

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

**COMPLETE COPY OF VALIDATION PACKAGE TO:**

Kathy Wendt

H4-21

KW 6/9/14  
INITIAL/DATE

**COMMENTS:**

**SDG X0045**

**SAF-RC-232**

**Sample Location: 100-D-75:2**

Date: 2 June 2014  
To: Washington Closure Hanford Inc. (technical representative)  
From: ELR Consulting  
Project: 100-IU-2 & 100-IU-6 Remaining Waste Sites – Soil Full Protocol - Waste Site 100-D-75:2  
Subject: Inorganic - Data Package No. X0045-GEL

## **INTRODUCTION**

This memo presents the results of data validation on Data Package No. X0045 prepared by GEL Laboratories (GEL). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analyte</b>
J1T349	5/8/14	Soil	C	See note 1
J1T350	5/8/14	Soil	C	See note 1
J1T351	5/8/14	Soil	C	See note 1
J1T352	5/8/14	Soil	C	See note 1
J1T353	5/8/14	Soil	C	See note 1
J1T354	5/8/14	Soil	C	See note 1

1 – Metals by 6010C & mercury by 7471B.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL-96-22, September 2009). Appendices 1 through 6 provide the following information as indicated below:

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

## **DATA QUALITY PARAMETERS**

### **Holding Times**

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

All holding times were acceptable.

## **Preparation (Method) Blanks**

### Preparation Blanks

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

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

All preparation blank results were acceptable.

### Field (Equipment) Blank

One field blank (J1T354) was submitted for analysis. Thirteen analytes were detected in the field blank. Under the WCH statement of work, no qualification is required.

## **Accuracy**

### Matrix Spike and Laboratory Control Sample

Matrix spike (MS) and laboratory control sample (LCS) analyses are used to assess the analytical accuracy of the reported data. The matrix spike is used to assess the effect of the matrix on the ability to accurately quantify sample concentrations. Recoveries must fall within the range of 75% to 125%. Samples with a recovery of less than 30% and a sample result below the IDL are rejected and flagged "UR". Samples with a recovery of 30% to 74% and a sample result less than the IDL are qualified "UJ". Samples with a recovery of greater than 125% or less than 74% and a sample result greater than the IDL are qualified as estimates and flagged "J". Finally, for samples with a recovery greater than 125% and a sample result less than the IDL, no qualification is required.

Due to matrix spike recoveries outside QC limits, all potassium (133%), sodium (159%) and zinc (153%) results were qualified as estimates and flagged "J".

All other accuracy results were acceptable.

## **Precision**

### Laboratory Duplicate Samples

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

Due to RPDs outside QC limits all aluminum (33.6%), antimony (61.8%), barium (51.3%), calcium (51.3%), chromium (35.7%), cobalt (50.6%), copper (48.5%), iron (48%), magnesium (44.4%), manganese (51.4%), silicon (32.2%), vanadium (55.7%) and zinc (32.8%) results were qualified as estimates and flagged "J".

All other laboratory duplicate results were acceptable.

### Field Duplicate

One set of field duplicates (J1T351/J1T353) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. The RPDs for barium (52.4%), calcium (49.3%), iron (32.2%), lead (56.9%), sodium (45.3%) and vanadium (38.2%) were outside QC limits. Under the WCH statement of work, no qualification is required. All other field duplicates were acceptable.

## **Analytical Detection Levels**

Reported analytical detection levels are compared against the 100 Area RQLs to ensure that laboratory detection levels meet the required criteria. All results met the RQL.

## **Completeness**

Data package No. X0045 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

## **MAJOR DEFICIENCIES**

None found.

## MINOR DEFICIENCIES

The following minor deficiencies were noted:

- Due to matrix spike recoveries outside QC limits, all potassium (133%), sodium (159%) and zinc (153%) results were qualified as estimates and flagged "J".
- Due to RPDs outside QC limits all aluminum (33.6%), antimony (61.8%), barium (51.3%), calcium (51.3%), chromium (35.7%), cobalt (50.6%), copper (48.5%), iron (48%), magnesium (44.4%), manganese (51.4%), silicon (32.2%), vanadium (55.7%) and zinc (32.8%) results were qualified as estimates and flagged "J".

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

## REFERENCES

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

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, September 2009.

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

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

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

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

INORGANICS DATA QUALIFICATION SUMMARY\*

SDG: X0045	REVIEWER: ELR	Project: 100-D-75:2	PAGE <u>1</u> OF <u>1</u>
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Potassium Sodium zinc	J	All	MS recovery
Aluminum antimony barium calcium chromium cobalt copper iron magnesium manganese silicon vanadium zinc	J	All	RPD

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

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

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 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: X0045

Client Sample ID: J1T349  
 Sample ID: 348427001  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:50  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.77%

Project: WCHN00213  
 Client ID: WCHN001

✓ 5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Mercury Analysis-CVAA</b>											
SW846 7471B Mercury in Solid "Dry Weight Corrected"											
Mercury	B	0.00701	0.00398	0.0119	mg/kg	1	NOR1	05/21/14	1153	1389189	1
<b>Metals Analysis-ICP</b>											
ICP METALS 6010TR Close-out List "Dry Weight Corrected"											
Aluminum	J	5900	6.06	17.8	mg/kg	1	JWJ	05/27/14	1059	1387429	2
Antimony	J	3.08	0.294	0.891	mg/kg	1					
Barium	J	86.0	0.0891	0.446	mg/kg	1					
Beryllium		0.802	0.0891	0.446	mg/kg	1					
Boron	B	2.97	0.891	4.46	mg/kg	1					
Cadmium		0.788	0.0891	0.446	mg/kg	1					
Calcium	J	4900	7.13	22.3	mg/kg	1					
Chromium	J	8.36	0.134	0.446	mg/kg	1					
Cobalt	J	13.3	0.134	0.446	mg/kg	1					
Copper	J	20.4	0.267	0.891	mg/kg	1					
Iron	J	21900	7.13	22.3	mg/kg	1					
Lead	J	11.7	0.294	0.891	mg/kg	1					
Magnesium	J	4010	7.58	26.7	mg/kg	1					
Manganese	J	339	0.178	0.891	mg/kg	1					
Molybdenum		1.02	0.178	0.891	mg/kg	1					
Nickel	J	9.66	0.134	0.446	mg/kg	1					
Potassium	*N J	1290	5.71	22.3	mg/kg	1					
Silicon	J	1260	1.34	8.91	mg/kg	1					
Sodium	*N J	284	6.24	22.3	mg/kg	1					
Vanadium	*N J	67.5	0.0891	0.446	mg/kg	1					
Zinc	*N J	140	0.357	0.891	mg/kg	1					
Arsenic	DU	4.46	4.46	26.7	mg/kg	10	JWJ	05/27/14	1302	1387429	3
Silver	DU	0.891	0.891	4.46	mg/kg	10					
<b>Metals Analysis-ICP-MS</b>											
SW846 3050B/6020A Selenium "Dry Weight Corrected"											
Selenium	DU	0.325	0.325	1.00	mg/kg	2	SKJ	05/22/14	1641	1390099	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	ICP-MS 3050BS PREP	JXM5	05/22/14	0730	1390098
SW846 3050B	ICP-MS 3050BS PREP	KXP3	05/16/14	1000	1387287
SW846 3050B	SW846 3050B Prep for 6010C	KXP3	05/16/14	1000	1387428

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 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: X0045

Client Sample ID: J1T350  
 Sample ID: 348427002  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:57  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.17%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Mercury Analysis-CVAA</b>											
SW846 7471B Mercury in Solid "Dry Weight Corrected"											
Mercury	B	0.00441	0.00405	0.0121	mg/kg	1	NOR1	05/21/14	1202	1389189	1
<b>Metals Analysis-ICP</b>											
ICP METALS 6010TR Close-out List "Dry Weight Corrected"											
Aluminum	*	6460	6.37	18.7	mg/kg	1	JWJ	05/27/14	1112	1387429	2
Antimony	*	3.64	0.309	0.937	mg/kg	1					
Barium	*	75.1	0.0937	0.468	mg/kg	1					
Beryllium	*	0.907	0.0937	0.468	mg/kg	1					
Boron	B	1.65	0.937	4.68	mg/kg	1					
Cadmium	*	0.991	0.0937	0.468	mg/kg	1					
Calcium	*	6220	7.49	23.4	mg/kg	1					
Chromium	*	8.12	0.141	0.468	mg/kg	1					
Cobalt	*	15.3	0.141	0.468	mg/kg	1					
Copper	*	20.1	0.281	0.937	mg/kg	1					
Iron	*	24100	7.49	23.4	mg/kg	1					
Lead	*	10.7	0.309	0.937	mg/kg	1					
Magnesium	*	4960	7.96	28.1	mg/kg	1					
Manganese	*	326	0.187	0.937	mg/kg	1					
Molybdenum	*	1.12	0.187	0.937	mg/kg	1					
Nickel	*	11.7	0.141	0.468	mg/kg	1					
Potassium	*N	1550	6.00	23.4	mg/kg	1					
Silicon	*	1370	1.41	9.37	mg/kg	1					
Sodium	*N	307	6.56	23.4	mg/kg	1					
Vanadium	*N	73.8	0.0937	0.468	mg/kg	1					
Zinc	*N	78.9	0.375	0.937	mg/kg	1					
Arsenic	DU	4.68	4.68	28.1	mg/kg	10	JWJ	05/27/14	1314	1387429	3
Silver	DU	0.937	0.937	4.68	mg/kg	10					
<b>Metals Analysis-ICP-MS</b>											
SW846 3050B/6020A Selenium "Dry Weight Corrected"											
Selenium	DU	0.313	0.313	1.00	mg/kg	2	SKJ	05/22/14	1711	1390099	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	ICP-MS 3050BS PREP	JXM5	05/22/14	0730	1390098
SW846 3050B	ICP-MS 3050BS PREP	KXP3	05/16/14	1000	1387287
SW846 3050B	SW846 3050B Prep for 6010C	KXP3	05/16/14	1000	1387428

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 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: X0045

Client Sample ID: J1T351  
 Sample ID: 348427003  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 3.85%

Project: WCHN00213  
 Client ID: WCHN001

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Mercury Analysis-CVAA</b>											
SW846 7471B Mercury in Solid "Dry Weight Corrected"											
Mercury		0.0145	0.0038	0.0113	mg/kg	1	NORI	05/21/14	1203	1389189	1
<b>Metals Analysis-ICP</b>											
ICP METALS 6010TR Close-out List "Dry Weight Corrected"											
Aluminum	*	3420	6.02	17.7	mg/kg	1	JWJ	05/27/14	1120	1387429	2
Antimony	*	1.33	0.292	0.886	mg/kg	1					
Arsenic	U	0.443	0.443	2.66	mg/kg	1					
Barium	*	39.0	0.0886	0.443	mg/kg	1					
Beryllium	B	0.345	0.0886	0.443	mg/kg	1					
Boron	B	2.05	0.886	4.43	mg/kg	1					
Cadmium	B	0.386	0.0886	0.443	mg/kg	1					
Calcium	*	2380	7.09	22.1	mg/kg	1					
Chromium	*	6.10	0.133	0.443	mg/kg	1					
Cobalt	*	6.76	0.133	0.443	mg/kg	1					
Copper	*	21.3	0.266	0.886	mg/kg	1					
Iron	*	11700	7.09	22.1	mg/kg	1					
Lead	*	46.9	0.292	0.886	mg/kg	1					
Magnesium	*	2370	7.53	26.6	mg/kg	1					
Manganese	*	181	0.177	0.886	mg/kg	1					
Molybdenum	B	0.569	0.177	0.886	mg/kg	1					
Nickel	*	6.59	0.133	0.443	mg/kg	1					
Potassium	*N	589	5.67	22.1	mg/kg	1					
Silicon	*	1090	1.33	8.86	mg/kg	1					
Sodium	*N	208	6.20	22.1	mg/kg	1					
Vanadium	*N	32.1	0.0886	0.443	mg/kg	1					
Zinc	*N	63.6	0.354	0.886	mg/kg	1					
Silver	DU	0.886	0.886	4.43	mg/kg	10	JWJ	05/27/14	1317	1387429	3
<b>Metals Analysis-ICP-MS</b>											
SW846 3050B/6020A Selenium "Dry Weight Corrected"											
Selenium	DU	0.306	0.306	1.00	mg/kg	2	SKJ	05/22/14	1715	1390099	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	ICP-MS 3050BS PREP	JXM5	05/22/14	0730	1390098
SW846 3050B	ICP-MS 3050BS PREP	KXP3	05/16/14	1000	1387287
SW846 3050B	SW846 3050B Prep for 6010C	KXP3	05/16/14	1000	1387428

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 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: X0045

Client Sample ID: J1T352  
 Sample ID: 348427004  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:40  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.08%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Mercury Analysis-CVAA</b>											
SW846 7471B Mercury in Solid "Dry Weight Corrected"											
Mercury		0.0238	0.00378	0.0113	mg/kg	1	NOR1	05/21/14	1205	1389189	1
<b>Metals Analysis-ICP</b>											
ICP METALS 6010TR Close-out List "Dry Weight Corrected"											
Aluminum	*J	4480	6.66	19.6	mg/kg	1	JWJ	05/27/14	1123	1387429	2
Antimony	*J	1.52	0.323	0.980	mg/kg	1					
Arsenic	U	0.490	0.490	2.94	mg/kg	1					
Barium	*J	54.0	0.098	0.490	mg/kg	1					
Beryllium		0.517	0.098	0.490	mg/kg	1					
Boron	B	3.23	0.980	4.90	mg/kg	1					
Cadmium		0.643	0.098	0.490	mg/kg	1					
Calcium	*J	3860	7.84	24.5	mg/kg	1					
Chromium	*J	5.07	0.147	0.490	mg/kg	1					
Cobalt	*J	10.9	0.147	0.490	mg/kg	1					
Copper	*J	24.0	0.294	0.980	mg/kg	1					
Iron	*J	15600	7.84	24.5	mg/kg	1					
Lead	*	89.2	0.323	0.980	mg/kg	1					
Magnesium	*J	5250	8.33	29.4	mg/kg	1					
Manganese	*J	245	0.196	0.980	mg/kg	1					
Molybdenum	B	0.609	0.196	0.980	mg/kg	1					
Nickel	*	11.8	0.147	0.490	mg/kg	1					
Potassium	*NJ	873	6.27	24.5	mg/kg	1					
Silicon	*J	917	1.47	9.80	mg/kg	1					
Sodium	*NJ	380	6.86	24.5	mg/kg	1					
Vanadium	*NJ	32.4	0.098	0.490	mg/kg	1					
Zinc	*NJ	125	0.392	0.980	mg/kg	1					
Silver	DU	0.980	0.980	4.90	mg/kg	10	JWJ	05/27/14	1326	1387429	3
<b>Metals Analysis-ICP-MS</b>											
SW846 3050B/6020A Selenium "Dry Weight Corrected"											
Selenium	DU	0.310	0.310	1.00	mg/kg	2	SKJ	05/22/14	1718	1390099	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	ICP-MS 3050BS PREP	JXM5	05/22/14	0730	1390098
SW846 3050B	ICP-MS 3050BS PREP	KXP3	05/16/14	1000	1387287
SW846 3050B	SW846 3050B Prep for 6010C	KXP3	05/16/14	1000	1387428

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 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: X0045

Client Sample ID: J1T353  
 Sample ID: 348427005  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.91%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Mercury Analysis-CVAA</b>											
SW846 7471B Mercury in Solid "Dry Weight Corrected"											
Mercury	U	0.00414	0.00414	0.0124	mg/kg	1	NOR1	05/21/14	1207	1389189	1
<b>Metals Analysis-ICP</b>											
ICP METALS 6010TR Close-out List "Dry Weight Corrected"											
Aluminum	J	3810	6.76	19.9	mg/kg	1	JWJ	05/27/14	1125	1387429	2
Antimony	J	2.53	0.328	0.994	mg/kg	1					
Barium	J	66.7	0.0994	0.497	mg/kg	1					
Beryllium		0.540	0.0994	0.497	mg/kg	1					
Boron	B	1.67	0.994	4.97	mg/kg	1					
Cadmium		0.598	0.0994	0.497	mg/kg	1					
Calcium	J	3940	7.95	24.9	mg/kg	1					
Chromium	J	4.30	0.149	0.497	mg/kg	1					
Cobalt	J	8.52	0.149	0.497	mg/kg	1					
Copper	J	17.8	0.298	0.994	mg/kg	1					
Iron	J	16200	7.95	24.9	mg/kg	1					
Lead	J	26.1	0.328	0.994	mg/kg	1					
Magnesium	J	2260	8.45	29.8	mg/kg	1					
Manganese	J	181	0.199	0.994	mg/kg	1					
Molybdenum	B	0.770	0.199	0.994	mg/kg	1					
Nickel	J	5.58	0.149	0.497	mg/kg	1					
Potassium	*N J	844	6.36	24.9	mg/kg	1					
Silicon	J	1130	1.49	9.94	mg/kg	1					
Sodium	*N J	330	6.96	24.9	mg/kg	1					
Vanadium	*N J	47.3	0.0994	0.497	mg/kg	1					
Zinc	*N J	51.4	0.398	0.994	mg/kg	1					
Arsenic	DU	4.97	4.97	29.8	mg/kg	10	JWJ	05/27/14	1329	1387429	3
Silver	DU	0.994	0.994	4.97	mg/kg	10					
<b>Metals Analysis-ICP-MS</b>											
SW846 3050B/6020A Selenium "Dry Weight Corrected"											
Selenium	DU	0.319	0.319	1.00	mg/kg	2	SKJ	05/22/14	1722	1390099	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	ICP-MS 3050BS PREP	JXM5	05/22/14	0730	1390098
SW846 3050B	ICP-MS 3050BS PREP	KXP3	05/16/14	1000	1387287
SW846 3050B	SW846 3050B Prep for 6010C	KXP3	05/16/14	1000	1387428



**Appendix 4**

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

**Metals Fractional Narrative  
WC-HANFORD, INC. (WCHN)  
SDG X0045**

**Sample Analysis**

<b>Sample ID</b>	<b>Client ID</b>
348427001	J1T349
348427002	J1T350
348427003	J1T351
348427004	J1T352
348427005	J1T353
348427006	J1T354
1203087187	Method Blank (MB) ICP
1203087188	Laboratory Control Sample (LCS)
1203087194	348427001(J1T349L) Serial Dilution (SD)
1203087192	348427001(J1T349D) Sample Duplicate (DUP)
1203087193	348427001(J1T349S) Matrix Spike (MS)
1203096618	348427001(J1T349PS) Post Spike (PS)
1203093991	Method Blank (MB) ICP-MS
1203093992	Laboratory Control Sample (LCS)
1203093995	348427001(J1T349L) Serial Dilution (SD)
1203093993	348427001(J1T349D) Sample Duplicate (DUP)
1203093994	348427001(J1T349S) Matrix Spike (MS)
1203091619	Method Blank (MB) CVAA
1203091620	Laboratory Control Sample (LCS)
1203091623	348427001(J1T349L) Serial Dilution (SD)
1203091621	348427001(J1T349D) Sample Duplicate (DUP)
1203091622	348427001(J1T349S) Matrix Spike (MS)

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

**Method/Analysis Information**

**Analytical Batch:** 1387429, 1390099 and 1389189

**Prep Batch :** 1387428, 1390098 and 1389186  
**Standard Operating Procedures:** GL-MA-E-013 REV# 22, GL-MA-E-009 REV# 23, GL-MA-E-014 REV# 25 and GL-MA-E-010 REV# 27  
**Analytical Method:** SW846 3050B/6010C, SW846 3050B/6020A and SW846 7471B  
**Prep Method :** SW846 3050B and SW846 7471B Prep

#### **Preparation/Analytical Method Verification**

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

#### **System Configuration**

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

The Metals analysis - ICPMS was performed on a Perkin Elmer ELAN DRC-e 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, and dynamic reaction cell. The DRC-e uses a dynamic reaction cell to eliminate polyatomic interferences. 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 3607 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/PQL Requirements**

All PQL standards for 6010C met the control limits with the exception of the analytes

listed below. The sample concentrations were less than the MDL or greater than 2x the PQL, so the data is not adversely affected. The PQL recovered high for lead, antimony, and potassium for samples 348427001 (J1T349), 348427002 (J1T350), 348427003 (J1T351), 348427004 (J1T352) and 348427005 (J1T353)-ICP. For antimony, the initial PQL passed within the limits. The closing PQL (PQL03) analyzed after the batch was 2.2% higher than the 130% control limits. Samples 348427003 and 348427004 were affect. The data may be biased 2% high at the low level concentration.

**ICSA/ICSAB Statement**

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

**Continuing Calibration Blanks (CCB) Requirements**

All continuing calibration blanks(CCB) bracketing this SDG met the 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: 348427001 (J1T349)-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 matrix spike recovery failed outside of the control limits for potassium, sodium, vanadium, and zinc. 1203087193 (J1T349)-ICP.

**Duplicate Relative Percent Difference (RPD) Statement**

The 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 RL, a control of RL is used to evaluate the DUP results. The sample and sample duplicate % RPD failed outside the control limits for sodium, barium, copper, aluminum, antimony, calcium, chromium, cobalt, iron, lead, magnesium, manganese, nickel, potassium, silicon, vanadium and zinc. 1203087192 (J1T349)-ICP.

**Post Spike (PS) Recovery Statement**

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

**Serial Dilution % Difference Statement**

The serial dilution is used to assess matrix suppression or enhancement. Raw element concentrations 25x the IDL/MDL for CVAA, 50X the IDL/MDL for ICP and 100X the IDL/MDL for ICP-MS analyses are applicable for serial dilution assessment. All applicable analytes met the established acceptance percent difference criteria.

**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 required dilutions in order to minimize suppression due to matrix interferences. Samples were diluted in order to bring raw values within the linear range of the instrument, and for the analytes interfered with, in order to ensure that the inter-element correction factors were valid. These samples were suppressed for silver and arsenic. 348427001 (J1T349), 348427002 (J1T350), 348427003 (J1T351), 348427004 (J1T352), 348427005 (J1T353) and 348427006 (J1T354)-ICP. The ICPMS solid samples in this SDG were diluted the standard two times. ICP-MS.

**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 reports are included in the Miscellaneous Data section of the package. A data exception report was not required for this SDG. The following DER was generated for this SDG: 1297409.

**Additional Comments**

Additional comments were not required for this SDG.

**Certification Statement**

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

**Review Validation:**

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

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

**Reviewer:** \_\_\_\_\_ **Date:** \_\_\_\_\_

DATA EXCEPTION REPORT			
<b>Mo.Day Yr.</b> 27-MAY-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> 1387429	<b>Sample Numbers:</b> See Below		
<b>Potentially affected work order(s)(SDG):</b> 348423(X0044),348427(X0045),348428(X0046)			
<b>Application Issues:</b> Failed RPD for DUP Failed Recovery for MS/PS			
<b>Specification and Requirements Exception Description:</b>		<b>DER Disposition:</b>	
<p>1. Failed Recovery for MS/PS:</p> <p style="padding-left: 20px;">QC 1203087190MS,1203087193MS, 1203087196MS</p> <p>2. Failed RPD for DUP:</p> <p style="padding-left: 20px;">QC 1203087189DUP, 1203087192DUP, 1203087195DUP</p> <p>3. Closing PQL failure (PQL03)</p>		<p>1. The matrix spike recovery failed outside of the control limits for silicon, barium, potassium, sodium, vanadium, zinc, molybdenum, nickel, selenium, silver, tin, arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, lead and antimony. The post spike passed the required control limits for all analytes. This verifies the absence of a matrix interference. 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 sodium, barium, copper, aluminum, antimony, calcium, chromium, cobalt, iron, lead, magnesium, manganese, nickel, potassium, silicon, vanadium and zinc 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>3. The initial PQL passed within the limits for antimony. The closing PQL (PQL03) analyzed after the batch was 2.2% higher than the 130% control limits. Samples 348427003, 348427004, 348428001, and 348428002 were affect. The data may be biased 2% high at the low level concentration.</p>	

**Originator's Name:**  
Jerry Wigfall      27-MAY-14

**Data Validator/Group Leader:**  
Jamie Johnson      27-MAY-14

342401

**Washington Closure Hanford**      **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**      RC-232-061      Page 1 of 2

Collector <i>vs. Sexsmith</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code	Data Turnaround
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	SAF No. RC-232	<i>15 day</i>		
Ice Chest No. <i>RCC-07-011</i>	Field Logbook No. EL-1667-01	COA C10D72A000			
Shipped To GEL Laboratories Charleston	Offsite Property No. <i>A131100</i>	Method of Shipment Commercial Carrier <i>Fed Ex</i>			
Other Labs Shipped To		Bill of Lading/Air Bill No. <i>See ASPC</i>			

POSSIBLE SAMPLE HAZARDS/REMARKS None  Special Handling and/or Storage Cool 4C	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C						
	Type of Container	G/P	aG	aG	aG						
	No. of Container(s)	1	1	1	1						
	Volume	125mL	125mL	125mL	125mL						
Sample Analysis	See item (1) in Special Instructions	TPH-Diesel Range - WTPH-D	PCBs - 8082	PAHs - 8310							

Sample No.	Matrix	Sample Date	Sample Time								
J1T349	SOIL	<i>05/08/14</i>	<i>0850</i>	X	X	X	X				
J1T350	SOIL	<i>05/08/14</i>	<i>0857</i>	X	X	X	X				
J1T351	SOIL	<i>05/08/14</i>	<i>0910</i>	X	X	X	X				
J1T352	SOIL	<i>05/08/14</i>	<i>0940</i>	X	X	X	X				
J1T353	SOIL	<i>05/08/14</i>	<i>0910</i>	X	X	X	X				

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From <i>[Signature]</i>	Date/Time <i>1035</i>	Received By/Stored In <i>[Signature]</i>	Date/Time <i>1035</i>
Relinquished By/Removed From <i>[Signature]</i>	Date/Time <i>1205</i>	Received By/Stored In <i>[Signature]</i>	Date/Time <i>1205</i>
Relinquished By/Removed From <i>[Signature]</i>	Date/Time <i>05/08/14</i>	Received By/Stored In <i>[Signature]</i>	Date/Time <i>05/08/14</i>
Relinquished By/Removed From <i>[Signature]</i>	Date/Time <i>5/8/14 1326</i>	Received By/Stored In <i>[Signature]</i>	Date/Time <i>0930</i>
Relinquished By/Removed From <i>[Signature]</i>	Date/Time	Received By/Stored In <i>[Signature]</i>	Date/Time <i>05/09/14</i>
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

**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)



FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time
WCH-EE-011			

23

<b>Washington Closure Hanford</b>		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>			RC-232-061	Page 2 of 2
Collector <i>W. S. Smith</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code <i>15 day</i>	Data Turnaround	
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	SAF No. RC-232				
Ice Chest No. <i>RC-07-011</i>	Field Logbook No. EL-1667-01	COA C10D72A000	Method of Shipment Commerical Carrier <i>FedEx</i>			
Shipped To GEL Laboratories Charlston	Offsite Property No. <i>A131100</i>	Bill of Lading/Air Bill No. <i>582 ASPC</i>				

Other Labs Shipped To  <i>N/A</i>	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C								
	Type of Container	G/P	aG	aG	aG								
	No. of Container(s)	1	1	1	1								
	Volume	125mL	125mL	125mL	125mL								
	Sample Analysis	See Item (1) in Special Instructions	TPH-Diesel Range - WTPH-D +	PCBs - 8062	PAHs - 6310								

POSSIBLE SAMPLE HAZARDS/REMARKS <i>None</i>												
Special Handling and/or Storage <i>Cool 4C</i>												
Sample No.	Matrix	Sample Date	Sample Time									
J1T354	SOIL	<i>05/08/14</i>	<i>0902</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>					
J1T355	SOIL	<i>DWShea 5/8/14</i>										
J1T356	SOIL											
J1T357	SOIL											
J1T358	SOIL											

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From <i>W. S. Smith</i>	Date/Time <i>5/8/14 1035</i>	Received By/Stored In <i>S. Martinez</i>	Date/Time <i>5/8/14 1035</i>
Relinquished By/Removed From <i>S. Martinez</i>	Date/Time <i>5/8/14 1205</i>	Received By/Stored In <i>DWShea</i>	Date/Time <i>5/8/14 1205</i>
Relinquished By/Removed From <i>DWShea</i>	Date/Time <i>5/8/14 1326</i>	Received By/Stored In <i>FedEx</i>	Date/Time <i>5/9/14 0930</i>
Relinquished By/Removed From <i>FedEx</i>	Date/Time <i>5/9/14 0930</i>	Received By/Stored In <i>P. West</i>	Date/Time <i>5/9/14 0930</i>
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

**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)

*20051414*

REVIEWED BY  
*SM S*

DATE  
*5/8/14*

24

WCH-EE-011

---

**Appendix 5**  
**Data Validation Supporting Documentation**

**INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT:	100P-75:2		DATA PACKAGE: X0045		
VALIDATOR:	ELK	LAB: TAC	DATE: 5/31/14		
			SDG: X0045		
ANALYSES PERFORMED					
<b>SW-846/ICP</b>	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide		
SAMPLES/MATRIX					
JIT349		JIT350	JIT351	JIT352	
JIT353		JIT354			
Soil					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present? ..... Yes  No  N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

Initial calibrations performed on all instruments? ..... Yes No  N/A

Initial calibrations acceptable? ..... Yes No  N/A

ICP interference checks acceptable? ..... Yes No  N/A

ICV and CCV checks performed on all instruments? ..... Yes No  N/A

ICV and CCV checks acceptable? ..... Yes No  N/A

Standards traceable? ..... Yes No  N/A

Standards expired? ..... Yes No  N/A

Calculation check acceptable? ..... Yes No  N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**

**3. BLANKS (Levels B, C, D, and E)**

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

FB 13 detected

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

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

Comments: MS - potassium (133%) Na (159%) zinc (153%)  
- J all detected

no PAs

**INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**

**5. PRECISION (Levels C, D, and E)**

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

Comments: RPD - <sup>analy</sup>al, barium, calcium, chromium, cobalt  
Copper, Iron, Mg, Mn, K, silicon, Vanadium, zinc - J all

FD - barium (52.4%) calcium (45.3%) Fe (32.2%)  
lead (56.9%) Ni (45.3%) Vanadium (38.2%)

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

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

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**

**7. FURNACE AA QUALITY CONTROL (Levels D and E)**

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**INORGANIC ANALYSIS DATA VALIDATION CHECKLIST**

**9. RESULT QUANTITATION AND DETECTION LIMITS (all levels)**

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Appendix 6**

**Additional Documentation Requested by Client**

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

**QC Summary**

Report Date: May 27, 2014

Page 1 of 8

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

Contact:

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Paramname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1390099										
QC1203093993	348427001	DUP									
Selenium		DU	0.325	DU	0.328	mg/kg	N/A		SKJ	05/22/14	16:44
QC1203093992	LCS										
Selenium	4.97		D	4.40	mg/kg		88.5	(80%-120%)		05/22/14	16:29
QC1203093991	MB										
Selenium			DU	0.325	mg/kg					05/22/14	16:26
QC1203093994	348427001	MS									
Selenium	5.06	DU	0.325	D	4.30	mg/kg		83.9 (75%-125%)		05/22/14	16:48
QC1203093995	348427001	SD/ILT									
Selenium		DU	0.286	DU	1.62	ug/L	N/A	(0%-10%)		05/22/14	16:56
<b>Metals Analysis-ICP</b>											
Batch	1387429										
QC1203087192	348427001	DUP									
Aluminum		*	5900	*	4200	mg/kg	33.6*	(0%-20%)	JWJ	05/27/14	11:01
Antimony		*	3.08	*	1.62	mg/kg	61.8*^	(+/-0.959)			
Arsenic		DU	4.46	DU	4.79	mg/kg	N/A			05/27/14	13:05
Barium		*	86.0	*	50.9	mg/kg	51.3*	(0%-20%)		05/27/14	11:01
Beryllium			0.802		0.499	mg/kg	46.6 ^	(+/-0.479)			
Boron		B	2.97	B	2.23	mg/kg	28.6 ^	(+/-4.79)			
Cadmium			0.788	B	0.477	mg/kg	49.3 ^	(+/-0.479)			
Calcium		*	4900	*	2900	mg/kg	51.3*	(0%-20%)			
Chromium		*	8.36	*	5.83	mg/kg	35.7*	(0%-20%)			
Cobalt		*	13.3	*	7.93	mg/kg	50.6*	(0%-20%)			
Copper		*	20.4	*	12.4	mg/kg	48.5*	(0%-20%)			
Iron		*	21900	*	13400	mg/kg	48.0*	(0%-20%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 2 of 8

Paramname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1387429										
Lead	*	11.7	*	7.85	mg/kg	39.3*		(0%-20%)	JWJ	05/27/14	11:01
Magnesium	*	4010	*	2550	mg/kg	44.4*		(0%-20%)			
Manganese	*	339	*	200	mg/kg	51.4*		(0%-20%)			
Molybdenum		1.02	B	0.626	mg/kg	48.1	^	(+/-0.959)			
Nickel	*	9.66	*	6.50	mg/kg	39.1*		(0%-20%)			
Potassium	*N	1290	*	837	mg/kg	42.8*		(0%-20%)			
Silicon	*	1260	*	1750	mg/kg	32.2*		(0%-20%)			
Silver	DU	0.891	DU	0.959	mg/kg	N/A				05/27/14	13:05
Sodium	*N	284	*	227	mg/kg	22.5*		(0%-20%)		05/27/14	11:01
Vanadium	*N	67.5	*	38.1	mg/kg	55.7*		(0%-20%)			
Zinc	*N	140	*	101	mg/kg	32.8*		(0%-20%)			
QC1203087188 LCS											
Aluminum		467		467	mg/kg	99.9		(80%-120%)		05/27/14	10:25
Antimony		46.7		46.8	mg/kg	100		(80%-120%)			
Arsenic		46.7		46.6	mg/kg	99.8		(80%-120%)			
Barium		46.7		47.9	mg/kg	103		(80%-120%)			
Beryllium		46.7		49.2	mg/kg	105		(80%-120%)			
Boron		46.7		48.4	mg/kg	103		(80%-120%)			
Cadmium		46.7		48.5	mg/kg	104		(80%-120%)			
Calcium		467		466	mg/kg	99.7		(80%-120%)			
Chromium		46.7		48.0	mg/kg	103		(80%-120%)			
Cobalt		46.7		47.2	mg/kg	101		(80%-120%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 3 of 8

Paramname	NOM	Sample Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis-ICP									
Batch	1387429								
Copper	46.7		48.5	mg/kg		104	(80%-120%)	JWJ	05/27/14 10:25
Iron	46.7		46.5	mg/kg		99.6	(80%-120%)		
Lead	46.7		48.1	mg/kg		103	(80%-120%)		
Magnesium	46.7		48.0	mg/kg		103	(80%-120%)		
Manganese	46.7		48.2	mg/kg		103	(80%-120%)		
Molybdenum	46.7		47.4	mg/kg		101	(80%-120%)		
Nickel	46.7		47.7	mg/kg		102	(80%-120%)		
Potassium	46.7		49.8	mg/kg		107	(80%-120%)		
Silicon	46.7		44.2	mg/kg		94.5	(80%-120%)		
Silver	46.7		48.0	mg/kg		103	(80%-120%)		
Sodium	46.7		48.2	mg/kg		103	(80%-120%)		
Vanadium	46.7		49.2	mg/kg		105	(80%-120%)		
Zinc	46.7		49.7	mg/kg		106	(80%-120%)		
QC1203087187 MB									
Aluminum		U	6.09	mg/kg					05/27/14 10:22
Antimony		U	0.296	mg/kg					
Arsenic		U	0.448	mg/kg					
Barium		U	0.0896	mg/kg					
Beryllium		U	0.0896	mg/kg					
Boron		U	0.896	mg/kg					
Cadmium		U	0.0896	mg/kg					
Calcium		U	7.17	mg/kg					

# GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 558-8171 - www.gel.com

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 4 of 8

Paramname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1387429										
Chromium			U	0.134	mg/kg				JWJ	05/27/14	10:22
Cobalt			U	0.134	mg/kg						
Copper			U	0.269	mg/kg						
Iron			U	7.17	mg/kg						
Lead			U	0.296	mg/kg						
Magnesium			U	7.62	mg/kg						
Manganese			U	0.179	mg/kg						
Molybdenum			U	0.179	mg/kg						
Nickel			U	0.134	mg/kg						
Potassium			U	5.73	mg/kg						
Silicon			U	1.34	mg/kg						
Silver			U	0.0896	mg/kg						
Sodium			U	6.27	mg/kg						
Vanadium			U	0.0896	mg/kg						
Zinc			U	0.358	mg/kg						
QC1203087193 348427001 MS											
Aluminum	482	*	5900	8450	mg/kg		N/A	(75%-125%)		05/27/14	11:04
Antimony	48.2	*	3.08	44.4	mg/kg		85.7	(75%-125%)			
Arsenic	48.2	DU	4.46 D	42.1	mg/kg		87.4	(75%-125%)		05/27/14	13:08
Barium	48.2	*	86.0	135	mg/kg		101	(75%-125%)		05/27/14	11:04
Beryllium	48.2		0.802	48.7	mg/kg		99.5	(75%-125%)			
Boron	48.2	B	2.97	49.9	mg/kg		97.4	(75%-125%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 5 of 8

Paramname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anist	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1387429										
Cadmium	48.2		0.788	46.5	mg/kg		94.9	(75%-125%)	JWJ	05/27/14	11:04
Calcium	482	*	4900	6620	mg/kg		N/A	(75%-125%)			
Chromium	48.2	*	8.36	56.4	mg/kg		99.7	(75%-125%)			
Cobalt	48.2	*	13.3	60.8	mg/kg		98.5	(75%-125%)			
Copper	48.2	*	20.4	73.1	mg/kg		109	(75%-125%)			
Iron	482	*	21900	26200	mg/kg		N/A	(75%-125%)			
Lead	48.2	*	11.7	58.4	mg/kg		96.8	(75%-125%)			
Magnesium	482	*	4010	5350	mg/kg		N/A	(75%-125%)			
Manganese	48.2	*	339	405	mg/kg		N/A	(75%-125%)			
Molybdenum	48.2		1.02	47.6	mg/kg		96.6	(75%-125%)			
Nickel	48.2	*	9.66	56.4	mg/kg		97	(75%-125%)			
Potassium	482	*N	1290 N	1940	mg/kg		133*	(75%-125%)			
Silicon	482	*	1260	1650	mg/kg		80.1	(75%-125%)			
Silver	48.2	DU	0.891 D	45.9	mg/kg		95.1	(75%-125%)		05/27/14	13:08
Sodium	482	*N	284 N	1050	mg/kg		159*	(75%-125%)		05/27/14	11:04
Vanadium	48.2	*N	67.5 N	129	mg/kg		128*	(75%-125%)			
Zinc	48.2	*N	140 N	214	mg/kg		153*	(75%-125%)			
QC1203096618 348427001 PS											
Potassium	5000	*N	14500	19100	ug/L		91.3	(80%-120%)		05/27/14	11:10
Sodium	5000	*N	3190	7980	ug/L		95.8	(80%-120%)			
Vanadium	500	*N	757	1260	ug/L		102	(80%-120%)			
Zinc	500	*N	1570	2040	ug/L		93.3	(80%-120%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 6 of 8

Paramname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1387429										
QC1203087194 348427001 SDILT											
Aluminum	*	66200	D	14100	ug/L	6.79		(0%-10%)	JWJ	05/27/14	11:07
Antimony	*	34.5	D	8.97	ug/L	29.9		(0%-10%)			
Arsenic	DU	-0.117	DU	22.3	ug/L	N/A		(0%-10%)		05/27/14	13:11
Barium	*	964	D	203	ug/L	5.03		(0%-10%)		05/27/14	11:07
Beryllium		9.00	D	1.96	ug/L	8.68		(0%-10%)			
Boron	B	33.3	D	11.0	ug/L	65.3		(0%-10%)			
Cadmium		8.84	D	1.91	ug/L	8.07		(0%-10%)			
Calcium	*	55000	D	11600	ug/L	5.84		(0%-10%)			
Chromium	*	93.8	D	20.0	ug/L	6.44		(0%-10%)			
Cobalt	*	149	D	31.1	ug/L	4.36		(0%-10%)			
Copper	*	229	D	45.8	ug/L	.173		(0%-10%)			
Iron	*	246000	D	52000	ug/L	5.81		(0%-10%)			
Lead	*	131	D	28.1	ug/L	7.15		(0%-10%)			
Magnesium	*	44900	D	9530	ug/L	6.06		(0%-10%)			
Manganese	*	3810	D	807	ug/L	6.07		(0%-10%)			
Molybdenum		11.5	D	2.40	ug/L	4.54		(0%-10%)			
Nickel	*	108	D	22.6	ug/L	4.15		(0%-10%)			
Potassium	*N	14500	D	3000	ug/L	3.27		(0%-10%)			
Silicon	*	14100	D	2930	ug/L	3.6		(0%-10%)			
Silver	DU	-1.54	DU	4.46	ug/L	N/A		(0%-10%)		05/27/14	13:11
Sodium	*N	3190	D	605	ug/L	5.13		(0%-10%)		05/27/14	11:07

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 7 of 8

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1387429										
Vanadium	*N	757	D	157	ug/L	3.61		(0%-10%)	JWJ	05/27/14	11:07
Zinc	*N	1570	D	326	ug/L	3.78		(0%-10%)			
<b>Metals Analysis-Mercury</b>											
Batch	1389189										
QC1203091621	348427001	DUP									
Mercury	B	0.00701	B	0.0116	mg/kg	49.6	^	(+/-0.0119)	NOR1	05/21/14	11:55
QC1203091620	LCS	0.116									
Mercury				0.111	mg/kg			96.1	(80%-120%)		05/21/14 11:52
QC1203091619	MB	U									
Mercury				0.00393	mg/kg						05/21/14 11:44
QC1203091622	348427001	MS									
Mercury	0.122	B	0.00701	0.121	mg/kg			93	(80%-120%)		05/21/14 11:57
QC1203091623	348427001	SDILT									
Mercury	B	0.118	DU	0.0199	ug/L	N/A		(0%-10%)			05/21/14 11:58

**Notes:**

The Qualifiers in this report are defined as follows:

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

Date: 2 June 2014  
 To: Washington Closure Hanford Inc. (technical representative)  
 From: ELR Consulting  
 Project: 100-IU-2 & 100-IU-6 Remaining Waste Sites – Soil Full Protocol - Waste Site  
 100-D-75:2  
 Subject: PCB - Data Package No. X0045-GEL

**INTRODUCTION**

This memo presents the results of data validation on Data Package No. X0045 prepared by GEL Laboratories (GEL). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analyte
J1T349	5/8/14	Soil	C	See note 1
J1T350	5/8/14	Soil	C	See note 1
J1T351	5/8/14	Soil	C	See note 1
J1T352	5/8/14	Soil	C	See note 1
J1T353	5/8/14	Soil	C	See note 1

1 – PCBS by 8082A.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL-96-22, September 2009). Appendices 1 through 6 provide the following information as indicated below:

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

**DATA QUALITY OBJECTIVES**

**· Holding Times**

Holding times are not applicable for PCB analysis.

**· Method Blanks**

Method blank analyses are conducted to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No

contaminants should be present in the method blank. Analytical results for analytes present in any sample at less than five times the concentration of that analyte found in the associated blank are qualified as non-detects and flagged "U". Common laboratory contaminants present in samples at less than ten times the concentration of that analyte found in the associated blank are qualified as non-detects. If a sample result is less than the CRQL and is less than five times (or less than ten times for lab contaminants) the highest associated blank result, the sample result value is raised to the CRQL level and qualified as undetected "U".

All method blank results were acceptable.

#### Field (equipment) Blanks

No field blanks were submitted for analysis.

### **Accuracy**

#### Matrix Spike/Matrix Spike Duplicate & Blank Spike Recoveries

Matrix spike/matrix spike duplicate analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike/matrix spike duplicate analyses are performed in duplicate using five compounds for which percent recoveries must be within a range of 50-150% or within laboratory control limits. If spike recoveries are outside control limits, detected sample results less than five times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries below control limits are qualified as estimates and flagged "UJ". Undetected sample results are not qualified if the spike recovery is above control limits. Sample results greater than five times the spike concentration require no qualification.

All accuracy results were acceptable.

#### Surrogate Recovery

The analyses of surrogate compounds provide a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program. If two surrogates of the same class of compounds (base/neutral or acid) are out of control limits, all associated sample results greater than the contract required quantitation limit (CRQL) are qualified as estimates and flagged "J". Sample results less than the CRQL and below the lower control limit are qualified as estimates and flagged "UJ". Sample results less than the CRQL with recoveries above the upper control limit require no qualification. If a surrogate recovery is less than 10%, detects are qualified as estimates and flagged "J" and nondetects are rejected and flagged "UR".

All surrogate results were acceptable.

## **Precision**

### Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike (MS)/matrix spike duplicate (MSD) results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. Samples results must be within RPD limits of +/-30%. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated detected sample results are qualified as estimates and flagged "J". If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All duplicate results were acceptable.

### Field Duplicate Samples

One set of field duplicates (J1T351/J1T353) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. All field duplicates were acceptable.

## **Analytical Detection Levels**

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

## **Completeness**

Data package No. X0045 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

## **MAJOR DEFICIENCIES**

None found.

## **MINOR DEFICIENCIES**

None found.

## **REFERENCES**

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

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, September 2009.

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

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

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

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

PCB DATA QUALIFICATION SUMMARY\*

<b>SDG: X0045</b>	<b>REVIEWER: ELR</b>	<b>Project: 100-D-75:2</b>	<b>PAGE <u>1</u> OF <u>1</u></b>
<b>COMMENTS: No qualifiers assigned</b>			

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

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



# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 21, 2014

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

Client SDG: X0045

Client Sample ID: J1T350  
 Sample ID: 348427002  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:57  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.17%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

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	U	1.11	1.11	3.32	ug/kg	1	YS1	05/20/14	0834	1388936	1
Aroclor-1221	U	1.11	1.11	3.32	ug/kg	1					
Aroclor-1232	U	1.11	1.11	3.32	ug/kg	1					
Aroclor-1242	U	1.11	1.11	3.32	ug/kg	1					
Aroclor-1248	U	1.11	1.11	3.32	ug/kg	1					
Aroclor-1254	U	1.11	1.11	3.32	ug/kg	1					
Aroclor-1260	JT	2.69	1.11	3.32	ug/kg	1	YS1	05/20/14	0834	1388936	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/15/14	0930	1387921
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/19/14	1055	1388935

The following Analytical Methods were performed:

Method	Description	Analyst	Comments
1	SW846 3541/8082A		
2	SW846 3541/8082A		

Surrogate/Tracer	Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decachlorobiphenyl		SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.59 ug/kg	6.65	84.0	(35%-119%)
4cmx		SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.22 ug/kg	6.65	78.4	(44%-106%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 21, 2014

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

Client SDG: X0045

Client Sample ID: J1T351  
 Sample ID: 348427003  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 3.85%

Project: WCHN00213  
 Client ID: WCHN001

K 5/31/14

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	U	1.15	1.15	3.46	ug/kg	1	YS1	05/20/14	0847	1388936	1
Aroclor-1221	U	1.15	1.15	3.46	ug/kg	1					
Aroclor-1232	U	1.15	1.15	3.46	ug/kg	1					
Aroclor-1242	U	1.15	1.15	3.46	ug/kg	1					
Aroclor-1248	U	1.15	1.15	3.46	ug/kg	1					
Aroclor-1254	U	1.15	1.15	3.46	ug/kg	1					
Aroclor-1260	T	7.82	1.15	3.46	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/15/14	0930	1387921
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/19/14	1055	1388935

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"	4.85 ug/kg	6.91	70.1	(44%-106%)
Decachlorobiphenyl	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.90 ug/kg	6.91	85.4	(35%-119%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 21, 2014

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

Client SDG: X0045

Client Sample ID: J1T352  
 Sample ID: 348427004  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:40  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.08%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

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	U	1.13	1.13	3.38	ug/kg	1	YS1	05/20/14	0901	1388936	1
Aroclor-1221	U	1.13	1.13	3.38	ug/kg	1					
Aroclor-1232	U	1.13	1.13	3.38	ug/kg	1					
Aroclor-1242	U	1.13	1.13	3.38	ug/kg	1					
Aroclor-1248	U	1.13	1.13	3.38	ug/kg	1					
Aroclor-1254	U	1.13	1.13	3.38	ug/kg	1					
Aroclor-1260	T	26.2	1.13	3.38	ug/kg	1					

**The following Prep Methods were performed:**

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/15/14	0930	1387921
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/19/14	1055	1388935

**The following Analytical Methods were performed:**

Method	Description	Analyst Comments
1	SW846 3541/8082A	
2	SW846 3541/8082A	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decachlorobiphenyl	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.71 ug/kg	6.77	84.3	(35%-119%)
4cmx	SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	4.78 ug/kg	6.77	70.6	(44%-106%)

**Notes:**

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 558-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 21, 2014

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

Client SDG: X0045

Client Sample ID: J1T353  
 Sample ID: 348427005  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.91%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

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	U	1.14	1.14	3.42	ug/kg	1	YSI	05/20/14	0941	1388936	1
Aroclor-1221	U	1.14	1.14	3.42	ug/kg	1					
Aroclor-1232	U	1.14	1.14	3.42	ug/kg	1					
Aroclor-1242	U	1.14	1.14	3.42	ug/kg	1					
Aroclor-1248	U	1.14	1.14	3.42	ug/kg	1					
Aroclor-1254	U	1.14	1.14	3.42	ug/kg	1					
Aroclor-1260	T	11.2	1.14	3.42	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/15/14	0930	1387921
SW846 3541	Prep Method 3541 PCB Prep Soil	CXR2	05/19/14	1055	1388935

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3541/8082A	
2	SW846 3541/8082A	

Surrogate/Tracer	Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decachlorobiphenyl		SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	5.91 ug/kg	6.84	86.4	(35%-119%)
4cmx		SW846 3541/8082A PCB Solid Automated Soxhlet "Dry Weight Corrected"	4.77 ug/kg	6.84	69.8	(44%-106%)

Notes:

**Appendix 4**  
**Laboratory Narrative and Chain-of-Custody Documentation**

**PCB Case Narrative  
WC-HANFORD, INC. (WCHN)  
SDG X0045**

**Method/Analysis Information**

**Procedure:** Analysis of Polychlorinated Biphenyls by ECD  
**Analytical Method:** SW846 3541/8082A  
**Prep Method:** SW846 3541  
**Analytical Batch Number:** 1388936  
**Prep Batch Number:** 1388935

**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>
348427001	J1T349
348427002	J1T350
348427003	J1T351
348427004	J1T352
348427005	J1T353
1203091001	Method Blank (MB)
1203091002	Laboratory Control Sample (LCS)
1203091003	348427004(J1T352) Matrix Spike (MS)
1203091004	348427004(J1T352) 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 348427004 (J1T352) was selected for the matrix spike and matrix spike duplicate analysis.

**Matrix Spike (MS) Recovery Statement**

The MS recoveries for this SDG were within the established acceptance limits on the reporting column.

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

The MSD recoveries for this SDG were within the established acceptance limits on the reporting column.

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

The RPD between the MS and MSD met the acceptance limits on the reporting column.

**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**

The samples in this SDG did not require dilutions.

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

All samples in this SDG were extracted and analyzed twice due to quality issue in the first analysis. The second analysis was reported.

**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. A DER was not required for the samples in this SDG in this batch.

**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 higher results from either column have been chosen and reported in the data package for the client samples, MB and LCS. The data reported for the MS and MSD are from the same analytical column as the parent sample.

Due to software issue, the surrogate recovery range was not indicated or possibly indicated incorrectly 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:

Instrument ID	Instrument	System Configuration	Column ID	Column Description
ECD9A.I_1	Agilent 7890A Gas Chromatograph/Dual ECD w/ 7693 Autosampler	7890A GC/ECD	Restek Rtx-CLPest 1	30m x 0.25mm, 0.25um
ECD9A.I_2	Agilent 7890A Gas Chromatograph/Dual ECD w/ 7693 Autosampler	7890A GC/ECD	Restek Rtx-CLPest 2	30m x 0.25mm, 0.20um

**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.

34841

**Washington Closure Hanford**      **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**      RC-232-061      Page 1 of 2

Collector <i>US S&amp;S Smith</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code	Data Turnaround
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	SAF No. RC-232		15 days	
Ice Chest No. RCC-07-c11	Field Logbook No. EL-1667-01	COA C10D72A000	Method of Shipment Commerical Carrier <i>Fed Ex</i>		
Shipped To GEL Laboratories Charlston	Offsite Property No. A131100	Bill of Lading/Air Bill No. <i>See ASPC</i>			

Other Labs Shipped To  <i>n/a</i>	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C				
	Type of Container	G/P	aG	aG	aG				

POSSIBLE SAMPLE HAZARDS/REMARKS  None	No. of Container(s)	1	1	1	1				
	Volume	125mL	125mL	125mL	125mL				
	Sample Analysis	See item (1) in Special Instructions	TPH-Classes Range - WTPH-D +	PCBs - 8082	PAHs - 8310				
	Special Handling and/or Storage <i>Cool 4C</i>								

Sample No.	Matrix	Sample Date	Sample Time						
J1T349	SOIL	05/08/14	0850	X	X	X	X		
J1T350	SOIL	05/08/14	0857	X	X	X	X		
J1T351	SOIL	05/08/14	0910	X	X	X	X		
J1T352	SOIL	05/08/14	0940	X	X	X	X		
J1T353	SOIL	05/08/14	0910	X	X	X	X		

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From <i>Shirley I. Smith</i>	Date/Time 1035	Received By/Stored In <i>Christina Z...</i>	Date/Time 1035
Relinquished By/Removed From <i>Shirley I. Smith</i>	Date/Time 1305	Received By/Stored In <i>BWShea</i>	Date/Time 1205
Relinquished By/Removed From <i>BWShea</i>	Date/Time 1326	Received By/Stored In <i>Fed Ex</i>	Date/Time 0930
Relinquished By/Removed From <i>P. Dent</i>	Date/Time	Received By/Stored In <i>P. Dent</i>	Date/Time 050914
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

**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)

REVIEWED BY  
*8115*

---

DATE  
*5/8/14*

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time
WCH-EE-011			

20

Washington Closure Hanford		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				RC-232-061		Page 2 of 2	
Collector <i>W. S. Smith</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH		Price Code <i>15 day</i>	Data Turnaround			
Project Designation 100-IU-2 & 100-IU-5 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	Field Logbook No. EL-1667-01	COA C10D72A000		SAF No. RC-232				
Ice Chest No. <i>RCC-07-011</i>	Offsite Property No. <i>A131100</i>	Method of Shipment Commercial Carrier <i>FedEx</i>		Bill of Lading/Air Bill No. <i>See ASPC</i>					
Shipped To GEL Laboratories Charleston	Other Labs Shipped To <i>N/A</i>								
POSSIBLE SAMPLE HAZARDS/REMARKS  None	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C				
	Type of Container	GP	gG	gG	gG				
	No. of Container(s)	1	1	1	1				
	Volume	125mL	125mL	125mL	125mL				
	Sample Analysis	See item (1) in Special Instructions	TPH-Diesel Range - WTPH-D +	PCBs - 8082	PAHs - 8310				
Special Handling and/or Storage Cool 4C									
Sample No.	Matrix	Sample Date	Sample Time						
J1T354	SOIL	<i>05/08/14</i>	<i>0902</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>		
J1T355	SOIL	<i>DWShea 5/8/14</i>							
J1T356	SOIL								
J1T357	SOIL								
J1T358	SOIL								
CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS					
Relinquished By/Removed From <i>W. S. Smith</i>	Date/Time <i>1035 5/8/14</i>	Received By/Stored In <i>C. Martinecz</i>	Date/Time <i>1035 05/08/14</i>	(1) ICP Metals - 8010TR (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)					
Relinquished By/Removed From <i>C. Martinecz</i>	Date/Time <i>1205 05/08/14</i>	Received By/Stored In <i>DWShea</i>	Date/Time <i>1205 5/8/14</i>						
Relinquished By/Removed From <i>DWShea</i>	Date/Time <i>1326 5/8/14</i>	Received By/Stored In <i>FedEx</i>	Date/Time <i>0930 5-9-14</i>						
Relinquished By/Removed From <i>FedEx</i>	Date/Time	Received By/Stored In <i>P. Vent</i>	Date/Time <i>0930 5-9-14</i>						
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time						
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; display: inline-block;"> REVIEWED BY <i>SMS</i> DATE <i>5/8/14</i> </div>					
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time						
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time						
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time						
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time						
WCH-EE-011									

21

**Appendix 5**  
**Data Validation Supporting Documentation**

**PCB DATA VALIDATION CHECKLIST**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT:	100-D-7512		DATA PACKAGE: X0045		
VALIDATOR:	ELR	LAB:	TAL	DATE: 5/31/14	
			SDG:	X0045	
ANALYSES PERFORMED					
SW-846 8081	SW-846 8081 (TCLP)	SW-846 8082	SW-846 8081 (TCLP)		
SAMPLES/MATRIX					
J11349 J11350 J11351 J11352 J11353					
Soil					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present? ..... Yes  No  N/A

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

Initial calibrations acceptable? ..... Yes No  N/A  
 Continuing calibrations acceptable? ..... Yes No  N/A  
 Standards traceable? ..... Yes No  N/A  
 Standards expired? ..... Yes No  N/A  
 Calculation check acceptable? ..... Yes No  N/A  
 DDT and endrin breakdowns acceptable? ..... Yes No  N/A

Comments: \_\_\_\_\_  
 \_\_\_\_\_

PCB DATA VALIDATION CHECKLIST

3. BLANKS (Levels B, C, D, and E)

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

Comments: no FR  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
no PA

**PCB DATA VALIDATION CHECKLIST**

**5. PRECISION (Levels C, D, and E)**

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**6. SYSTEM PERFORMANCE (Levels D and E)**

- Chromatographic performance acceptable? .....  Yes  No  N/A
- Positive results resolved acceptably? .....  Yes  No  N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**PCB DATA VALIDATION CHECKLIST**

**8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)**

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

**9. SAMPLE CLEANUP (Levels D and E)**

Fluorilil ® (or other absorbent) cleanup performed? ..... Yes No N/A  
Lot check performed? ..... Yes No N/A  
Check recoveries acceptable? ..... Yes No N/A  
GPC cleanup performed? ..... Yes No N/A  
GPC check performed? ..... Yes No N/A  
GPC check recoveries acceptable? ..... Yes No N/A  
GPC calibration performed? ..... Yes No N/A  
GPC calibration check performed? ..... Yes No N/A  
GPC calibration check retention times acceptable? ..... Yes No N/A  
Check/calibration materials traceable? ..... Yes No N/A  
Check/calibration materials Expired? ..... Yes No N/A  
Analytical batch QC given similar cleanup? ..... Yes No N/A  
Transcription/Calculation Errors? ..... Yes No N/A  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Appendix 6**  
**Additional Documentation Requested by Client**

**QC Summary**

Report Date: May 21, 2014

Page 1 of 2

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

Contact: Joan Kessner

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatiles-PCB</b>											
Batch	1388936										
QC1203091002	LCS										
Aroclor-1016	33.1			25.3	ug/kg		76.5	(39%-120%)	YS1	05/20/14	08:11
Aroclor-1260	33.1			28.7	ug/kg		86.8	(50%-116%)			
**4cmx	6.62			4.93	ug/kg		74.5	(44%-106%)			
**Decachlorobiphenyl	6.62			5.79	ug/kg		87.5	(35%-119%)			
QC1203091001	MB										
Aroclor-1016			U	1.09	ug/kg					05/20/14	08:00
Aroclor-1221			U	1.09	ug/kg						
Aroclor-1232			U	1.09	ug/kg						
Aroclor-1242			U	1.09	ug/kg						
Aroclor-1248			U	1.09	ug/kg						
Aroclor-1254			U	1.09	ug/kg						
Aroclor-1260			U	1.09	ug/kg						
**4cmx	6.56			4.70	ug/kg		71.7	(44%-106%)			
**Decachlorobiphenyl	6.56			5.60	ug/kg		85.3	(35%-119%)			
QC1203091003	348427004	MS									
Aroclor-1016	34.0	U	1.13	25.3	ug/kg		74.2	(25%-125%)		05/20/14	09:14
Aroclor-1260	34.0	T	26.2	52.5	ug/kg		77.2	(28%-127%)			
**4cmx	6.80		4.78	4.71	ug/kg		69.2	(44%-106%)			
**Decachlorobiphenyl	6.80		5.71	5.39	ug/kg		79.3	(35%-119%)			
QC1203091004	348427004	MSD									
Aroclor-1016	34.0	U	1.13	26.1	ug/kg	3.25	76.7	(0%-30%)		05/20/14	09:27

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427      Client SDG: X0045      Project Description: RC-232 Soil      Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-PCB											
Batch	1388936										
Aroclor-1260	34.0	T	26.2	62.2	ug/kg	17.0	106	(0%-30%)			
**4cmx	6.80		4.78	4.80	ug/kg		70.5	(44%-106%)	YS1	05/20/14	09:27
**Decachlorobiphenyl	6.80		5.71	5.46	ug/kg		80.3	(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 or %RPD not applicable.  
 ^ 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.

Date: 2 June 2014  
 To: Washington Closure Hanford Inc. (technical representative)  
 From: ELR Consulting  
 Project: 100-IU-2 & 100-IU-6 Remaining Waste Sites – Soil Full Protocol - Waste Site 100-D-75:2  
 Subject: Polyaromatic Hydrocarbon - Data Package No. X0045-GEL

**INTRODUCTION**

This memo presents the results of data validation on Data Package No. X0045 prepared by GEL Laboratories (GEL). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation	Analyte
J1T349	5/8/14	Soil	C	See note 1
J1T350	5/8/14	Soil	C	See note 1
J1T351	5/8/14	Soil	C	See note 1
J1T352	5/8/14	Soil	C	See note 1
J1T353	5/8/14	Soil	C	See note 1
J1T354	5/8/14	Soil	C	See note 1

1 – Polyaromatic Hydrocarbons by 3550B.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL-96-22, September 2009). Appendices 1 through 6 provide the following information as indicated below:

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

**DATA QUALITY OBJECTIVES**

**Holding Times**

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Analytes must be extracted within 14 days of the date of sample collection and analyzed within 40 days from the date of extraction.

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

detects. If holding times are exceeded by greater than two times the limit, all associated detectable sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

All holding times were acceptable.

### **Method Blanks**

Method blank analyses are conducted to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. Analytical results for analytes present in any sample at less than five times the concentration of that analyte found in the associated blank are qualified as non-detects and flagged "U". Common laboratory contaminants present in samples at less than ten times the concentration of that analyte found in the associated blank are qualified as non-detects. If a sample result is less than the CRQL and is less than five times (or less than ten times for lab contaminants) the highest associated blank result, the sample result value is raised to the CRQL level and qualified as undetected "U".

All method blank results were acceptable.

### Field (equipment) Blanks

One field blank (J1T354) was submitted for analysis. No analytes were detected in the field blank.

### **Accuracy**

#### Matrix Spike/Matrix Spike Duplicate & Blank Spike Recoveries

Matrix spike/matrix spike duplicate analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike/matrix spike duplicate analyses are performed in duplicate using five compounds for which percent recoveries must be within a range of 50-150% or within laboratory control limits. If spike recoveries are outside control limits, detected sample results less than five times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries below control limits are qualified as estimates and flagged "UJ". Undetected sample results are not qualified if the spike recovery is above control limits. Sample results greater than five times the spike concentration require no qualification.

All accuracy results were acceptable.

### Surrogate Recovery

The analyses of surrogate compounds provide a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program. If two surrogates of the same class of compounds (base/neutral or acid) are out of control limits, all associated sample results greater than the contract required quantitation limit (CRQL) are qualified as estimates and flagged "J". Sample results less than the CRQL and below the lower control limit are qualified as estimates and flagged "UJ". Sample results less than the CRQL with recoveries above the upper control limit require no qualification. If a surrogate recovery is less than 10%, detects are qualified as estimates and flagged "J" and nondetects are rejected and flagged "UR".

All surrogate results were acceptable.

### **Precision**

#### Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike (MS)/matrix spike duplicate (MSD) results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. Samples results must be within RPD limits of +/-30%. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated detected sample results are qualified as estimates and flagged "J". If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All duplicate results were acceptable.

#### Field Duplicate Samples

One set of field duplicates (J1T351/J1T353) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. All field duplicates were acceptable.

### **Analytical Detection Levels**

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

### **Completeness**

Data package No. X0045 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

None found.

### **REFERENCES**

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

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, September 2009.

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

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

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

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

POLYAROMATIC HYDROCARBON DATA QUALIFICATION SUMMARY\*

<b>SDG: X0045</b>	<b>REVIEWER:</b> <b>ELR</b>	<b>Project: 100-D-75:2</b>	<b>PAGE <u>1</u> OF <u>1</u></b>
<b>COMMENTS: No qualifiers assigned</b>			

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

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

# GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 558-8171 - www.gel.com

## Certificate of Analysis

Report Date: May 24, 2014

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

Client SDG: X0045

Client Sample ID: J1T349  
 Sample ID: 348427001  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:50  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.77%

Project: WCHN00213  
 Client ID: WCHN001

K 5/31/14

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	5.09	5.09	17.0	ug/kg	1	CWW	05/20/14	1556	1387954	1
Acenaphthylene	U	5.09	5.09	17.0	ug/kg	1					
Anthracene	U	1.70	1.70	17.0	ug/kg	1					
Benzo(a)anthracene	U	0.543	0.543	1.70	ug/kg	1					
Benzo(a)pyrene		4.84	0.543	1.70	ug/kg	1					
Benzo(b)fluoranthene		16.9	0.543	1.70	ug/kg	1					
Benzo(ghi)perylene		4.83	0.543	1.70	ug/kg	1					
Benzo(k)fluoranthene		8.86	0.271	0.848	ug/kg	1					
Chrysene		20.0	0.543	1.70	ug/kg	1					
Dibenzo(a,h)anthracene	J	0.812	0.543	1.70	ug/kg	1					
Fluoranthene		37.9	0.543	1.70	ug/kg	1					
Fluorene	U	5.09	5.09	17.0	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.543	0.543	1.70	ug/kg	1					
Naphthalene	U	5.09	5.09	17.0	ug/kg	1					
Phenanthrene	J	16.3	5.09	17.0	ug/kg	1					
Pyrene		33.6	0.543	1.70	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	05/19/14	1810	1387951

The following Analytical Methods were performed:

Method	Description	Analyst Comments
I	SW846 8310	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decafluorobiphenyl	8310/3550 PAH Std list Soil "Dry Weight Corrected"	5460 ug/kg	8480	64.4	(23%-104%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 24, 2014

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

Client SDG: X0045

Client Sample ID: J1T350  
 Sample ID: 348427002  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:57  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.17%

Project: WCHN00213  
 Client ID: WCHN001

K 5/31/14

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	5.05	5.05	16.8	ug/kg	1	CWW	05/20/14	1721	1387954	1
Acenaphthylene	U	5.05	5.05	16.8	ug/kg	1					
Anthracene	U	1.68	1.68	16.8	ug/kg	1					
Benzo(a)anthracene	U	0.539	0.539	1.68	ug/kg	1					
Benzo(a)pyrene	J	1.46	0.539	1.68	ug/kg	1					
Benzo(b)fluoranthene		4.91	0.539	1.68	ug/kg	1					
Benzo(ghi)perylene	U	0.539	0.539	1.68	ug/kg	1					
Benzo(k)fluoranthene		2.60	0.269	0.842	ug/kg	1					
Chrysene		5.82	0.539	1.68	ug/kg	1					
Dibenzo(a,h)anthracene	U	0.539	0.539	1.68	ug/kg	1					
Fluoranthene		11.6	0.539	1.68	ug/kg	1					
Fluorene	U	5.05	5.05	16.8	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.539	0.539	1.68	ug/kg	1					
Naphthalene	U	5.05	5.05	16.8	ug/kg	1					
Phenanthrene	J	8.60	5.05	16.8	ug/kg	1					
Pyrene		10.2	0.539	1.68	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	AXVI	05/19/14	1810	1387951

The following Analytical Methods were performed:

Method	Description	Analyst Comments			
I	SW846 8310				
Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decafluorobiphenyl	8310/3550 PAH Std list Soil "Dry Weight Corrected"	5940 ug/kg	8420	70.5	(23%-104%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 24, 2014

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

Client SDG: X0045

Client Sample ID: J1T351  
 Sample ID: 348427003  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 3.85%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>HPLC-PAH</b>											
8310/3550 PAH Std list Soil "Dry Weight Corrected"											
Acenaphthene	U	5.18	5.18	17.3	ug/kg	1	CWW	05/20/14	2009	1387954	1
Acenaphthylene	U	5.18	5.18	17.3	ug/kg	1					
Anthracene	U	1.73	1.73	17.3	ug/kg	1					
Benzo(a)anthracene	U	0.552	0.552	1.73	ug/kg	1					
Benzo(a)pyrene	J	1.28	0.552	1.73	ug/kg	1					
Benzo(b)fluoranthene		2.52	0.552	1.73	ug/kg	1					
Benzo(ghi)perylene	U	0.552	0.552	1.73	ug/kg	1					
Benzo(k)fluoranthene	U	0.276	0.276	0.863	ug/kg	1					
Chrysene		2.42	0.552	1.73	ug/kg	1					
Dibenzo(a,h)anthracene	U	0.552	0.552	1.73	ug/kg	1					
Fluoranthene		4.38	0.552	1.73	ug/kg	1					
Fluorene	U	5.18	5.18	17.3	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.552	0.552	1.73	ug/kg	1					
Naphthalene	U	5.18	5.18	17.3	ug/kg	1					
Phenanthrene	U	5.18	5.18	17.3	ug/kg	1					
Pyrene		5.60	0.552	1.73	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	AXVI	05/19/14	1810	1387951

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"	5780 ug/kg	8630	67.0	(23%-104%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 24, 2014

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

Client SDG: X0045

Client Sample ID: J1T352  
 Sample ID: 348427004  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:40  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.08%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

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	5.10	5.10	17.0	ug/kg	1	CWW	05/20/14	2216	1387954	1
Acenaphthylene	U	5.10	5.10	17.0	ug/kg	1					
Anthracene	U	1.70	1.70	17.0	ug/kg	1					
Benzo(a)anthracene		5.98	0.544	1.70	ug/kg	1					
Benzo(a)pyrene		3.30	0.544	1.70	ug/kg	1					
Benzo(b)fluoranthene		5.55	0.544	1.70	ug/kg	1					
Benzo(ghi)perylene		2.54	0.544	1.70	ug/kg	1					
Benzo(k)fluoranthene	U	0.272	0.272	0.849	ug/kg	1					
Chrysene		5.07	0.544	1.70	ug/kg	1					
Dibenzo(a,h)anthracene	U	0.544	0.544	1.70	ug/kg	1					
Fluoranthene	U	0.544	0.544	1.70	ug/kg	1					
Fluorene	U	5.10	5.10	17.0	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.544	0.544	1.70	ug/kg	1					
Naphthalene	U	5.10	5.10	17.0	ug/kg	1					
Phenanthrene	J	8.61	5.10	17.0	ug/kg	1					
Pyrene	U	0.544	0.544	1.70	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	05/19/14	1810	1387951

The following Analytical Methods were performed:

Method	Description	Analyst Comments
I	SW846 8310	

Surrogate/Tracer	Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decafluorobiphenyl		8310/3550 PAH Std list Soil "Dry Weight Corrected"	5300 ug/kg	8490	62.4	(23%-104%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 24, 2014

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

Client SDG: X0045

Client Sample ID: J1T353  
 Sample ID: 348427005  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.91%

Project: WCHN00213  
 Client ID: WCHN001

✓ 5/31/14

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	5.13	5.13	17.1	ug/kg	1	CWW	05/20/14	2258	1387954	1
Acenaphthylene	U	5.13	5.13	17.1	ug/kg	1					
Anthracene	U	1.71	1.71	17.1	ug/kg	1					
Benzo(a)anthracene	U	0.547	0.547	1.71	ug/kg	1					
Benzo(a)pyrene		2.21	0.547	1.71	ug/kg	1					
Benzo(b)fluoranthene		7.07	0.547	1.71	ug/kg	1					
Benzo(ghi)perylene	U	0.547	0.547	1.71	ug/kg	1					
Benzo(k)fluoranthene		3.60	0.274	0.855	ug/kg	1					
Chrysene		11.5	0.547	1.71	ug/kg	1					
Dibenzo(a,h)anthracene	U	0.547	0.547	1.71	ug/kg	1					
Fluoranthene		29.9	0.547	1.71	ug/kg	1					
Fluorene	U	5.13	5.13	17.1	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.547	0.547	1.71	ug/kg	1					
Naphthalene	U	5.13	5.13	17.1	ug/kg	1					
Phenanthrene		39.0	5.13	17.1	ug/kg	1					
Pyrene		26.7	0.547	1.71	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	AXVI	05/19/14	1810	1387951

The following Analytical Methods were performed:

Method	Description	Analyst Comments
I	SW846 8310	

Surrogate/Tracer	Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Decafluorobiphenyl		8310/3550 PAH Std list Soil "Dry Weight Corrected"	5690 ug/kg	8550	66.6	(23%-104%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 24, 2014

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

Client SDG: X0045

Client Sample ID: J1T354  
 Sample ID: 348427006  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:02  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: <0.1%

Project: WCHN00213  
 Client ID: WCHN001

✓ 5/31/14

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	4.99	4.99	16.6	ug/kg	1	CWW	05/20/14	2340	1387954	1
Acenaphthylene	U	4.99	4.99	16.6	ug/kg	1					
Anthracene	U	1.66	1.66	16.6	ug/kg	1					
Benzo(a)anthracene	U	0.533	0.533	1.66	ug/kg	1					
Benzo(a)pyrene	U	0.533	0.533	1.66	ug/kg	1					
Benzo(b)fluoranthene	U	0.533	0.533	1.66	ug/kg	1					
Benzo(ghi)perylene	U	0.533	0.533	1.66	ug/kg	1					
Benzo(k)fluoranthene	U	0.266	0.266	0.832	ug/kg	1					
Chrysene	U	0.533	0.533	1.66	ug/kg	1					
Dibenzo(a,h)anthracene	U	0.533	0.533	1.66	ug/kg	1					
Fluoranthene	U	0.533	0.533	1.66	ug/kg	1					
Fluorene	U	4.99	4.99	16.6	ug/kg	1					
Indeno(1,2,3-cd)pyrene	U	0.533	0.533	1.66	ug/kg	1					
Naphthalene	U	4.99	4.99	16.6	ug/kg	1					
Phenanthrene	U	4.99	4.99	16.6	ug/kg	1					
Pyrene	U	0.533	0.533	1.66	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	05/19/14	1810	1387951

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"	6830 ug/kg	8320	82.1	(23%-104%)

Notes:

**Appendix 4**  
**Laboratory Narrative and Chain-of-Custody Documentation**

HPLC-PAH  
WC-HANFORD, INC. (WCHN)  
SDG X0045

**Method/Analysis Information**

**Procedure:** Polynuclear Aromatic Hydrocarbons  
**Analytical Method:** SW846 8310  
**Prep Method:** SW846 3550B  
**Analytical Batch Number:** 1387954  
**Prep Batch Number:** 1387951

**Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
348427001	J1T349
348427002	J1T350
348427003	J1T351
348427004	J1T352
348427005	J1T353
348427006	J1T354
1203088511	Method Blank (MB)
1203088512	Laboratory Control Sample (LCS)
1203088513	348427003(J1T351) Matrix Spike (MS)
1203088514	348427003(J1T351) 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 inverted 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 348427003 (J1T351) 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 except for dilutions.

### **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.

#### **Additional Comments**

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

#### **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.

3484d 1

Washington Closure Hanford		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				RC-232-061		Page 1 of 2	
Collector <i>US SEXSMITH</i>		Company Contact Joan Kessner		Telephone No. 375-4688		Project Coordinator KESSNER, JH		Price Code Data Turnaround	
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites		Sampling Location 100-D-75:2 Confirmatory Sampling				SAF No. RC-232		<i>15 day</i>	
Ice Chest No. <i>RCC-07-011</i>		Field Logbook No. EL-1667-01		COA C10D72A000		Method of Shipment Commercial Carrier <i>Fed Ex</i>			
Shipped To GEL Laboratories Charlston		Offsite Property No. <i>A131100</i>				Bill of Lading/Air Bill No. <i>See ASPC</i>			
Other Labs Shipped To <i>N/A</i>		Preservation		Cool 4C	Cool 4C	Cool 4C	Cool 4C		
		Type of Container		G/P	aG	aG	aG		
POSSIBLE SAMPLE HAZARDS/REMARKS None		No. of Container(s)		1	1	1	1		
		Volume		125mL	125mL	125mL	125mL		
Special Handling and/or Storage Cool 4C		Sample Analysis		See item (1) in Special Instructions	TPH-Diesel Range - WTPH-D +	PCBs - 8082	PAHs - 8310		
Sample No.	Matrix	Sample Date	Sample Time						
J1T349	SOIL	<i>05/08/14</i>	<i>0850</i>	X	X	X	X		
J1T350	SOIL	<i>05/08/14</i>	<i>0857</i>	X	X	X	X		
J1T351	SOIL	<i>05/08/14</i>	<i>0910</i>	X	X	X	X		
J1T352	SOIL	<i>05/08/14</i>	<i>0940</i>	X	X	X	X		
J1T353	SOIL	<i>05/08/14</i>	<i>0910</i>	X	X	X	X		
CHAIN OF POSSESSION				Sign/Print Names				SPECIAL INSTRUCTIONS	
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time		(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)	
<i>US Sexsmith</i>		<i>10/35</i>		<i>US Sexsmith</i>		<i>10/35</i>			
<i>US Sexsmith</i>		<i>5/8/14</i>		<i>US Sexsmith</i>		<i>5/8/14</i>			
<i>US Sexsmith</i>		<i>5/8/14</i>		<i>US Sexsmith</i>		<i>1205</i>			
<i>US Sexsmith</i>		<i>5/8/14</i>		<i>US Sexsmith</i>		<i>1326</i>			
<i>US Sexsmith</i>		<i>5/8/14</i>		<i>US Sexsmith</i>		<i>0930</i>			
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time			
<i>FED</i>		<i>5/8/14</i>		<i>Fed Ex</i>		<i>5/8/14</i>			
<i>FED</i>		<i>5/8/14</i>		<i>P. Ward</i>		<i>5/8/14</i>			
<i>FED</i>		<i>5/8/14</i>		<i>P. Ward</i>		<i>5/8/14</i>			
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time			
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time			
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time			
Relinquished By/Removed From		Date/Time		Received By/Stored In		Date/Time			
FINAL SAMPLE DISPOSITION		Disposal Method		Disposed By		Date/Time			
WCH-EE-011									

21

**Washington Closure Hanford**      **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**      RC-232-061      Page 2 of 2

Collector <i>JR SEXTON</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code <i>15 day</i>	Data Turnaround
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	SAF No. RC-232			
Ice Chest No. <i>RCC-07-011</i>	Field Logbook No. EL-1667-01	COA C10D72A000	Method of Shipment Commercial Carrier <i>FedEx</i>		
Shipped To GEL Laboratories Charleston	Offsite Property No. <i>A131100</i>	Bill of Lading/Air Bill No. <i>See CSPC</i>			

Other Labs Shipped To  <i>N/A</i>	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C						
	Type of Container	GP	aG	aG	aG						
	No. of Container(s)	1	1	1	1						
	Volume	125mL	125mL	125mL	125mL						
POSSIBLE SAMPLE HAZARDS/REMARKS  <i>None</i>	Sample Analysis	See Item (1) in Special Instructions	TPH-Diesel Range - WTPH-D +	PCBs - 8082	PAHs - 8310						
	Special Handling and/or Storage <i>Cool 4C</i>										

Sample No.	Matrix	Sample Date	Sample Time								
J1T354	SOIL	<i>05/08/14</i>	<i>0902</i>	X	X	X	X				
J1T355	SOIL	<i>DWShea 5/8/14</i>									
J1T356	SOIL										
J1T357	SOIL										
J1T358	SOIL										

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From <i>John T. Smith</i>	Date/Time <i>5/8/14 1035</i>	Received By/Stored In <i>C. Martinez</i>	Date/Time <i>5/8/14 1035</i>
Relinquished By/Removed From <i>John T. Smith</i>	Date/Time <i>5/8/14 1205</i>	Received By/Stored In <i>DWShea</i>	Date/Time <i>5/8/14 1205</i>
Relinquished By/Removed From <i>DWShea</i>	Date/Time <i>5/8/14 1326</i>	Received By/Stored In <i>FedEx</i>	Date/Time
Relinquished By/Removed From <i>FedEx</i>	Date/Time	Received By/Stored In <i>P. West</i>	Date/Time <i>5/8/14 0930</i>
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

**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)

*20051414*

REVIEWED BY  
*SMS*  
DATE  
*5/8/14*

22

**Appendix 5**  
**Data Validation Supporting Documentation**

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT:	100-D-75:2		DATA PACKAGE: X0045		
VALIDATOR:	ELR	LAB:	TAL	DATE: 5/31/14	
			SDG:	X0045	
ANALYSES PERFORMED					
8015	8021	8141	8151	8315	<b>8310</b>
		WTPH-HCID	WTPH-G	WTPH-D	
SAMPLES/MATRIX:					
JIT349		JIT350		JIT351	
JIT353		JIT354			
Soil					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present? ..... Yes No **N/A**

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)**

Initial calibrations acceptable? ..... Yes No **N/A**  
 Continuing calibrations acceptable? ..... Yes No **N/A**  
 Standards traceable? ..... Yes No **N/A**  
 Standards expired? ..... Yes No **N/A**  
 Calculation check acceptable? ..... Yes No **N/A**

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

**3. BLANKS (Levels B, C, D, and E)**

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

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

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

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

*No P45*

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

**5. PRECISION (Levels C, D, and E)**

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### GENERAL ORGANIC DATA VALIDATION CHECKLIST

**8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)**

Results reported for all requested analyses? ..... Yes  No  N/A

Results supported in the raw data? (Levels D, E)..... Yes  No  N/A

Samples properly prepared? (Levels D, E)..... Yes  No  N/A

Detection limits meet RDL? ..... Yes  No  N/A

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

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**9. SAMPLE CLEANUP (Levels D and E)**

Fluoridil ® (or other aborbant) cleanup performed? ..... Yes  No  N/A

Lot check performed? ..... Yes  No  N/A

Check recoveries acceptable? ..... Yes  No  N/A

Check materials traceable? ..... Yes  No  N/A

Check materials Expired? ..... Yes  No  N/A

Analytical batch QC given similar cleanup? ..... Yes  No  N/A

Transcription/Calculation Errors? ..... Yes  No  N/A

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Appendix 6**  
**Additional Documentation Requested by Client**

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: May 24, 2014

Page 1 of 4

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

Contact:

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Paramname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
<b>HPLC-PAH</b>									
Batch	1387954								
QC1203088512	LCS								
Acenaphthene	1670		1480	ug/kg		89.1	(58%-99%)	CWW	05/20/14 13:50
Acenaphthylene	1670		1360	ug/kg		81.9	(58%-98%)		
Anthracene	1670		1470	ug/kg		88	(63%-94%)		
Benzo(a)anthracene	167		148	ug/kg		89.1	(73%-98%)		
Benzo(a)pyrene	167		143	ug/kg		86.1	(63%-99%)		
Benzo(b)fluoranthene	167		146	ug/kg		87.9	(70%-130%)		
Benzo(ghi)perylene	167		138	ug/kg		83	(70%-130%)		
Benzo(k)fluoranthene	83.3		78.0	ug/kg		93.6	(70%-130%)		
Chrysene	167		157	ug/kg		94.4	(70%-130%)		
Dibenzo(a,h)anthracene	167		164	ug/kg		98.6	(70%-130%)		
Fluoranthene	167		142	ug/kg		85.1	(70%-130%)		
Fluorene	1670		1450	ug/kg		86.9	(65%-130%)		
Indeno(1,2,3-cd)pyrene	167		155	ug/kg		93	(70%-130%)		
Naphthalene	1670		1330	ug/kg		79.7	(57%-130%)		
Phenanthrene	1670		1450	ug/kg		87	(70%-130%)		
Pyrene	167		148	ug/kg		89	(70%-130%)		
**Decafluorobiphenyl	8330		6760	ug/kg		81.1	(23%-104%)		
QC1203088511	MB								
Acenaphthene		U	4.99	ug/kg					05/20/14 13:08
Acenaphthylene		U	4.99	ug/kg					

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427      Client SDG: X0045      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	1387954										
Anthracene			U	1.66	ug/kg						
Benzo(a)anthracene			U	0.532	ug/kg				CWW	05/20/14	13:08
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						
<b>**Decafluorobiphenyl</b>	8320			7030	ug/kg		84.6	(23%-104%)			
QC1203088513	348427003 MS										
Acenaphthene	1730	U	5.18	1330	ug/kg		76.9	(49%-90%)		05/20/14	20:51
Acenaphthylene	1730	U	5.18	1230	ug/kg		70.8	(48%-97%)			
Anthracene	1730	U	1.73	1350	ug/kg		77.8	(49%-91%)			
Benzo(a)anthracene	173	U	0.552	137	ug/kg		78.9	(29%-126%)			
Benzo(a)pyrene	173	J	1.28	130	ug/kg		74.3	(26%-130%)			
Benzo(b)fluoranthene	173		2.52	133	ug/kg		75.2	(32%-135%)			
Benzo(ghi)perylene	173	U	0.552	124	ug/kg		71.4	(34%-125%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427      Client SDG: X0045      Project Description: RC-232 Soil      Page 3 of 4

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC-PAH											
Batch	1387954										
Benzo(k)fluoranthene	86.6	U	0.276	71.8	ug/kg		82.9	(48%-142%)	CWW	05/20/14	20:51
Chrysene	173		2.42	141	ug/kg		79.8	(39%-127%)			
Dibenzo(a,h)anthracene	173	U	0.552	147	ug/kg		84.9	(38%-130%)			
Fluoranthene	173		4.38	132	ug/kg		73.8	(20%-139%)			
Fluorene	1730	U	5.18	1310	ug/kg		75.7	(51%-90%)			
Indeno(1,2,3-cd)pyrene	173	U	0.552	138	ug/kg		79.9	(41%-145%)			
Naphthalene	1730	U	5.18	1170	ug/kg		67.4	(43%-87%)			
Phenanthrene	1730	U	5.18	1340	ug/kg		77.3	(50%-100%)			
Pyrene	173		5.60	140	ug/kg		77.5	(18%-149%)			
**Decafluorobiphenyl	8660		5780	5880	ug/kg		67.8	(23%-104%)			
QC1203088514 348427003 MSD											
Acenaphthene	1730	U	5.18	1390	ug/kg	4.38	80.4	(0%-30%)		05/20/14	21:33
Acenaphthylene	1730	U	5.18	1210	ug/kg	0.906	70.2	(0%-30%)			
Anthracene	1730	U	1.73	1340	ug/kg	0.484	77.6	(0%-30%)			
Benzo(a)anthracene	173	U	0.552	140	ug/kg	2.29	80.9	(0%-30%)			
Benzo(a)pyrene	173	J	1.28	131	ug/kg	0.574	74.8	(0%-30%)			
Benzo(b)fluoranthene	173		2.52	139	ug/kg	4.54	78.9	(0%-30%)			
Benzo(ghi)perylene	173	U	0.552	129	ug/kg	4.17	74.6	(0%-30%)			
Benzo(k)fluoranthene	86.5	U	0.276	74.8	ug/kg	4.15	86.5	(0%-30%)			
Chrysene	173		2.42	150	ug/kg	6.42	85.4	(0%-30%)			
Dibenzo(a,h)anthracene	173	U	0.552	153	ug/kg	3.85	88.4	(0%-30%)			
Fluoranthene	173		4.38	141	ug/kg	6.20	78.8	(0%-30%)			

# GEL LABORATORIES LLC

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

## QC Summary

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Page 4 of 4

Parmaame	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC-PAH											
Batch	1387954										
Fluorene	1730	U	5.18	1380	ug/kg	5.25	79.9	(0%-30%)	CWW	05/20/14	21:33
Indeno(1,2,3-cd)pyrene	173	U	0.552	143	ug/kg	3.56	82.9	(0%-30%)			
Naphthalene	1730	U	5.18	1180	ug/kg	1.14	68.3	(0%-30%)			
Phenanthrene	1730	U	5.18	1410	ug/kg	4.88	81.3	(0%-30%)			
Pyrene	173		5.60	146	ug/kg	3.97	80.9	(0%-30%)			
**Decafluorobiphenyl	8650		5780	5980	ug/kg		69.2	(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 or %RPD not applicable.  
 ^ 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.

Date: 2 June 2014  
To: Washington Closure Hanford Inc. (technical representative)  
From: ELR Consulting  
Project: 100-IU-2 & 100-IU-6 Remaining Waste Sites – Soil Full Protocol - Waste Site  
100-D-75:2  
Subject: Diesel Range Organics - Data Package No. X0045-GEL

## **INTRODUCTION**

This memo presents the results of data validation on Data Package No. X0045 prepared by GEL Laboratories (GEL). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation</b>	<b>Analyte</b>
J1T349	5/8/14	Soil	C	See note 1
J1T350	5/8/14	Soil	C	See note 1
J1T351	5/8/14	Soil	C	See note 1
J1T352	5/8/14	Soil	C	See note 1
J1T353	5/8/14	Soil	C	See note 1

1 – Diesel range organics by NWTPH-d.

Data validation was conducted in accordance with the Washington Closure Hanford (WCH) validation statement of work and the 100 Area Remedial Action Sampling and Analysis Plan (DOE/RL-96-22, September 2009). Appendices 1 through 6 provide the following information as indicated below:

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

## **DATA QUALITY OBJECTIVES**

### **Holding Times**

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Analytes must be extracted within 14 days of the date of sample collection and analyzed within 40 days from the date of extraction.

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

associated detectable sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

All holding times were acceptable.

### **Method Blanks**

Method blank analyses are conducted to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. Analytical results for analytes present in any sample at less than five times the concentration of that analyte found in the associated blank are qualified as non-detects and flagged "U". Common laboratory contaminants present in samples at less than ten times the concentration of that analyte found in the associated blank are qualified as non-detects. If a sample result is less than the CRQL and is less than five times (or less than ten times for lab contaminants) the highest associated blank result, the sample result value is raised to the CRQL level and qualified as undetected "U".

All method blank results were acceptable.

### **Field (equipment) Blanks**

No field blanks were submitted for analysis.

### **Accuracy**

#### **Matrix Spike/Matrix Spike Duplicate & Blank Spike Recoveries**

Matrix spike/matrix spike duplicate analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike/matrix spike duplicate analyses are performed in duplicate using five compounds for which percent recoveries must be within a range of 50-150% or within laboratory control limits. If spike recoveries are outside control limits, detected sample results less than five times the spike concentration are qualified as estimates and flagged "J". Undetected sample results with spike recoveries below control limits are qualified as estimates and flagged "UJ". Undetected sample results are not qualified if the spike recovery is above control limits. Sample results greater than five times the spike concentration require no qualification.

All accuracy results were acceptable.

### Surrogate Recovery

The analyses of surrogate compounds provide a measure of performance for individual samples. Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program. If two surrogates of the same class of compounds (base/neutral or acid) are out of control limits, all associated sample results greater than the contract required quantitation limit (CRQL) are qualified as estimates and flagged "J". Sample results less than the CRQL and below the lower control limit are qualified as estimates and flagged "UJ". Sample results less than the CRQL with recoveries above the upper control limit require no qualification. If a surrogate recovery is less than 10%, detects are qualified as estimates and flagged "J" and nondetects are rejected and flagged "UR".

All surrogate results were acceptable.

### **Precision**

#### Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike (MS)/matrix spike duplicate (MSD) results provide matrix-specific information on the precision of the method for specific target compound classes. Precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. Samples results must be within RPD limits of +/-30%. If RPD values are out of specification and the sample concentration is less than five times the spike concentration, all associated detected sample results are qualified as estimates and flagged "J". If RPD values are out of specification and the sample concentration is greater than five times the spike concentration, no qualification is required.

All duplicate results were acceptable.

#### Field Duplicate Samples

One set of field duplicates (J1T351/J1T353) were submitted for analysis. Field duplicates are compared using the same criteria as for laboratory duplicates. All field duplicates were acceptable.

### **Analytical Detection Levels**

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

### **Completeness**

Data package No. X0045 was submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

None found.

### **REFERENCES**

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

DOE/RL-96-22, Rev. 5, *100 Area Remedial Action Sampling and Analysis Plan*, U.S. Department of Energy, September 2009.

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

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

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

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

DIESEL RANGE ORGANIC DATA QUALIFICATION SUMMARY\*

<b>SDG: X0045</b>	<b>REVIEWER: ELR</b>	<b>Project: 100-D-75:2</b>	<b>PAGE <u>1</u> OF <u>1</u></b>
<b>COMMENTS: No qualifiers assigned</b>			

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

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

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 22, 2014

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

Client SDG: X0045

Client Sample ID: J1T349  
 Sample ID: 348427001  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:50  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.77%

Project: WCHN00213  
 Client ID: WCHN001

5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Diesel Range Organics</b>											
SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"											
Diesel Range Organics (C10-C20)	U	2180	2180	6720	ug/kg	1	BYT1	05/21/14	1235	1388965	1
Motor Oil (C20-C36)		6810	2180	6720	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/15/14	1000	1387937
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/20/14	0920	1388964

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"	453 ug/kg	672	67.5	(50%-150%)

Notes:

**Certificate of Analysis**

Report Date: May 22, 2014

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

Client SDG: X0045

Client Sample ID: J1T350  
 Sample ID: 348427002  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 08:57  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 1.17%

Project: WCHN00213  
 Client ID: WCHN001

W 5/21/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Diesel Range Organics</b>											
<b>SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"</b>											
Diesel Range Organics (C10-C20)	U	2170	2170	6660	ug/kg	1	BYT1	05/21/14	1313	1388965	1
Motor Oil (C20-C36)	J	5680	2170	6660	ug/kg	1					

**The following Prep Methods were performed:**

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/15/14	1000	1387937
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/20/14	0920	1388964

**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"	554 ug/kg	666	83.1	(50%-150%)

**Notes:**

## GEL LABORATORIES LLC

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

### Certificate of Analysis

Report Date: May 22, 2014

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

Client SDG: X0045

Client Sample ID: J1T351  
 Sample ID: 348427003  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 3.85%

Project: WCHN00213  
 Client ID: WCHN001

✓  
5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Diesel Range Organics</b>											
SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"											
Diesel Range Organics (C10-C20)	U	2250	2250	6930	ug/kg	1	BYT1	05/21/14	1352	1388965	1
Motor Oil (C20-C36)	J	5740	2250	6930	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/15/14	1000	1387937
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/20/14	0920	1388964

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"	482 ug/kg	693	69.5	(50%-150%)

Notes:

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 22, 2014

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

Client SDG: X0045

Client Sample ID: J1T352  
 Sample ID: 348427004  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:40  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.08%

Project: WCHN00213  
 Client ID: WCHN001

*W*  
5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Diesel Range Organics</b>											
SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"											
Diesel Range Organics (C10-C20)	U	2190	2190	6730	ug/kg	1	BYT1	05/21/14	1432	1388965	1
Motor Oil (C20-C36)	J	4160	2190	6730	ug/kg	1					

**The following Prep Methods were performed:**

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/15/14	1000	1387937
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/20/14	0920	1388964

**The following Analytical Methods were performed:**

Method	Description	Analyst Comments				
I	NWTPH-Dx in Soil					
Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits	
o-Terphenyl	SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"	490 ug/kg	673	72.9	(50%-150%)	

**Notes:**

# GEL LABORATORIES LLC

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

## Certificate of Analysis

Report Date: May 22, 2014

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

Client SDG: X0045

Client Sample ID: J1T353  
 Sample ID: 348427005  
 Matrix: SOIL  
 Collect Date: 08-MAY-14 09:10  
 Receive Date: 09-MAY-14  
 Collector: Client  
 Moisture: 2.91%

Project: WCHN00213  
 Client ID: WCHN001

*W*  
5/31/14

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
<b>Diesel Range Organics</b>											
SW 3541/NWTPH-Dx in Soil "Dry Weight Corrected"											
Diesel Range Organics (C10-C20)	U	2230	2230	6850	ug/kg	1	BYTI	05/21/14	1510	1388965	1
Motor Oil (C20-C36)	J	6820	2230	6850	ug/kg	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/15/14	1000	1387937
SW846 3541	3541 DRO IN SOIL PREP	CXR2	05/20/14	1227	1388964

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"	499 ug/kg	685	72.8	(50%-150%)

Notes:

**Appendix 4**  
**Laboratory Narrative and Chain-of-Custody Documentation**

**FID Diesel Range Organics  
WC-HANFORD, INC. (WCHN)  
SDG X0045**

**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:** 1388965  
**Prep Batch Number:** 1388964

**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>
348427001	J1T349
348427002	J1T350
348427003	J1T351
348427004	J1T352
348427005	J1T353
1203091081	Method Blank (MB)
1203091082	Laboratory Control Sample (LCS)
1203091083	348427005(J1T353) Matrix Spike (MS)
1203091084	348427005(J1T353) 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 348427005 (J1T353) was selected for the matrix spike and matrix spike duplicate analysis.

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

The MS recovery was within the established acceptance limits.

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

The MSD recovery was within the established acceptance limits.

#### **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**

All samples in this SDG were extracted and analyzed twice due to Method Blank contamination in the first analysis. The second analysis was reported.

### **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.

**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 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 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.

**Washington Closure Hanford**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

RC-232-061

Page 1 of 2

Collector <i>W. Sexsmith</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code	Data Turnaround
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	SAF No. RC-232	<i>15 day</i>		
Ice Chest No. <i>RCC-07-011</i>	Field Logbook No. EL-1667-01	COA C10D72A000	Method of Shipment Commerical Carrier <i>Fed Ex</i>		
Shipped To GEL Laboratories Charleston	Offsite Property No. <i>A131100</i>	Bill of Lading/Air Bill No. <i>See ASPC</i>			

Other Labs Shipped To  <i>n/a</i>	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C								
	Type of Container	GP	aG	aG	aG								
	No. of Container(s)	1	1	1	1								
	Volume	125mL	125mL	125mL	125mL								
	Sample Analysis	See Item (1) in Special Instructions	TPH-Diesel Range - WTPH-D+	PCBs - 8082	PAHs - 8310								

Sample No.	Matrix	Sample Date	Sample Time										
J1T349	SOIL	<i>05/08/14</i>	<i>0850</i>	X	X	X	X						
J1T350	SOIL	<i>05/08/14</i>	<i>0857</i>	X	X	X	X						
J1T351	SOIL	<i>05/08/14</i>	<i>0910</i>	X	X	X	X						
J1T352	SOIL	<i>05/08/14</i>	<i>0940</i>	X	X	X	X						
J1T353	SOIL	<i>05/08/14</i>	<i>0910</i>	X	X	X	X						

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From <i>W. Sexsmith</i>	Date/Time <i>1035</i>	Received By/Stored In <i>C. Mart...</i>	Date/Time <i>1035</i>
Relinquished By/Removed From <i>W. Sexsmith</i>	Date/Time <i>1205</i>	Received By/Stored In <i>D. W. Shea</i>	Date/Time <i>1205</i>
Relinquished By/Removed From <i>W. Sexsmith</i>	Date/Time <i>05/08/14</i>	Received By/Stored In <i>Fed Ex</i>	Date/Time <i>0930</i>
Relinquished By/Removed From <i>FED</i>	Date/Time <i>5/8/14 1326</i>	Received By/Stored In <i>P. Dent</i>	Date/Time <i>5/30/14 050914</i>
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

**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)



FINAL SAMPLE DISPOSITION	Disposed Method	Disposed By	Date/Time
--------------------------	-----------------	-------------	-----------

WCH-EE-011

19

**Washington Closure Hanford**      **CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**      RC-232-061      Page 2 of 2

Collector <i>10 Sx 5m<sup>2</sup> M</i>	Company Contact Joan Kessner	Telephone No. 375-4688	Project Coordinator KESSNER, JH	Price Code <i>15 day</i>	Data Turnaround
Project Designation 100-IU-2 & 100-IU-6 Remaining Waste Sites	Sampling Location 100-D-75:2 Confirmatory Sampling	SAF No. RC-232			
Ice Chest No. <i>RCC-07-011</i>	Field Logbook No. EL-1667-01	COA C10D72A000	Method of Shipment Commercial Carrier <i>FedEx</i>		
Shipped To GEL Laboratories Charleston	Offsite Property No. <i>A131100</i>	Bill of Lading/Air Bill No. <i>See ASPC</i>			

Other Labs Shipped To  <i>N/A</i>	Preservation	Cool 4C	Cool 4C	Cool 4C	Cool 4C					
	Type of Container	GP	aG	aG	aG					
	No. of Container(s)	1	1	1	1					
	Volume	125mL	125mL	125mL	125mL					
POSSIBLE SAMPLE HAZARDS/REMARKS <i>None</i>	Sample Analysis	See item (1) in Special Instructions	TPH-Diesel Range - WTPH-D +	PCBs - 8082	PAHs - 8310					

Sample No.	Matrix	Sample Date	Sample Time							
J1T354	SOIL	<i>05/08/14</i>	<i>0902</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>			
J1T355	SOIL	<i>Dushea 5/8/14</i>								
J1T356	SOIL									
J1T357	SOIL									
J1T358	SOIL									

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By/Removed From <i>John T. Smith</i>	Date/Time <i>1035 5/8/14</i>	Received By/Stored In <i>C. Martin</i>	Date/Time <i>1035 05/08/14</i>
Relinquished By/Removed From <i>John T. Smith</i>	Date/Time <i>1205 5/8/14</i>	Received By/Stored In <i>Dushea</i>	Date/Time <i>1205 5/8/14</i>
Relinquished By/Removed From <i>Dushea</i>	Date/Time <i>1326 5/8/14</i>	Received By/Stored In <i>FedEx</i>	Date/Time <i>0930 5/8/14</i>
Relinquished By/Removed From <i>FedEx</i>	Date/Time	Received By/Stored In <i>P. Dent</i>	Date/Time <i>0900 5/8/14</i>
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time
Relinquished By/Removed From	Date/Time	Received By/Stored In	Date/Time

**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)

*20051414*

REVIEWED BY  
*SMS*

DATE  
*5/8/14*

FINAL SAMPLE DISPOSITION  
WCH-EE-011

20

**Appendix 5**  
**Data Validation Supporting Documentation**

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

VALIDATION LEVEL:	A	B	<b>C</b>	D	E
PROJECT:	100-D-75:2		DATA PACKAGE: X0045		
VALIDATOR:	ELR	LAB: TAL	DATE: 5/31/14		
		SDG: X0045			
ANALYSES PERFORMED					
8015	8021	8141	8151	8315	
		WTPH-HCID	WTPH-G	<b>WTPH-D</b>	
SAMPLES/MATRIX:					
J1T349 J1T350 J1T351 J1T351 J1T352					
Soil					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present? ..... Yes No **N/A**

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)**

Initial calibrations acceptable? ..... Yes No **N/A**  
 Continuing calibrations acceptable? ..... Yes No **N/A**  
 Standards traceable? ..... Yes No **N/A**  
 Standards expired? ..... Yes No **N/A**  
 Calculation check acceptable? ..... Yes No **N/A**

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

**3. BLANKS (Levels B, C, D, and E)**

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

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

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

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

Comments: \_\_\_\_\_ no PAF \_\_\_\_\_  
\_\_\_\_\_

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

**5. PRECISION (Levels C, D, and E)**

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**GENERAL ORGANIC DATA VALIDATION CHECKLIST**

**8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)**

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

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**9. SAMPLE CLEANUP (Levels D and E)**

Fluoridil ® (or other aborbant) cleanup performed?..... Yes No N/A  
Lot check performed? ..... Yes No N/A  
Check recoveries acceptable?..... Yes No N/A  
Check materials traceable? ..... Yes No N/A  
Check materials Expired?..... Yes No N/A  
Analytical batch QC given similar cleanup? ..... Yes No N/A  
Transcription/Calculation Errors? ..... Yes No N/A

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Appendix 6**  
**Additional Documentation Requested by Client**

# GEL LABORATORIES LLC

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

## QC Summary

Report Date: May 22, 2014

Page 1 of 1

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

Contact:

Workorder: 348427

Client SDG: X0045

Project Description: RC-232 Soil

Paramname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anist	Date	Time
<b>Diesel Range Organics</b>											
Batch	1388965										
QC1203091082	LCS										
Diesel Range Organics (C10-C20)	66000			47700	ug/kg		72.4	(70%-130%)	BYT1	05/21/14	11
Motor Oil (C20-C36)	66000			55700	ug/kg		84.5	(70%-130%)			
**o--Terphenyl	660			518	ug/kg		78.6	(50%-150%)			
QC1203091081	MB										
Diesel Range Organics (C10-C20)			U	2160	ug/kg					05/21/14	11
Motor Oil (C20-C36)			U	2160	ug/kg						
**o--Terphenyl	663			519	ug/kg		78.3	(50%-150%)			
QC1203091083	348427005 MS										
Diesel Range Organics (C10-C20)	68300	U	2230	50600	ug/kg		74.1	(70%-130%)		05/21/14	15
Motor Oil (C20-C36)	68300	J	6820	63000	ug/kg		82.3	(70%-130%)			
**o--Terphenyl	683		499	532	ug/kg		77.8	(50%-150%)			
QC1203091084	348427005 MSD										
Diesel Range Organics (C10-C20)	67800	U	2230	55100	ug/kg	8.49	81.3	(0%-20%)		05/21/14	16
Motor Oil (C20-C36)	67800	J	6820	68200	ug/kg	7.85	90.6	(0%-20%)			
**o--Terphenyl	678		499	553	ug/kg		81.7	(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