REVIEW FORM**

Client: <b>WCHN</b>		SDG/AR/COC/Work Order: <b>343419/343424/343428/343431</b>	
Received By: <b>JP</b>		Date Received: <b>2-21-14</b>	
<b>Suspected Hazard Information</b>	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
COC/Samples marked as radioactive?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <b>0 cpm</b>
Classified Radioactive II or III by RSO?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If yes, Were swipes taken of sample containers < action levels?
COC/Samples marked containing PCBs?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Package, COC, and/or Samples marked as beryllium or asbestos containing?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	If yes, samples are to be segregated as Safety Controlled Samples, and opened by the GEL Safety Group.
Shipped as a DOT Hazardous?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____
Samples identified as Foreign Soil?	<input checked="" type="checkbox"/>	<input 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"/>	<input type="checkbox"/>	<input 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"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: <b>Ice bags</b> Blue ice    Dry ice    None    Other (describe) *all temperatures are recorded in Celsius
2a	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <b>130462961</b> Secondary Temperature Device Serial # (If Applicable): _____
3	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
5	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected: _____
7	Are Encore containers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If yes, immediately deliver to Volatiles laboratory)
8	Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected: _____
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected: _____
12	Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14	Carrier and tracking number.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: <b>FedEx Air</b> FedEx Ground    UPS    Field Services    Courier    Other  <b>7979 8355 0089</b>

Comments (Use Continuation Form if needed):

# **Laboratory Certifications**

**List of current GEL Certifications as of 27 February 2014**

<b>State</b>	<b>Certification</b>
Alaska	UST-110
Arkansas	88-0651
CLIA	42D0904046
California NELAP	01151CA
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC000122013-10
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-12-00283, P330-12-00284
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC000122013-10
Idaho Chemistry	SC00012
Idaho Radiochemistry	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
Michigan	9976
Mississippi	SC000122013-10
Nebraska	NE-OS-26-13
Nevada	SC000122014-1
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 GVL	23611001
South Carolina Radiochemi	10120002
Tennessee	TN 02934
Texas NELAP	T104704235-13-8
Utah NELAP	SC000122013-11
Vermont	VT87156
Virginia NELAP	460202
Washington	C780-12
Wisconsin	999887790

# **HPLC Polynuclear Aromatic Hydrocarbon Analysis**

**HPLC-PAH  
WC-HANFORD, INC. (WCHN)  
SDG XP0051**

**Method/Analysis Information**

**Procedure:** Polynuclear Aromatic Hydrocarbons  
Analytical Method: SW846 8310  
Prep Method: SW846 3550B  
Analytical Batch Number: 1368519  
Prep Batch Number: 1368518

**Sample Analysis**

The following samples were analyzed using the analytical protocol as established in SW846 8310:

<b>Sample ID</b>	<b>Client ID</b>
343419001	J1T9J6
343419002	J1T9J5
1203040354	Method Blank (MB)
1203040355	Laboratory Control Sample (LCS)
1203040356	343419001(J1T9J6) Matrix Spike (MS)
1203040357	343419001(J1T9J6) Matrix Spike Duplicate (MSD)

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

**Preparation/Analytical Method Verification**

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP).

The data discussed in this narrative has been analyzed in accordance with GL-OA-E-030 REV# 15.

Raw data reports are processed and reviewed by the analyst using the Target software package. False positives have been removed from the Target quantitation reports per standard operating procedures (SOP) section 18.0.

**Calibration Information**

Due to software limitations, the files displayed at the beginning of the Form 6 are only the last files uploaded for each individual level. A complete listing of all files used in the current ICAL are shown on the Calibration History that is included with each Level 4 or higher package. The last file by date in each level is the one currently uploaded for that level.

The linear equation used in Target and indicated on the initial calibration summary form is not a conventional linear equation (slope intercept formula) and does not match the equation found in SW-846 method 8000B. The x and y axes are inversed in Target, so that the instrument response is treated as the independent variable (x) and the concentration ratio is treated as the dependent variable (y). The equation used in Target to calculate sample results is adjusted to account for the linear equation inversion and reciprocal slope. The adjusted calculation has been independently verified to produce valid results.

**Initial Calibration**

All initial calibration requirements have been met for this SDG.

**CCV Requirements**

All associated calibration verification standards (ICV or CCV) met the acceptance criteria.

**Quality Control (QC) Information**

**Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

**Surrogate Recoveries**

All the surrogate recoveries were within the established acceptance criteria for this SDG.

**Laboratory Control Sample (LCS) Recovery**

The LCS spike recoveries met the acceptance limits.

**QC Sample Designation**

Client sample 343419001 (J1T9J6) was chosen for matrix spike and matrix spike duplicate analysis.

**Matrix Spike (MS) Recovery Statement**

The MS recoveries were within the established acceptance limits.

**Matrix Spike Duplicate (MSD) Recovery Statement**

The MSD recoveries were within the established acceptance limits.

**MS/MSD Relative Percent Difference (RPD) Statement**

The RPDs between the MS and MSD met the acceptance limits.

**Technical Information:**

**Holding Time Specifications**

All samples in this SDG in this analytical batch met the specified holding time. GEL assigns holding times based on the associated methodology, which assigns the date and time from sample collection or 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.

**Preparation/Analytical Method Verification**

All procedures were performed as stated in the SOP.

**Sample Dilutions**

The samples in this SDG did not require dilutions.

**Sample Re-extraction/Re-analysis**

Re-extractions or re-analyses were not required in this SDG.

### **Miscellaneous Information:**

#### **Data Exception (DER) Documentation**

Data exception reports (DERs) are generated to document procedural anomalies that may deviate from referenced SOP or contractual documents.

A data exception report (DER) was not generated for this SDG.

#### **Manual Integrations**

Some initial calibration standards, continuing calibration standards, and/or samples may have required manual integrations due to software limitations.

Please see the raw data in the Miscellaneous Section.

Due to an unknown eluting between Benzo(b)fluoranthene and Benzo(k)fluoranthene, it was necessary to manually integrate the Benzo(k)fluoranthene peak for the DAD detector for samples 343419001 (J1T9J6) and 343419002 (J1T9J5). Analyst judgement was used to make the best integration.

#### **Additional Comments**

The Form 8 is used only as a sequence of the analysis.

One or more analytes were detected whose concentration greatly differed between the primary and confirmation analysis (greater than 40% difference or RPD) in sample 343419001 (J1T9J6). Because both detectors indicated an acceptable peak in the appropriate retention time window for these analytes, the analytes are reported as positive results. Due to the high percent difference or RPD between the two detectors, it is indicated as such on the appropriate Form I/Certificate of Analysis (C of A) with a 'P' qualifier. Those analytes reported with a percent difference or RPD greater than 40% but less than 70% are qualified as presumptive evidence of the presence of the material.

#### **Electronic Package Comment**

The following package was generated using an electronic data processing program referred to as "virtual packaging". In an effort to increase quality and efficiency, the laboratory is developing systems to eventually 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 of each electronic package will indicate the analyst, reviewer, and report specialist names associated with the generation of the data and package. The data validator will always sign and date the case narrative.

Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

### **System Configuration**

The laboratory utilizes a high performance liquid chromatography (HPLC) instrument configuration for Polynuclear Aromatic Hydrocarbons analyses.

The chromatographic hardware system consists of a HP Model 1100 HPLC with programmable gradient pumping and a 100uL loop injector.

The HPLC 1100 is coupled to a HP Model G1315A Diode Array UV detector which monitors absorbance at the following five wavelengths: 1) 224 nm; 2) 250 nm; 3) 270 nm; 4) 234 nm; 5) 300 nm.

The HPLC 1100 is also coupled to a HP Model G1321A Fluorescence Detector in series which monitors the following varying excitations and emissions 1) EX 230 nm EM 330 nm; 2) EX 210 nm EM 314 nm; 3) EX 250 nm EM 368 nm; 4) EX 237 nm EM 440 nm; 5) EX 277 nm EM 376 nm; 6) EX 255 nm EM 420 nm; 7) EX 230 nm EM 453 nm.

The Diode Array UV detector is used as the primary detector and the Fluorescence Detector is used as the confirmation detector. All results are reported from the primary Diode Array UV detector.

The HPLC system is identified with a designation of HPLC E in the raw data printouts.

### **Chromatographic Columns**

Chromatographic separation of Polynuclear Aromatic Hydrocarbons is accomplished through analysis on the following reversed phase columns:

Phenomenex: Luna C18 (2), 100 A, 250 mm x 4.6 mm containing 5 um size particle.

### **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.

## 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: XP0051 GEL Work Order: 343419 Project: RC-232 Soil

#### The Qualifiers in this report are defined as follows:

- J 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). Value is estimated
- P Aroclor target analyte with greater than 25% difference between column analyses.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- DL Indicates that sample is diluted.
- RA Indicates that sample is re-analyzed without re-extraction.
- RE Indicates that sample is re-extracted.

#### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Michael Penny

Date: 27 FEB 2014

Title: Group Leader

## Roadmap for WCHN XP0051 HPLC\_PAH

This roadmap was analyzed by cww on 02-26-2014, 16:26.

This roadmap was reviewed by map on 02-27-2014, 08:48.

This roadmap was packaged by map on 02-27-2014, 09:50.

### Sample

exclude	manual	datafile	smpid	injdate	injtime	sublist	clientid	dilution	batchid	comment
<input type="checkbox"/>	N	/chem/hplce.i/p022514.b/ph5b2506.d	343419001	25-FEB-2014	12:27	XP0051.sub	J1T9J6	1	1368519	<input type="checkbox"/>
<input type="checkbox"/>	N	/chem/hplce.i/p022514.b/ph5b2510.d	343419002	25-FEB-2014	15:16	XP0051.sub	J1T9J5	1	1368519	<input type="checkbox"/>

### QC Sample

exclude	manual	datafile	smpid	sampletype	injdate	injtime	sublist	clientid	dilution	batchid	comment
<input type="checkbox"/>	N	/chem/hplce.i/p022514.b/ph5b2504.d	1203040354	mb	25-FEB-2014	11:03	XP0051.sub	PAHBLK01	1	1368519	<input type="checkbox"/>
<input type="checkbox"/>	N	/chem/hplce.i/p022514.b/ph5b2505.d	1203040355	lcs	25-FEB-2014	11:45	XP0051.sub	PAHBLK01LCS	1	1368519	Pass
<input type="checkbox"/>	N	/chem/hplce.i/p022514.b/ph5b2507.d	1203040356	ms	25-FEB-2014	13:10	XP0051.sub	J1T9J6MS	1	1368519	Pass
<input type="checkbox"/>	N	/chem/hplce.i/p022514.b/ph5b2508.d	1203040357	msd	25-FEB-2014	13:52	XP0051.sub	J1T9J6MSD	1	1368519	Pass

# **Sample Data Summary**

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 27, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J6	Project: WCHN00213
Sample ID: 343419001	Client ID: WCHN001
Matrix: SOIL	
Collect Date: 20-FEB-14 08:24	
Receive Date: 21-FEB-14	
Collector: Client	
Moisture: 6.71%	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>HPLC-PAH</b>											
<b>8310/3550 PAH Std list Soil "Dry Weight Corrected"</b>											
Acenaphthene	U	5.36	5.36	17.9	ug/kg	1	CWW	02/25/14	1227	1368519	1
Acenaphthylene	U	5.36	5.36	17.9	ug/kg	1					
Anthracene	U	1.79	1.79	17.9	ug/kg	1					
Benzo(a)anthracene		67.0	0.572	1.79	ug/kg	1					
Benzo(a)pyrene		76.8	0.572	1.79	ug/kg	1					
Benzo(b)fluoranthene		74.1	0.572	1.79	ug/kg	1					
Benzo(ghi)perylene		67.8	0.572	1.79	ug/kg	1					
Benzo(k)fluoranthene		41.1	0.286	0.893	ug/kg	1					
Chrysene		53.5	0.572	1.79	ug/kg	1					
Dibenzo(a,h)anthracene	P	7.72	0.572	1.79	ug/kg	1					
Fluoranthene		62.9	0.572	1.79	ug/kg	1					
Fluorene	U	5.36	5.36	17.9	ug/kg	1					
Indeno(1,2,3-cd)pyrene	P	63.1	0.572	1.79	ug/kg	1					
Naphthalene	U	5.36	5.36	17.9	ug/kg	1					
Phenanthrene	J	11.8	5.36	17.9	ug/kg	1					
Pyrene		61.5	0.572	1.79	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3550B	3550B PAH BY HPLC Prep in soil	AXV1	02/24/14	1720	1368518

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 8310	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decafluorobiphenyl	8310/3550 PAH Std list Soil "Dry Weight Corrected"	5870 ug/kg	8930	65.7	(23%-104%)

**Notes:**

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 27, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J5	Project: WCHN00213
Sample ID: 343419002	Client ID: WCHN001
Matrix: SOIL	
Collect Date: 20-FEB-14 08:38	
Receive Date: 21-FEB-14	
Collector: Client	
Moisture: 7.01%	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>HPLC-PAH</b>											
<b>8310/3550 PAH Std list Soil "Dry Weight Corrected"</b>											
Acenaphthene	U	5.36	5.36	17.9	ug/kg	1	CWW	02/25/14	1516	1368519	1
Acenaphthylene	U	5.36	5.36	17.9	ug/kg	1					
Anthracene	U	1.79	1.79	17.9	ug/kg	1					
Benzo(a)anthracene		7.01	0.572	1.79	ug/kg	1					
Benzo(a)pyrene		4.50	0.572	1.79	ug/kg	1					
Benzo(b)fluoranthene		11.5	0.572	1.79	ug/kg	1					
Benzo(ghi)perylene		4.61	0.572	1.79	ug/kg	1					
Benzo(k)fluoranthene		6.10	0.286	0.894	ug/kg	1					
Chrysene		12.0	0.572	1.79	ug/kg	1					
Dibenzo(a,h)anthracene	J	0.746	0.572	1.79	ug/kg	1					
Fluoranthene		22.9	0.572	1.79	ug/kg	1					
Fluorene	U	5.36	5.36	17.9	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.572	0.572	1.79	ug/kg	1					
Naphthalene	U	5.36	5.36	17.9	ug/kg	1					
Phenanthrene	J	9.31	5.36	17.9	ug/kg	1					
Pyrene		19.5	0.572	1.79	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3550B	3550B PAH BY HPLC Prep in soil	AXV1	02/24/14	1720	1368518

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 8310	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decafluorobiphenyl	8310/3550 PAH Std list Soil "Dry Weight Corrected"	5700 ug/kg	8940	63.8	(23%-104%)

**Notes:**

# QC Summary

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: February 27, 2014

Page 1 of 4

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

**Workorder: 343419**

**Client SDG: XP0051**

**Project Description: RC-232 Soil**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>HPLC-PAH</b>											
Batch	1368519										
QC1203040355	LCS										
Acenaphthene	1670			1330	ug/kg		79.6	(58%-99%)	CWW	02/25/14	11:45
Acenaphthylene	1670			1320	ug/kg		79.2	(58%-98%)			
Anthracene	1670			1540	ug/kg		92.2	(63%-94%)			
Benzo(a)anthracene	167			150	ug/kg		90	(73%-98%)			
Benzo(a)pyrene	167			138	ug/kg		83	(63%-99%)			
Benzo(b)fluoranthene	167			143	ug/kg		86	(70%-130%)			
Benzo(ghi)perylene	167			142	ug/kg		85.2	(70%-130%)			
Benzo(k)fluoranthene	83.3			67.4	ug/kg		80.9	(70%-130%)			
Chrysene	167			161	ug/kg		96.9	(70%-130%)			
Dibenzo(a,h)anthracene	167			168	ug/kg		101	(70%-130%)			
Fluoranthene	167			140	ug/kg		84.3	(70%-130%)			
Fluorene	1670			1380	ug/kg		83.1	(65%-130%)			
Indeno(1,2,3-cd)pyrene	167			153	ug/kg		91.6	(70%-130%)			
Naphthalene	1670			1280	ug/kg		76.6	(57%-130%)			
Phenanthrene	1670			1400	ug/kg		84.1	(70%-130%)			
Pyrene	167			151	ug/kg		90.5	(70%-130%)			
**Decafluorobiphenyl	8330			6380	ug/kg		76.6	(23%-104%)			
QC1203040354	MB										
Acenaphthene			U	4.99	ug/kg					02/25/14	11:03
Acenaphthylene			U	4.99	ug/kg						

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 2 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>HPLC-PAH</b>											
Batch	1368519										
Anthracene			U	1.66	ug/kg						
Benzo(a)anthracene			U	0.532	ug/kg				CWW	02/25/14	11:03
Benzo(a)pyrene			U	0.532	ug/kg						
Benzo(b)fluoranthene			U	0.532	ug/kg						
Benzo(ghi)perylene			U	0.532	ug/kg						
Benzo(k)fluoranthene			U	0.266	ug/kg						
Chrysene			U	0.532	ug/kg						
Dibenzo(a,h)anthracene			U	0.532	ug/kg						
Fluoranthene			U	0.532	ug/kg						
Fluorene			U	4.99	ug/kg						
Indeno(1,2,3-cd)pyrene			U	0.532	ug/kg						
Naphthalene			U	4.99	ug/kg						
Phenanthrene			U	4.99	ug/kg						
Pyrene			U	0.532	ug/kg						
**Decafluorobiphenyl	8320			6410	ug/kg		77	(23%-104%)			
QC1203040356 343419001 MS											
Acenaphthene	1790	U	5.36	1300	ug/kg		73	(49%-90%)		02/25/14	13:10
Acenaphthylene	1790	U	5.36	1280	ug/kg		71.8	(48%-97%)			
Anthracene	1790	U	1.79	1530	ug/kg		85.4	(49%-91%)			
Benzo(a)anthracene	179		67.0	202	ug/kg		75.6	(29%-126%)			
Benzo(a)pyrene	179		76.8	220	ug/kg		80.3	(26%-130%)			
Benzo(b)fluoranthene	179		74.1	229	ug/kg		86.9	(32%-135%)			
Benzo(ghi)perylene	179		67.8	201	ug/kg		74.7	(34%-125%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 3 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>HPLC-PAH</b>											
Batch	1368519										
Benzo(k)fluoranthene	89.3	41.1		135	ug/kg		106	(48%-142%)	CWW	02/25/14	13:10
Chrysene	179	53.5		217	ug/kg		91.8	(39%-127%)			
Dibenzo(a,h)anthracene	179	P	7.72	174	ug/kg		93.3	(38%-130%)			
Fluoranthene	179		62.9	202	ug/kg		77.6	(20%-139%)			
Fluorene	1790	U	5.36	1380	ug/kg		77.2	(51%-90%)			
Indeno(1,2,3-cd)pyrene	179	P	63.1	208	ug/kg		81.3	(41%-145%)			
Naphthalene	1790	U	5.36	1160	ug/kg		64.9	(43%-87%)			
Phenanthrene	1790	J	11.8	1390	ug/kg		77	(50%-100%)			
Pyrene	179		61.5	214	ug/kg		85.3	(18%-149%)			
**Decafluorobiphenyl	8930		5870	5650	ug/kg		63.2	(23%-104%)			
QC1203040357 343419001 MSD											
Acenaphthene	1780	U	5.36	1300	ug/kg	0.560	72.6	(0%-30%)		02/25/14	13:52
Acenaphthylene	1780	U	5.36	1280	ug/kg	0.450	71.5	(0%-30%)			
Anthracene	1780	U	1.79	1520	ug/kg	0.168	85.3	(0%-30%)			
Benzo(a)anthracene	178		67.0	191	ug/kg	5.56	69.6	(0%-30%)			
Benzo(a)pyrene	178		76.8	201	ug/kg	9.28	69.4	(0%-30%)			
Benzo(b)fluoranthene	178		74.1	202	ug/kg	12.7	71.6	(0%-30%)			
Benzo(ghi)perylene	178		67.8	188	ug/kg	7.06	67.1	(0%-30%)			
Benzo(k)fluoranthene	89.2		41.1	117	ug/kg	14.1	85.6	(0%-30%)			
Chrysene	178		53.5	202	ug/kg	7.35	83.2	(0%-30%)			
Dibenzo(a,h)anthracene	178	P	7.72	169	ug/kg	3.40	90.1	(0%-30%)			
Fluoranthene	178		62.9	196	ug/kg	2.68	74.7	(0%-30%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 4 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>HPLC-PAH</b>											
Batch	1368519										
Fluorene	1780	U	5.36	1370	ug/kg	0.441	76.9	(0%-30%)	CWW	02/25/14	13:52
Indeno(1,2,3-cd)pyrene	178	P	63.1	193	ug/kg	7.70	72.7	(0%-30%)			
Naphthalene	1780	U	5.36	1130	ug/kg	2.32	63.5	(0%-30%)			
Phenanthrene	1780	J	11.8	1390	ug/kg	0.218	77.3	(0%-30%)			
Pyrene	178		61.5	208	ug/kg	2.99	81.9	(0%-30%)			
*Decafluorobiphenyl	8920		5870	5540	ug/kg		62.1	(23%-104%)			

**Notes:**

The Qualifiers in this report are defined as follows:

- A The TIC is a suspected aldol-condensation product
- B The analyte was detected in both the associated QC blank and in the sample.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- J 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). Value is estimated
- P Aroclor target analyte with greater than 25% difference between column analyses.
- T Spike and/or spike duplicate 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.
- 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
  - o Analyte failed to recover within LCS limits (Organics only)

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.

# Miscellaneous Data

# Prep Logbook

## Extraction of Semivolatile and Nonvolatile Organic Compounds from Soil, Sludge, and Other Miscellaneous Solid Samples

Batch ID: 1368518      Verified by: \_\_\_\_\_  
 Analyst: Alberto Velasco  
 Method: SW846 3550B

Lab SOP: GL-OA-E-010 REV# 21  
 Instrument: Semi-Volatiles Manual

Sample ID	Run Date	Aliquot (g)	Prepped Aliquot (mL)	Prepped Factor (mL/g)
1203040354 MB	24-FEB-2014 17:20:00	30.05	1	0.03328
1203040355 LCS	24-FEB-2014 17:20:00	30.02	1	0.03331
343419001	24-FEB-2014 17:20:00	30.01	1	0.03332
1203040356 MS (343419001)	24-FEB-2014 17:20:00	30	1	0.03333
1203040357 MSD (343419001)	24-FEB-2014 17:20:00	30.03	1	0.0333
343419002	24-FEB-2014 17:20:00	30.08	1	0.03324
343428001	24-FEB-2014 17:20:00	30.09	1	0.03323
1203040358 MS (343428001)	24-FEB-2014 17:20:00	30.06	1	0.03327
1203040359 MSD (343428001)	24-FEB-2014 17:20:00	30.04	1	0.03329

Type	Sample Id	Description	Serial Number	Spike Amt	Units	Comments:
LCS	1203040355	8310 PAH SPIKE	UE131224-15	1	mL	Verified By: SLW
MS	1203040356	8310 PAH SPIKE	UE131224-15	1	mL	Final Solvent: Acetonitrile
MS	1203040358	8310 PAH SPIKE	UE131224-15	1	mL	
MSD	1203040357	8310 PAH SPIKE	UE131224-15	1	mL	
MSD	1203040359	8310 PAH SPIKE	UE131224-15	1	mL	
SURR	All	Decafluorobiphenyl 250 mg/L	UE140131-25	1	mL	
REGNT	All	HPLC Grade Acetonitrile	2069348	5	mL	
REGNT	All	Methylene Chloride	2073001-D	300	mL	
SOURC	All	SODIUM SULFATE	2051933	30	g	

# **FID Diesel Range Organics Analysis**

# Case Narrative

**FID Diesel Range Organics  
WC-HANFORD, INC. (WCHN)  
SDG XP0051**

**Method/Analysis Information**

**Procedure:** Analysis of Diesel Range Organics by Flame Ionization Detector  
Analytical Method: NWTPH-Dx in Soil  
Prep Method: SW846 3541  
Analytical Batch Number: 1368613  
Prep Batch Number: 1368612

**Sample Analysis**

The following samples were analyzed using the analytical protocol as established in NWTPH-Dx in Soil:

<b>Sample ID</b>	<b>Client ID</b>
343419001	J1T9J6
343419002	J1T9J5
1203040578	Method Blank (MB)
1203040579	Laboratory Control Sample (LCS)
1203040580	343419001(J1T9J6) Matrix Spike (MS)
1203040581	343419001(J1T9J6) Matrix Spike Duplicate (MSD)

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

**Preparation/Analytical Method Verification**

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-OA-E-003 REV# 24.

Raw data reports are processed and reviewed by the analyst using the Chemstation software package. False positives have been removed from the quantitation reports per standard operating procedures (SOP).

**Calibration Information**

**Initial Calibration**

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

**Continuing Calibration Verification (CCV) Requirements**

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria. Analyte peaks eluted within the established retention time windows for this method.

## **Quality Control (QC) Information**

### **Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

### **Surrogate Recoveries**

All surrogate recoveries were within the established acceptance criteria for this SDG.

### **Laboratory Control Sample (LCS) Recovery**

The LCS spike recoveries met the acceptance limits.

### **QC Sample Designation**

Sample 343419001 (J1T9J6) was selected for the matrix spike and matrix spike duplicate analysis.

### **Matrix Spike (MS) Recovery Statement**

The MS, performed on sample 343419001 (J1T9J6), recovered outside the established acceptance limits due to sample matrix interference as the MSD failed spike recovery in the same manner.

### **Matrix Spike Duplicate (MSD) Recovery Statement**

The MSD, performed on sample 343419001 (J1T9J6), recovered outside the established acceptance limits due to sample matrix interference as the MS failed spike recovery in the same manner.

### **MS/MSD Relative Percent Difference (RPD) Statement**

The RPD between the MS and MSD met the acceptance limits.

## **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. Analyte peaks eluted within the established retention time windows for this method.

### **Sample Dilutions**

The samples in this SDG did not require dilutions.

### **Sample Re-extraction/Re-analysis**

Re-extractions or re-analyses were not required in this SDG.

## **Miscellaneous Information**

### **Electronic Package Comment**

This package was generated using an electronic data processing program referred to as "virtual packaging". In an effort to increase quality and efficiency, the laboratory is developing systems to eventually 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. The data validator will always sign and date the case narrative.

### **Data Exception (DER) Documentation**

Data exception report (DER) is generated to document procedural anomalies that may deviate from referenced SOP or contractual documents. DER #1270453 was generated for the MS and MSD of sample 343419001 (J1T9J6).

**Manual Integrations**

Manual integrations were required for surrogates.

**Additional Comments**

The additional comments field is used to address special issues associated with each analysis, clarify method/contractual issues pertaining to the analysis, and to list any report documents generated as a result of sample analysis or review. The additional comments were not required.

**System Configuration**

The Diesel Range Organics analysis was performed on the following instrument configuration:

<b>Instrument ID</b>	<b>Instrument</b>	<b>System Configuration</b>	<b>Column ID</b>	<b>Column Description</b>
FID7.I	Agilent Gas Chromatograph	Agilent 6890N GC/FID	DB-5MS	30m x 0.25mm, 0.25um(J&W)

**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.

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 26-FEB-14	<b>Division:</b> Federal	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> GC/FID	<b>Test / Method:</b> NWTPH-Dx in Soil	<b>Matrix Type:</b> Solid	<b>Client Code:</b> WCHN
<b>Batch ID:</b> 1368613	<b>Sample Numbers:</b> See Below		
<b>Potentially affected work order(s)(SDG): 343419(XP0051)</b>			
<b>Application Issues:</b> Failed Recovery for MS/PS Failed Recovery for MSD/PSD			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
1. The MS(1203040580) and MSD(1203040581) recovered diesel range organics at 65% and 66% respectively(SPC Limit: 70%-130%).		1. As the MS and MSD displayed similar recoveries, the failures were attributed to sample matrix interference and the data have been reported.	

**Originator's Name:**

Benjamin Taft      26-FEB-14

**Data Validator/Group Leader:**

Jimin Cao      26-FEB-14

# 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: XP0051 GEL Work Order: 343419 Project: RC-232 Soil

### The Qualifiers in this report are defined as follows:

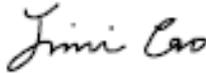
- J The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate). Value is estimated
- T Spike and/or spike duplicate sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- DL Indicates that sample is diluted.
- RA Indicates that sample is re-analyzed without re-extraction.
- RE Indicates that sample is re-extracted.

### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Jimin Cao

Date: 26 FEB 2014

Title: Data Validator

# **Sample Data Summary**



# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 26, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J5	Project: WCHN00213
Sample ID: 343419002	Client ID: WCHN001
Matrix: SOIL	
Collect Date: 20-FEB-14 08:38	
Receive Date: 21-FEB-14	
Collector: Client	
Moisture: 7.01%	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Diesel Range Organics											
SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"											
Diesel Range Organics (C10-C20)	JT	2650	2330	7160	ug/kg	1	BYT1	02/25/14	2113	1368613	1
Motor Oil (C20-C36)		18300	2330	7160	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	3541 DRO IN SOIL PREP	SXW3	02/24/14	1839	1368612

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	NWTPH-Dx in Soil	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
o-Terphenyl	SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"	518 ug/kg	716	72.3	(50%-150%)

**Notes:**

# **Quality Control Summary**

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: February 26, 2014

Page 1 of 2

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

**Workorder: 343419**      **Client SDG: XP0051**      **Project Description: RC-232 Soil**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Diesel Range Organics</b>											
Batch	1368613										
QC1203040579	LCS										
Diesel Range Organics (C10-C20)	66600			46600	ug/kg		70.1	(70%-130%)	BYT1	02/25/14	18:37
Motor Oil (C20-C36)	66600			48000	ug/kg		72.2	(70%-130%)			
**o-Terphenyl	666			479	ug/kg		72	(50%-150%)			
QC1203040578	MB										
Diesel Range Organics (C10-C20)			U	2170	ug/kg					02/25/14	17:58
Motor Oil (C20-C36)			U	2170	ug/kg						
**o-Terphenyl	666			437	ug/kg		65.5	(50%-150%)			
QC1203040580	343419001 MS										
Diesel Range Organics (C10-C20)	71500	JT	3580 T	50600	ug/kg		65.7 *	(70%-130%)		02/25/14	19:55
Motor Oil (C20-C36)	71500		19300	71500	ug/kg		73.1	(70%-130%)			
**o-Terphenyl	715		482	504	ug/kg		70.5	(50%-150%)			
QC1203040581	343419001 MSD										
Diesel Range Organics (C10-C20)	71500	JT	3580 T	50800	ug/kg	0.552	66.1 *	(0%-20%)		02/25/14	20:34
Motor Oil (C20-C36)	71500		19300	76800	ug/kg	7.15	80.5	(0%-20%)			
**o-Terphenyl	715		482	486	ug/kg		68	(50%-150%)			

**Notes:**

The Qualifiers in this report are defined as follows:

- A The TIC is a suspected aldol-condensation product
- B The analyte was detected in both the associated QC blank and in the sample.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- J 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). Value is estimated

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
P	Aroclor target analyte with greater than 25% difference between column analyses.										
T	Spike and/or spike duplicate 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.										
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										
o	Analyte failed to recover within LCS limits (Organics only)										

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.

# Miscellaneous

# Prep Logbook

## Extraction of Semivolatile and Nonvolatile Organic Compounds from Soil, Sludge, and Other Miscellaneous Solid Samples

Batch ID: 1368612      Verified by: \_\_\_\_\_  
 Analyst: Shannon Whitehead  
 Method: SW846 3541

Lab SOP: GL-OA-E-010 REV# 21  
 Instrument: Semi-Volatiles Manual

Sample ID	Run Date	Aliquot (g)	Prepped Aliquot (mL)	Prepped Factor (mL/g)
1203040578 MB	24-FEB-2014 18:39:00	30.02	1	0.03331
1203040579 LCS	24-FEB-2014 18:39:00	30.05	1	0.03328
343419001	24-FEB-2014 18:39:00	30.01	1	0.03332
1203040580 MS (343419001)	24-FEB-2014 18:39:00	30	1	0.03333
1203040581 MSD (343419001)	24-FEB-2014 18:39:00	30	1	0.03333
343419002	24-FEB-2014 18:39:00	30.02	1	0.03331
343428001	24-FEB-2014 18:39:00	30.04	1	0.03329
1203040582 MS (343428001)	24-FEB-2014 18:39:00	30.04	1	0.03329
1203040583 MSD (343428001)	24-FEB-2014 18:39:00	30.02	1	0.03331

Type	Sample Id	Description	Serial Number	Spike Amt	Units	Comments:
LCS	1203040579	AZDRO SPIKE LCS STD,4000ug/ml	WFI140218-52	1	mL	Verified By: AV Final Solvent: CH2Cl2
MS	1203040580	AZDRO SPIKE LCS STD,4000ug/ml	WFI140218-52	1	mL	
MS	1203040582	AZDRO SPIKE LCS STD,4000ug/ml	WFI140218-52	1	mL	
MSD	1203040581	AZDRO SPIKE LCS STD,4000ug/ml	WFI140218-52	1	mL	
MSD	1203040583	AZDRO SPIKE LCS STD,4000ug/ml	WFI140218-52	1	mL	
SURR	All	20 ppm surrogate	WE140131-04	1	mL	
REGNT	All	Methylene Chloride	2073001-D	120	mL	
SOURC	All	SODIUM SULFATE	2051933	30	g	

# PCB Analysis

# Case Narrative

**PCB Case Narrative  
WC-HANFORD, INC. (WCHN)  
SDG XP0051**

**Method/Analysis Information**

**Procedure:** Analysis of Polychlorinated Biphenyls by ECD  
Analytical Method: SW846 3541/8082A  
Prep Method: SW846 3541  
Analytical Batch Number: 1368417  
Prep Batch Number: 1368416

**Sample Analysis**

The following samples were analyzed using the analytical protocol as established in SW846 3541/8082A:

<b>Sample ID</b>	<b>Client ID</b>
343419001	J1T9J6
343419002	J1T9J5
1203040111	Method Blank (MB)
1203040112	Laboratory Control Sample (LCS)
1203040115	343419001(J1T9J6) Matrix Spike (MS)
1203040116	343419001(J1T9J6) Matrix Spike Duplicate (MSD)

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

**Preparation/Analytical Method Verification**

**SOP Reference**

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-OA-E-040 REV# 20.

Raw data reports are processed and reviewed by the analyst using the Chemstation software package. False positives have been removed from the quantitation reports per standard operating procedures (SOP).

**Calibration Information**

A complete list of the initial calibration data files are shown in the Calibration History report located in the Standard Data section of the data package.

**Initial Calibration**

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

**Continuing Calibration Verification (CCV) Requirements**

All associated calibration verification standards (ICV or CCV) met the acceptance criteria. All analytes were within the established retention time windows for this method.

## **Quality Control (QC) Information**

### **Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

### **Surrogate Recoveries**

All surrogate recoveries were within the established acceptance criteria for the samples in this SDG in this batch.

### **Laboratory Control Sample (LCS) Recovery**

The LCS spike recoveries met the acceptance limits.

### **QC Sample Designation**

Sample 343419001 (J1T9J6) was selected for the matrix spike and matrix spike duplicate analysis for this SDG.

### **Matrix Spike (MS) Recovery Statement**

The MS, performed on sample 343419001 (J1T9J6), did not meet spike recovery acceptance criteria due to dilution and sample matrix interference.

### **Matrix Spike Duplicate (MSD) Recovery Statement**

The MSD, performed on sample 343419001 (J1T9J6), did not meet spike recovery acceptance criteria due to dilution and sample matrix interference.

### **MS/MSD Relative Percent Difference (RPD) Statement**

The RPD between the MS and MSD met the acceptance limits.

## **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. All reported analyte detections in client and quality control samples were within the established retention time windows. Reported analyte concentrations were confirmed on dissimilar columns. All sample extracts were cleaned using alumina. Additionally, copper was added to all sample extracts to remove sulfur.

### **Sample Dilutions**

Samples 1203040115 (J1T9J6MS), 1203040116 (J1T9J6MSD) and 343419001 (J1T9J6) were diluted due to high concentrations of non-target analytes within the retention time window of interest.

### **Sample Re-extraction/Re-analysis**

Re-extractions or re-analyses were not required in this SDG in this batch.

## **Miscellaneous Information**

### **Electronic Package Comment**

The following package was generated using an electronic data processing program referred to as "virtual packaging". In an effort to increase quality and efficiency, the laboratory is developing systems to eventually 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. The data validator will always sign and date the case narrative. 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 report (DER) is generated to document procedural anomalies that may deviate from referenced SOP or contractual documents. DER #1270205 was generated for the MS and MSD of sample 343419001 (J1T9J6).

**Manual Integrations**

Certain standards and samples may have required manual integration to correctly position the baseline as set in the calibration standard injections. If manual integration was performed, copies of all manual integration peak profiles are included in the raw data section of this PCB fraction.

**Additional Comments**

The additional comments field is used to address special issues associated with each analysis, clarify method/contractual issues pertaining to the analysis, and to list any report documents generated as a result of sample analysis or review. The following additional comments were required:

The front column has been chosen as the primary column. The data are reported from the front column for all samples in this batch.

Due to software issue, the surrogate recovery range was not indicated in Quantitation Report. Please see Surrogate Recovery Report for correct surrogate acceptance limits.

Due to rounding differences in the calculation between the forms, the data reported in Sample Summary (form 1) and Spike Recovery Report (form 3) may differ slightly from the data reported in Identification Summary (form 10).

Aroclors quantitated on the raw data report by ChemStation data system do not necessarily represent positive Aroclor identification. In order for positive identification to be made, the Aroclor must match in pattern and retention time; as well as quantitate relatively close between the primary and confirmation columns, as specified in SW846 method 8000. When these conditions are not met, the Aroclor is reported as a non-detect on the data report.

**System Configuration**

The Semi-Volatiles-PCB analysis was performed on the following instrument configuration:

<b>Instrument ID</b>	<b>Instrument</b>	<b>System Configuration</b>	<b>Column ID</b>	<b>Column Description</b>
ECD8A.I_1	Agilent 6890 Gas Chromatograph/Dual ECD w/ 7683 Autosampler	HP6890 Series ECD	Rtx-CLP I	30m x 0.25mm, 0.25um (Rtx-CLPesticide I)
ECD8A.I_2	Agilent 6890 Gas Chromatograph/Dual ECD w/ 7683 Autosampler	HP6890 Series ECD	Rtx-CLP II	30m x 0.25mm, 0.20um (Rtx-CLPesticide II)

**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.

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 25-FEB-14	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> GC/ECD	<b>Test / Method:</b> SW846 3541/8082A	<b>Matrix Type:</b> Solid	<b>Client Code:</b> OLAB, WCHN
<b>Batch ID:</b> 1368417	<b>Sample Numbers:</b> See Below		
<p><b>Potentially affected work order(s)(SDG): 343290(XP0050),343419(XP0051),343495(X402192)</b></p> <p><b>Application Issues:</b> Failed Recovery for MS/PS Failed Recovery for MSD/PSD</p>			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
<p>QC sample1203040115(MS) and 1203040116(MSD), performed on sample 343419001, did not meet spike recovery acceptance criteria.</p>		<p>The failure was attributed to sample matrix interference and dilution as the MS and MSD failed in the same manner. The data were reported.</p>	

**Originator's Name:**  
Yiping Shi                      25-FEB-14

**Data Validator/Group Leader:**  
Jimin Cao                              25-FEB-14

# 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: XP0051 GEL Work Order: 343419 Project: RC-232 Soil

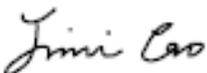
### The Qualifiers in this report are defined as follows:

- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- P Aroclor target analyte with greater than 25% difference between column analyses.
- T Spike and/or spike duplicate 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.
- DL Indicates that sample is diluted.
- RA Indicates that sample is re-analyzed without re-extraction.
- RE Indicates that sample is re-extracted.

### Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Jimin Cao

Date: 26 FEB 2014

Title: Data Validator

# **Sample Data Summary**

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 25, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J6	Project: WCHN00213
Sample ID: 343419001	Client ID: WCHN001
Matrix: SOIL	
Collect Date: 20-FEB-14 08:24	
Receive Date: 21-FEB-14	
Collector: Client	
Moisture: 6.71%	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Semi-Volatiles-PCB</b>											
<b>SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"</b>											
Aroclor-1016	DTU	11.9	11.9	35.6	ug/kg	10	JXM	02/25/14	1036	1368417	1
Aroclor-1221	DU	11.9	11.9	35.6	ug/kg	10					
Aroclor-1232	DU	11.9	11.9	35.6	ug/kg	10					
Aroclor-1242	DU	11.9	11.9	35.6	ug/kg	10					
Aroclor-1248	DU	11.9	11.9	35.6	ug/kg	10					
Aroclor-1254	DU	11.9	11.9	35.6	ug/kg	10					
Aroclor-1260	DP	42.4	11.9	35.6	ug/kg	10					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	Prep Method 3541 PCB Prep Soil	SJW1	02/24/14	1027	1368416

The following Analytical Methods were performed:

Method	Description	Analyst Comments				
1	SW846 3541/8082A					
Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits	
4cmx	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.15 ug/kg	7.13	72.3	(44%-106%)	
Decachlorobiphenyl	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.48 ug/kg	7.13	77.0	(35%-119%)	

**Notes:**

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 25, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J5	Project: WCHN00213
Sample ID: 343419002	Client ID: WCHN001
Matrix: SOIL	
Collect Date: 20-FEB-14 08:38	
Receive Date: 21-FEB-14	
Collector: Client	
Moisture: 7.01%	

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Semi-Volatiles-PCB</b>											
<b>SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"</b>											
Aroclor-1016	TU	1.19	1.19	3.58	ug/kg	1	JXM	02/25/14	0904	1368417	1
Aroclor-1221	U	1.19	1.19	3.58	ug/kg	1					
Aroclor-1232	U	1.19	1.19	3.58	ug/kg	1					
Aroclor-1242	U	1.19	1.19	3.58	ug/kg	1					
Aroclor-1248	U	1.19	1.19	3.58	ug/kg	1					
Aroclor-1254	U	1.19	1.19	3.58	ug/kg	1					
Aroclor-1260		10.7	1.19	3.58	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	Prep Method 3541 PCB Prep Soil	SJW1	02/24/14	1027	1368416

The following Analytical Methods were performed:

Method	Description	Analyst Comments				
1	SW846 3541/8082A					
Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits	
4cmx	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.27 ug/kg	7.16	73.6	(44%-106%)	
Decachlorobiphenyl	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.53 ug/kg	7.16	77.2	(35%-119%)	

**Notes:**

# **Quality Control Summary**

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: February 25, 2014

Page 1 of 2

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

**Workorder: 343419**

**Client SDG: XP0051**

**Project Description: RC-232 Soil**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatiles-PCB</b>											
Batch	1368417										
QC1203040112	LCS										
Aroclor-1016	33.3			23.5	ug/kg		70.5	(39%-120%)	JXM	02/25/14	07:59
Aroclor-1260	33.3			28.0	ug/kg		84.2	(50%-116%)			
**4cmx	6.66			4.84	ug/kg		72.6	(44%-106%)			
**Decachlorobiphenyl	6.66			5.95	ug/kg		89.2	(35%-119%)			
QC1203040111	MB										
Aroclor-1016			U	1.11	ug/kg					02/25/14	07:46
Aroclor-1221			U	1.11	ug/kg						
Aroclor-1232			U	1.11	ug/kg						
Aroclor-1242			U	1.11	ug/kg						
Aroclor-1248			U	1.11	ug/kg						
Aroclor-1254			U	1.11	ug/kg						
Aroclor-1260			U	1.11	ug/kg						
**4cmx	6.67			5.06	ug/kg		75.9	(44%-106%)			
**Decachlorobiphenyl	6.67			6.34	ug/kg		95.2	(35%-119%)			
QC1203040115	343419001	MS									
Aroclor-1016	35.5	DTU	11.9 DTU	11.8	ug/kg		0*	(25%-125%)		02/25/14	10:51
Aroclor-1260	35.5	DP	42.4 D	77.6	ug/kg		99.3	(28%-127%)			
**4cmx	7.09		5.15	4.90	ug/kg		69.1	(44%-106%)			
**Decachlorobiphenyl	7.09		5.48	5.12	ug/kg		72.2	(35%-119%)			
QC1203040116	343419001	MSD									
Aroclor-1016	35.5	DTU	11.9 DTU	11.8	ug/kg	N/A	0*	(0%-30%)		02/25/14	11:05

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatiles-PCB</b>											
Batch	1368417										
Aroclor-1260	35.5	DP	42.4	D	65.0	ug/kg	17.6	63.8	(0%-30%)		
**4cmx	7.10		5.15		4.52	ug/kg		63.6	(44%-106%)	JXM	02/25/14 11:05
**Decachlorobiphenyl	7.10		5.48		4.79	ug/kg		67.5	(35%-119%)		

### Notes:

The Qualifiers in this report are defined as follows:

- A The TIC is a suspected aldol-condensation product
- B The analyte was detected in both the associated QC blank and in the sample.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- J 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). Value is estimated
- P Aroclor target analyte with greater than 25% difference between column analyses.
- T Spike and/or spike duplicate 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.
- 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
- o Analyte failed to recover within LCS limits (Organics only)

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.

# Miscellaneous

# Prep Logbook

## Automated Soxhlet Extraction

**Batch ID:** 1368416  
**Analyst:** Sirena White  
**Method:** SW846 3541

**Verified by:** \_\_\_\_\_

**Lab SOP:** GL-OA-E-066 REV# 5  
**Instrument:** Semi-Volatiles Manual

Sample ID	Run Date	Aliquot (g)	Clean Up 1 Amount 1 (mL)	Clean Up Post Clean Up Amount 1 (mL)	Final Volume (mL)	Prepped Factor (mL/g)
1203040111 MB	24-FEB-2014 10:27:00	30	H2SO4/KM 2 nO4	9	1	0.03333
1203040112 LCS	24-FEB-2014 10:27:00	30.02	H2SO4/KM 2 nO4	9	1	0.03331
343290008 - 2	24-FEB-2014 10:27:00	30.05	H2SO4/KM 2 nO4	9	1	0.03328
343419001	24-FEB-2014 10:27:00	30.08	H2SO4/KM 2 nO4	9	1	0.03324
1203040115 MS (343419001)	24-FEB-2014 10:27:00	30.23	H2SO4/KM 2 nO4	9	1	0.03308
1203040116 MSD (343419001)	24-FEB-2014 10:27:00	30.2	H2SO4/KM 2 nO4	9	1	0.03311
343419002	24-FEB-2014 10:27:00	30.04	H2SO4/KM 2 nO4	9	1	0.03329
343428001	24-FEB-2014 10:27:00	30.04	H2SO4/KM 2 nO4	9	1	0.03329
1203040117 MS (343428001)	24-FEB-2014 10:27:00	30.05	H2SO4/KM 2 nO4	9	1	0.03328
1203040118 MSD (343428001)	24-FEB-2014 10:27:00	30.23	H2SO4/KM 2 nO4	9	1	0.03308
343495001	24-FEB-2014 10:27:00	30	H2SO4/KM 2 nO4	9	1	0.03333

Type	Sample Id	Description	Serial Number	Spike Amt	Units	Comments:
LCS	1203040112	PCB Laboratory Control	WE140123-04	1	mL	Final Solvent: Hexane Verified by: CR Clean-up Initials: SJW Clean-up SOP: GL-OA-E-037 REV.1 Clean-up date: 02/24/2014
MS	1203040115	PCB Laboratory Control	WE140123-04	1	mL	
MS	1203040117	PCB Laboratory Control	WE140123-04	1	mL	
MSD	1203040116	PCB Laboratory Control	WE140123-04	1	mL	
MSD	1203040118	PCB Laboratory Control	WE140123-04	1	mL	
SURR	All	PEST LOW LEVEL SURROGATE 200 UG/L	WE140108-01	1	mL	
REGNT	All	1:1 sulfuric acid	2057316	5	mL	
REGNT	All	Hexane	2067500-B4	120	mL	
REGNT	All	5% Potassium Permanganate	2068449	5	mL	
SOURC	All	SODIUM SULFATE	2051933	30	g	

# **Metals Analysis**

# Case Narrative

**Metals Fractional Narrative  
WC-HANFORD, INC. (WCHN)  
SDG XP0051**

**Sample Analysis**

<b>Sample ID</b>	<b>Client ID</b>
343419001	J1T9J6
343419002	J1T9J5
1203039862	Method Blank (MB) <b>ICP</b>
1203039863	Laboratory Control Sample (LCS)
1203039866	343419001(J1T9J6L) Serial Dilution (SD)
1203039864	343419001(J1T9J6D) Sample Duplicate (DUP)
1203039865	343419001(J1T9J6S) Matrix Spike (MS)
1203041736	343419001(J1T9J6PS) Post Spike (PS)
1203039854	Method Blank (MB) <b>ICP-MS</b>
1203039855	Laboratory Control Sample (LCS)
1203039858	343419001(J1T9J6L) Serial Dilution (SD)
1203039856	343419001(J1T9J6D) Sample Duplicate (DUP)
1203039857	343419001(J1T9J6S) Matrix Spike (MS)
1203037031	Method Blank (MB) <b>CVAA</b>
1203037032	Laboratory Control Sample (LCS)
1203040170	343419001(J1T9J6L) Serial Dilution (SD)
1203040168	343419001(J1T9J6D) Sample Duplicate (DUP)
1203040169	343419001(J1T9J6S) Matrix Spike (MS)

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

**Method/Analysis Information**

<b>Analytical Batch:</b>	1368332, 1368329 and 1367115
<b>Prep Batch :</b>	1368331, 1368328 and 1367113
<b>Standard Operating Procedures:</b>	GL-MA-E-013 REV# 22, GL-MA-E-009 REV# 22, GL-MA-E-014 REV# 25 and GL-MA-E-010 REV# 27
<b>Analytical Method:</b>	SW846 3050B/6010C, SW846 3050B/6020A and SW846 7471B
<b>Prep Method :</b>	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 - ICPMS was performed on a Perkin Elmer ELAN 9000 inductively coupled plasma mass spectrometer (ICP-MS). The instrument is equipped with a cross-flow nebulizer, quadrupole mass spectrometer, and dual mode electron multiplier detector. Internal standards of scandium, germanium, indium, tantalum, and/or lutetium were utilized to cover the mass spectrum. Operating conditions are set at 1400W power and combined argon pressures of 360+/- 7 kPa for the plasma and auxiliary gases, and 0.85 L/min carrier gas flow, and an initial lens voltage of 5.2.

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**

The CRDL standard recoveries met the referenced advisory control limits.

#### **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 samples were selected as the quality control (QC) samples for this SDG: 343419001 (J1T9J6)-ICP, ICP-MS and CVAA.

### **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 did not meet all the recommended quality control acceptance criteria for percent recoveries for the applicable analytes. The recoveries for arsenic, barium, beryllium, boron, cadmium, chromium, copper, molybdenum, nickel, potassium, silicon, silver, and sodium were not within the acceptance limits in sample 1203039865 (J1T9J6)-ICP. See data exception report (DER ID 1270913) behind the case narrative in this data package.

### **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 reporting 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. Not all applicable analytes met these requirements. The RPD values for aluminum, barium, copper, magnesium, manganese, nickel, silicon, and sodium were not within the acceptance limits in sample 1203039864 (J1T9J6)-ICP. See data exception report (DER ID 1270913) behind the case narrative in this data package.

### **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 did not meet the all recommended quality control acceptance criteria for percent recoveries for the applicable analytes and verifies the presence of matrix interferences. The potassium recovery was not within the acceptance limits in sample 1203041736 (J1T9J6)-ICP. See data exception report (DER ID 1270913) behind the case narrative in this data package.

### **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. Not all applicable analytes met the established percent difference criteria. The %D value for aluminum, barium, calcium, chromium, copper, iron, magnesium, manganese, nickel, potassium, and silicon were not within the acceptance limits in sample 1203039866 (J1T9J6)-ICP.

## **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 343419001 (J1T9J6) and 343419002 (J1T9J5)-ICP were diluted because the titanium concentration exceeded the linear range of the instrument which affected antimony, cobalt, lead, vanadium, and zinc. Samples in this SDG were diluted the standard two times for solids analyzed on the ICPMS.

### **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. Data exception report (DER ID 1270913) was generated for this SDG.

**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: Pat Steell Date: 02/28/2014

**DATA EXCEPTION REPORT**

<b>Mo.Day Yr.</b> 27-FEB-14	<b>Division:</b> Industrial	<b>Quality Criteria:</b> Specifications	<b>Type:</b> Process
<b>Instrument Type:</b> ICP	<b>Test / Method:</b> SW846 3050B/6010C	<b>Matrix Type:</b> Solid	<b>Client Code:</b> WCHN
<b>Batch ID:</b> 1368332	<b>Sample Numbers:</b> See Below		
<b>Potentially affected work order(s)(SDG): 343419(XP0051),343428(XP0052)</b>			
<b>Application Issues:</b> Failed Recovery for MS/PS Failed RPD for DUP			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
<p>1. Failed Recovery for MS/PS:</p> <p>QC 1203039865MS,1203039868MS, 1203041736PS, 1203041737PS</p> <p>2. Failed RPD for DUP:</p> <p>QC 1203039864DUP, 1203039867DUP</p>		<p>1. The matrix spike recovery failed outside of the control limits for arsenic, barium, beryllium, boron, cadmium, chromium, copper, molybdenum, nickel, potassium, selenium, silicon, silver and sodium. The post spike failed outside the required control limits for silicon, barium, copper, potassium and sodium but passed for all other analytes. This verifies the presence of a matrix interference for silicon, barium, copper, potassium and sodium 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 aluminum, barium, copper, magnesium, manganese, nickel, silicon, sodium, chromium, potassium and silver 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> <p>Sample #343419001 is light brown,dry soil-like material.</p> <p>Sample #343428001 is fine,gray powder with small rocks.</p>	

**Originator's Name:**

Helen Camello 27-FEB-14

**Data Validator/Group Leader:**

Louise Smith 27-FEB-14

# 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: XP0051 GEL Work Order: 343419 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).
- 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

Pat Steell 02/28/2014



# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 28, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J6  
Sample ID: 343419001

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/6020A	

Notes:



# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: February 28, 2014

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

Client SDG: XP0051

Client Sample ID: J1T9J5  
Sample ID: 343419002

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/6020A	

**Notes:**

# **Quality Control Summary**

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: February 28, 2014

Page 1 of 8

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

**Workorder: 343419**

**Client SDG: XP0051**

**Project Description: RC-232 Soil**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1368329										
QC1203039856	343419001	DUP									
Selenium		DU	0.350	DU	0.342	mg/kg	N/A ^		PRB	02/25/14	19:41
QC1203039855	LCS										
Selenium	4.90		D	4.32	mg/kg		88.2	(80%-120%)		02/25/14	19:12
QC1203039854	MB										
Selenium			DU	0.315	mg/kg					02/25/14	19:04
QC1203039857	343419001	MS									
Selenium	5.16	DU	0.350	D	4.40	mg/kg		84.3	(75%-125%)	02/25/14	19:48
QC1203039858	343419001	SDILT									
Selenium		DU	0.218	DU	1.75	ug/L	N/A	(0%-10%)		02/25/14	20:03
<b>Metals Analysis-ICP</b>											
Batch	1368332										
QC1203039864	343419001	DUP									
Aluminum		*M	5350	*	4100	mg/kg	26.5*	(0%-20%)	HSC	02/26/14	13:29
Antimony		BD	3.57	BD	1.73	mg/kg	69.3 ^	(+/-5.16)		02/26/14	11:41
Arsenic		BN	1.62	U	0.516	mg/kg	145 ^	(+/-3.10)		02/26/14	13:29
Barium		*MN	51.6	*	41.5	mg/kg	21.7*	(0%-20%)			
Beryllium		BN	0.318	B	0.279	mg/kg	12.8 ^	(+/-0.516)			
Boron		NU	1.07	U	1.03	mg/kg	N/A ^				
Cadmium		BN	0.529	B	0.433	mg/kg	20.1 ^	(+/-0.516)			
Calcium		M	4090		3630	mg/kg	11.8	(0%-20%)			
Chromium		MN	11.5		11.5	mg/kg	0.358	(0%-20%)			
Cobalt		D	7.46	D	7.97	mg/kg	6.63 ^	(+/-2.58)		02/26/14	11:41
Copper		*MN	21.8	*	29.9	mg/kg	31.0*	(0%-20%)		02/26/14	13:29
Iron		M	15800		13200	mg/kg	17.9	(0%-20%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 2 of 8

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1368332										
Lead	D	12.7	D	13.2	mg/kg	4.13	^	(+/-5.16)	HSC	02/26/14	11:41
Magnesium	*M	3460	*	2750	mg/kg	22.8*		(0%-20%)		02/26/14	13:29
Manganese	*M	234	*	189	mg/kg	21.4*		(0%-20%)			
Molybdenum	NU	0.214	U	0.207	mg/kg	N/A	^				
Nickel	*MN	9.66	*	7.86	mg/kg	20.6*		(0%-20%)			
Potassium	MN	1240		1040	mg/kg	17.8		(0%-20%)			
Silicon	*MN	941	*	548	mg/kg	52.7*		(0%-20%)			
Silver	N	0.569	B	0.483	mg/kg	16.4	^	(+/-0.516)			
Sodium	*N	127	*	93.1	mg/kg	30.5*	^	(+/-25.8)			
Vanadium	D	46.8	D	54.9	mg/kg	16.0		(0%-20%)		02/26/14	11:41
Zinc	D	158	D	166	mg/kg	5.18		(0%-20%)			
QC1203039863	LCS										
Aluminum		484		498	mg/kg			103 (80%-120%)		02/26/14	13:23
Antimony		48.4		48.5	mg/kg			100 (80%-120%)			
Arsenic		48.4		49.3	mg/kg			102 (80%-120%)			
Barium		48.4		49.2	mg/kg			101 (80%-120%)			
Beryllium		48.4		52.3	mg/kg			108 (80%-120%)			
Boron		48.4		47.8	mg/kg			98.6 (80%-120%)			
Cadmium		48.4		50.2	mg/kg			104 (80%-120%)			
Calcium		484		501	mg/kg			103 (80%-120%)			
Chromium		48.4		48.2	mg/kg			99.5 (80%-120%)			
Cobalt		48.4		48.6	mg/kg			100 (80%-120%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 3 of 8

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1368332										
Copper	48.4			49.7	mg/kg		103	(80%-120%)	HSC	02/26/14	13:23
Iron	484			508	mg/kg		105	(80%-120%)			
Lead	48.4			49.5	mg/kg		102	(80%-120%)			
Magnesium	484			505	mg/kg		104	(80%-120%)			
Manganese	48.4			48.7	mg/kg		100	(80%-120%)			
Molybdenum	48.4			47.4	mg/kg		97.9	(80%-120%)			
Nickel	48.4			49.1	mg/kg		101	(80%-120%)			
Potassium	484			479	mg/kg		98.9	(80%-120%)			
Silicon	484			440	mg/kg		90.8	(80%-120%)			
Silver	48.4			48.8	mg/kg		101	(80%-120%)			
Sodium	484			492	mg/kg		102	(80%-120%)			
Vanadium	48.4			48.9	mg/kg		101	(80%-120%)			
Zinc	48.4			49.2	mg/kg		101	(80%-120%)			
QC1203039862	MB										
Aluminum			U	6.75	mg/kg					02/26/14	13:19
Antimony			U	0.327	mg/kg						
Arsenic			U	0.496	mg/kg						
Barium			U	0.0992	mg/kg						
Beryllium			U	0.0992	mg/kg						
Boron			U	0.992	mg/kg						
Cadmium			B	-0.125	mg/kg						
Calcium			U	7.94	mg/kg						

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 4 of 8

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1368332										
Chromium			U	0.149	mg/kg				HSC	02/26/14	13:19
Cobalt			U	0.149	mg/kg						
Copper			U	0.298	mg/kg						
Iron			U	7.94	mg/kg						
Lead			U	0.327	mg/kg						
Magnesium			U	8.43	mg/kg						
Manganese			U	0.198	mg/kg						
Molybdenum			U	0.198	mg/kg						
Nickel			U	0.149	mg/kg						
Potassium			U	6.35	mg/kg						
Silicon			U	1.49	mg/kg						
Silver			U	0.0992	mg/kg						
Sodium			U	6.94	mg/kg						
Vanadium			U	0.0992	mg/kg						
Zinc			B	0.400	mg/kg						
QC1203039865 343419001 MS											
Aluminum	530	*M	5350	5470	mg/kg		N/A	(75%-125%)		02/26/14	13:31
Antimony	53.0	BD	3.57	D	49.0	mg/kg	85.7	(75%-125%)		02/26/14	11:45
Arsenic	53.0	BN	1.62	N	34.5	mg/kg	62.1*	(75%-125%)		02/26/14	13:31
Barium	53.0	*MN	51.6	N	89.6	mg/kg	71.7*	(75%-125%)			
Beryllium	53.0	BN	0.318	N	35.5	mg/kg	66.4*	(75%-125%)			
Boron	53.0	NU	1.07	N	31.7	mg/kg	59.8*	(75%-125%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 5 of 8

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1368332										
Cadmium	53.0	BN	0.529	N	34.3	mg/kg	63.7*	(75%-125%)	HSC	02/26/14	13:31
Calcium	530	M	4090		3860	mg/kg	N/A	(75%-125%)			
Chromium	53.0	MN	11.5	N	43.7	mg/kg	60.8*	(75%-125%)			
Cobalt	53.0	D	7.46	D	60.4	mg/kg	99.9	(75%-125%)		02/26/14	11:45
Copper	53.0	*MN	21.8	N	54.2	mg/kg	61.1*	(75%-125%)		02/26/14	13:31
Iron	530	M	15800		14200	mg/kg	N/A	(75%-125%)			
Lead	53.0	D	12.7	D	68.1	mg/kg	105	(75%-125%)		02/26/14	11:45
Magnesium	530	*M	3460		3250	mg/kg	N/A	(75%-125%)		02/26/14	13:31
Manganese	53.0	*M	234		229	mg/kg	N/A	(75%-125%)			
Molybdenum	53.0	NU	0.214	N	32.7	mg/kg	61.7*	(75%-125%)			
Nickel	53.0	*MN	9.66	N	41.8	mg/kg	60.7*	(75%-125%)			
Potassium	530	MN	1240	N	1470	mg/kg	43.2*	(75%-125%)			
Silicon	530	*MN	941	N	649	mg/kg	0*	(75%-125%)			
Silver	53.0	N	0.569	N	34.9	mg/kg	64.7*	(75%-125%)			
Sodium	530	*N	127	N	476	mg/kg	66*	(75%-125%)			
Vanadium	53.0	D	46.8	D	105	mg/kg	110	(75%-125%)		02/26/14	11:45
Zinc	53.0	D	158	D	206	mg/kg	91.9	(75%-125%)			
QC1203041736 343419001 PS											
Aluminum	5000	*M	49900		64400	ug/L	N/A	(80%-120%)		02/26/14	12:48
Arsenic	500	BN	15.1		490	ug/L	95.1	(80%-120%)			
Barium	500	*MN	482		1060	ug/L	116	(80%-120%)			
Beryllium	500	BN	2.96		508	ug/L	101	(80%-120%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 6 of 8

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1368332										
Boron	500	NU	-10.7	471	ug/L		94.2	(80%-120%)	HSC	02/26/14	12:48
Cadmium	500	BN	4.94	488	ug/L		96.7	(80%-120%)			
Calcium	5000	M	38100	51100	ug/L		N/A	(80%-120%)			
Chromium	500	MN	107	601	ug/L		98.9	(80%-120%)			
Copper	500	*MN	204	784	ug/L		116	(80%-120%)			
Iron	5000	M	148000	183000	ug/L		N/A	(80%-120%)			
Magnesium	5000	*M	32300	43900	ug/L		N/A	(80%-120%)			
Manganese	500	*M	2190	3110	ug/L		N/A	(80%-120%)			
Molybdenum	500	NU	-4.06	469	ug/L		93.9	(80%-120%)			
Nickel	500	*MN	90.1	583	ug/L		98.5	(80%-120%)			
Potassium	5000	MN	11600	19100	ug/L		149*	(80%-120%)			
Silicon	5000	*MN	8780	13700	ug/L		98.5	(80%-120%)			
Silver	500	N	5.31	484	ug/L		95.8	(80%-120%)			
Sodium	5000	*N	1180	6250	ug/L		101	(80%-120%)			
QC1203039866 343419001 SDILT											
Aluminum		*M	49900	DM	12000	ug/L	20*	(0%-10%)		02/26/14	13:34
Antimony		BD	6.66	DU	8.84	ug/L	N/A	(0%-10%)		02/26/14	11:47
Arsenic		BN	15.1	DU	2.68	ug/L	N/A	(0%-10%)		02/26/14	13:34
Barium		*MN	482	DM	118	ug/L	22.3*	(0%-10%)			
Beryllium		BN	2.96	DU	0.536	ug/L	N/A	(0%-10%)			
Boron		NU	-10.7	DU	5.36	ug/L	N/A	(0%-10%)			
Cadmium		BN	4.94	DU	0.536	ug/L	N/A	(0%-10%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 343419

Client SDG: XP0051

Project Description: RC-232 Soil

Page 7 of 8

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1368332										
Calcium	M	38100	DM	9320	ug/L	22.3*		(0%-10%)	HSC	02/26/14	13:34
Chromium	MN	107	DM	26.6	ug/L	24.2*		(0%-10%)			
Cobalt	D	13.9	D	2.70	ug/L	2.98		(0%-10%)		02/26/14	11:47
Copper	*MN	204	DM	48.2	ug/L	18.3*		(0%-10%)		02/26/14	13:34
Iron	M	148000	DM	37100	ug/L	25.7*		(0%-10%)			
Lead	D	23.6	D	4.34	ug/L	8.13		(0%-10%)		02/26/14	11:47
Magnesium	*M	32300	DM	7950	ug/L	23.2*		(0%-10%)		02/26/14	13:34
Manganese	*M	2190	DM	557	ug/L	27.3*		(0%-10%)			
Molybdenum	NU	-4.06	DU	1.07	ug/L	N/A		(0%-10%)			
Nickel	*MN	90.1	DM	23.3	ug/L	29.5*		(0%-10%)			
Potassium	MN	11600	DM	2840	ug/L	22.4*		(0%-10%)			
Silicon	*MN	8780	DM	1290	ug/L	26.6*		(0%-10%)			
Silver	N	5.31	D	1.08	ug/L	1.59		(0%-10%)			
Sodium	*N	1180	D	262	ug/L	10.9		(0%-10%)			
Vanadium	D	87.2	D	16.9	ug/L	2.99		(0%-10%)		02/26/14	11:47
Zinc	D	294	D	57.1	ug/L	3.07		(0%-10%)			

**Metals Analysis-Mercury**

Batch 1367115

QC1203040168	343419001	DUP									
Mercury	B	0.00926	B	0.00823	mg/kg	11.8	^	(+/-0.0127)	BCD1	02/25/14	14:29
QC1203037032	LCS										
Mercury		0.116		0.117	mg/kg			101	(80%-120%)	02/25/14	14:09
QC1203037031	MB										
Mercury			U	0.00386	mg/kg					02/25/14	14:07

# GEL LABORATORIES LLC

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

## QC Summary

**Workorder:** 343419

**Client SDG:** XP0051

**Project Description:** RC-232 Soil

**Page 8 of 8**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-Mercury</b>											
Batch	1367115										
QC1203040169	343419001	MS									
Mercury	0.128	B	0.00926	0.141	mg/kg		103	(80%-120%)	BCD1	02/25/14	14:31
QC1203040170	343419001	SDILT									
Mercury		B	0.144	DU	0.0215	ug/L	N/A	(0%-10%)		02/25/14	14:33

**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.

# Miscellaneous

# Prep Logbook

## Acid Digestion of Sediments, Sludges, and Soils

Batch ID:	1368331	Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
Analyst:	Karen Paolucci	LCS	1203039863	Metals Spike Mix I	UI1977019-01	.25	mL
Method:	SW846 3050B	LCS	1203039863	Metals Spike Mix II	UI1977022-06	.25	mL
Lab SOP:	GL-MA-E-009 REV# 22	MS	1203039865	Metals Spike Mix I	UI1977019-01	.25	mL
Instrument:	BAL-001	MS	1203039865	Metals Spike Mix II	UI1977022-06	.25	mL
		MS	1203039868	Metals Spike Mix I	UI1977019-01	.25	mL
		MS	1203039868	Metals Spike Mix II	UI1977022-06	.25	mL

Sample ID	Run Date	Matrix	Initial Weight (g)	Final Volume (mL)	Prep Factor (mL/g)
1203039862 MB	24-FEB-2014 01:00:05	Soil	0.504	50	99.20635
1203039863 LCS	24-FEB-2014 01:00:05	Soil	0.516	50	96.89922
343419001	24-FEB-2014 01:00:05	Soil	0.5	50	100
1203039864 DUP (343419001)	24-FEB-2014 01:00:05	Soil	0.519	50	96.33911
1203039865 MS (343419001)	24-FEB-2014 01:00:05	Soil	0.506	50	98.81423
1203039866 SDILT (343419001)	24-FEB-2014 01:00:05	Soil	0.5	50	100
343419002	24-FEB-2014 01:00:05	Soil	0.551	50	90.7441
343428001	24-FEB-2014 01:00:05	Solid	0.515	50	97.08738
1203039867 DUP (343428001)	24-FEB-2014 01:00:05	Solid	0.519	50	96.33911
1203039868 MS (343428001)	24-FEB-2014 01:00:05	Solid	0.519	50	96.33911
1203039869 SDILT (343428001)	24-FEB-2014 01:00:05	Solid	0.515	50	97.08738

Reagent/Solvent Lot ID	Description	Amount	Comments:
2056579	HYDROCHLORIC ACID	10 mL	Block Temperature: 92 C
2059610	Concentrated Nitric Acid	1.25 mL	Thermometer ID: 118631 Hot Block ID: 02 1st QC: Light brown, dry soil-like material. 2nd QC: Fine, grey powder with small rocks.

# Prep Logbook

## Acid Digestion of Sediments, Sludges, and Soils

Batch ID:	1368328	Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
Analyst:	Karen Paolucci	LCS	1203039855	ICP-MS spiking solution A	UI2065986-A	.25	mL
Method:	SW846 3050B	LCS	1203039855	ICP-MS spiking solution B	UI2065988-B	.25	mL
Lab SOP:	GL-MA-E-009 REV# 22	MS	1203039857	ICP-MS spiking solution A	UI2065986-A	.25	mL
Instrument:	BAL-001	MS	1203039857	ICP-MS spiking solution B	UI2065988-B	.25	mL
		MS	1203039860	ICP-MS spiking solution A	UI2065986-A	.25	mL
		MS	1203039860	ICP-MS spiking solution B	UI2065988-B	.25	mL

Sample ID	Run Date	Matrix	Initial Weight (g)	Final Volume (mL)	Prep Factor (mL/g)
1203039854 MB	24-FEB-2014 13:06:38	Soil	0.524	50	95.41985
1203039855 LCS	24-FEB-2014 13:06:38	Soil	0.51	50	98.03922
343419001	24-FEB-2014 13:06:38	Soil	0.505	50	99.0099
1203039856 DUP (343419001)	24-FEB-2014 13:06:38	Soil	0.517	50	96.7118
1203039857 MS (343419001)	24-FEB-2014 13:06:38	Soil	0.519	50	96.33911
1203039858 SDILT (343419001)	24-FEB-2014 13:06:38	Soil	0.505	50	99.0099
343419002	24-FEB-2014 13:06:38	Soil	0.522	50	95.78544
343428001	24-FEB-2014 13:06:38	Solid	0.504	50	99.20635
1203039859 DUP (343428001)	24-FEB-2014 13:06:38	Solid	0.502	50	99.60159
1203039860 MS (343428001)	24-FEB-2014 13:06:38	Solid	0.501	50	99.8004
1203039861 SDILT (343428001)	24-FEB-2014 13:06:38	Solid	0.504	50	99.20635

Reagent/Solvent Lot ID	Description	Amount	Comments:
1976094-02	Hydrogen Peroxide 30%	1.5 mL	Block Temperature: 92 C
2059610	Concentrated Nitric Acid	5 mL	Thermometer ID: 118631 Hot Block ID: 02 1st QC: Light brown, dry soil-like material. 2nd QC: Fine, grey, powder with small rocks.

# Prep Logbook

## Mercury Analysis Using the Perkin Elmer Automated Mercury Analyzer

Batch ID:	1367113	Type	Sample Id	Description	Serial Number	Spike Amount	Spike Units
Analyst:	Alan Stanley	LCS	1203037032	MHGSOILMSSPIKE	WHG140224-14	.3	mL
Method:	SW846 7471B Prep	MS	1203037034	MHGSOILMSSPIKE	WHG140224-14	.3	mL
Lab SOP:	GL-MA-E-010 REV# 27	MS	1203040169	MHGSOILMSSPIKE	WHG140224-14	.3	mL
Instrument:	Metals Manual Instrument	MS	1203040172	MHGSOILMSSPIKE	WHG140224-14	.3	mL
		MSD	1203037036	MHGSOILMSSPIKE	WHG140224-14	.3	mL

Sample ID	Run Date	Matrix	Initial Weight (g)	Final Volume (mL)	Prep Factor (mL/g)
1203037031 MB	24-FEB-2014 16:30:56	Solid	0.521	30	57.58157
1203037032 LCS	24-FEB-2014 16:30:56	Solid	0.518	30	57.91506
342973001	24-FEB-2014 16:30:56	Solid	0.544	30	55.14706
342973002	24-FEB-2014 16:30:56	Solid	0.536	30	55.97015
343051001	24-FEB-2014 16:30:56	Solid	0.509	30	58.9391
1203037034 MS (343051001)	24-FEB-2014 16:30:56	Solid	0.505	30	59.40594
1203037036 MSD (343051001)	24-FEB-2014 16:30:56	Solid	0.509	30	58.9391
1203037035 SDILT (343051001)	24-FEB-2014 16:30:56	Solid	0.509	30	58.9391
343112001	24-FEB-2014 16:30:56	Sludge	0.523	30	57.36138
343419001	24-FEB-2014 16:30:56	Soil	0.5	30	60
1203040168 DUP (343419001)	24-FEB-2014 16:30:56	Soil	0.508	30	59.05512
1203040169 MS (343419001)	24-FEB-2014 16:30:56	Soil	0.503	30	59.64215
1203040170 SDILT (343419001)	24-FEB-2014 16:30:56	Soil	0.5	30	60
343419002	24-FEB-2014 16:30:56	Soil	0.567	30	52.91005
343428001	24-FEB-2014 16:30:56	Solid	0.504	30	59.52381
1203040171 DUP (343428001)	24-FEB-2014 16:30:56	Solid	0.503	30	59.64215
1203040172 MS (343428001)	24-FEB-2014 16:30:56	Solid	0.517	30	58.02708
1203040173 SDILT (343428001)	24-FEB-2014 16:30:56	Solid	0.504	30	59.52381
343479002	24-FEB-2014 16:30:56	Soil	0.501	30	59.88024
343479003	24-FEB-2014 16:30:56	Soil	0.501	30	59.88024
343479004	24-FEB-2014 16:30:56	Soil	0.58	30	51.72414

Reagent/Solvent Lot ID	Description	Amount	Comments:
2055709-1	NITRIC ACID	.375 mL	Digestion Start Date: 18-FEB-2014 16:30
2058346-A	Hydrochloric Acid Conc.	1.125 mL	Digestion End Date: 18-FEB-2014 17:00
			Block Temperature: 95 C

# Prep Logbook

Sample ID	Run Date	Matrix	Initial Weight (g)	Final Volume (mL)	Prep Factor (mL/g)
<b>Reagent/Solvent Lot ID</b>	<b>Description</b>	<b>Amount</b>	<b>Comments:</b>		
2071784-C	5% KMnO4 solution	7.5 mL	Thermometer ID: 119629		
2072331-C	Hg reducing agent	2 mL	Hot Block ID: 7		
WHG140224-07	Mercury Working Standard 1st Source CAL S 0.2/CRA	30 uL	The first QC was a paint chip and soil like material. The second QC was a brown soil like material. The third QC was a grey pebble and sand like material.		
WHG140224-08	Mercury Working Standard 1st Source CAL S 0.5	75 uL			
WHG140224-09	Mercury Working 1st Source CAL S 2.0	300 uL			
WHG140224-10	Mercury Working 1st Source CAL S 5.0/CCV	750 uL			
WHG140224-11	Mercury Working 1st Source CAL S 10.0	1500 uL			
WHG140224-12	Mercury Working 2nd Source S 5.0/ICV	750 uL			