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Caerus Oil & Gas LLC (Operator #: 10456)
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Report of Work Completed – Release Investigation

COGCC Location Name (ID)	NA
Operator Location Name	A03 Vault Valve Release
COGCC Spill/Release Point Name	A03 Vault valve release
COGCC Spill/Release Point ID	481663
Legal Description	NESE Sec. 3 T5S-R96W
Coordinates (Lat/Long)	39.643139 / -108.148575

Mr. Rollins,

Confluence Compliance Companies, LLC (Confluence) prepared this Report of Work Completed (ROWC) for Caerus Oil & Gas LLC (Caerus) to document remedial investigation activities associated with a recent produced water release at the A03 Vault Valve Release (Location). The Location is 13.8 miles northwest of Parachute, Colorado, in Garfield County as illustrated in the attached Topographic Map. Additional information on the Location and the associated remediation project is provided in the title block above, the attached Site Diagrams, and laboratory analytical reports. This ROWC provides background on the Location, methods used to complete the release investigation, results of the investigation, and recommendations for how to proceed with this information.

Background

On February 18, 2022, the plug on a blind flange was found to be missing, releasing produced water and fresh waste into the valve can. The release was stopped, and the missing plug was replaced. The release was reported in a Colorado Oil and Gas Conservation Commission (COGCC) Form 19 Document 402960724.

Methodology

On March 9, 2022, Confluence coordinated and oversaw initial site investigation activities associated with the recent release at the Location. One soil sample was collected from the floor of the vault at approximately 4 inches below the vault floor, or 12 feet below ground surface (bgs) to characterize potential soil impacts beneath the point of release (POR). The soil sample was characterized using visual and olfactory observations and field-screened for volatile organic compounds using a photoionization detector (PID). The PID measurement of the POR sample was 106.8 parts per million (ppm). The sample also demonstrated a hydrocarbon odor and staining.

Confluence returned to the Location on May 10, 2022, to conduct additional release investigation. A hydrovacuum was utilized to remove impacted soil from the base of the vault. The vacuum encountered solid rock at approximately 15 inches below the vault floor, or 13 feet bgs. Three soil samples were collected from the excavated base of the vault to characterize the vertical extent of soil impacts. The soil samples were characterized using olfactory observations and field-screened for volatile organic compounds using a PID. The PID measurements of the three samples ranged from 1.4 to 7.5 ppm. The samples demonstrated staining but no hydrocarbon odor.

All soil samples were collected in laboratory provided jars, immediately placed on ice, and shipped for laboratory analysis under a completed chain-of-custody form to Pace Analytical Services (Pace) for COGCC Table 915-1 soil constituents of concern. Both the POR sample and the deepest of the three samples collected on May 10 were submitted for analysis of constituents listed in COGCC Table 915-1 for soil. The remaining two soil samples were submitted on hold and ultimately were not analyzed. Soil sample locations are presented in the attached Site Diagram.

Results

These results summarize observations from onsite remedial investigation efforts and associated laboratory analytical results. For organizational and presentation purposes, the results summary is divided between general observations of lithology and hydrogeology for the entire Location and site investigation activities.

Collected spatial data are depicted in the attached Site Diagram. Laboratory analytical reports are attached and summarized in the Laboratory Results Summary Table.

Lithology and Hydrogeology

Lithology at the Location is characterized by sand with gravel to silty clay underlain by uncharacterized rocky soil. Groundwater is expected to flow southwest toward West Fork Parachute Creek and ultimately to the Colorado River, located 13.9 miles southeast of the Location.

Initial Assessment Results

Laboratory results of initial characterization of the POR soil sample indicate compliance with COGCC Table 915-1 Protection of Groundwater Soil Screening Levels with the exception of benzene, 1,2,4 trimethylbenzene, 1,3,5 trimethylbenzene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, sodium adsorption ration (SAR), arsenic, barium, and cadmium. Benzene exceeded at 0.0632 milligrams per kilogram (mg/kg), 1,2,4 trimethylbenzene exceeded at 0.0803 mg/kg, 1,3,5 trimethylbenzene exceeded at 0.145 mg/kg, 1-methylnaphthalene exceeded at 0.0260 mg/kg, 2-methylnaphthalene exceeded at 0.0741 mg/kg, and naphthalene exceeded at 0.0453 mg/kg. SAR exceeded at 18.0, arsenic exceeded at 2.61 mg/kg, barium exceeded at 1860 mg/kg, and cadmium exceeded at 0.527 mg/kg.



Excavation Results

Laboratory results of the submitted excavation sample indicate compliance with COGCC Table 915-1 Protection of Groundwater Soil Screening Levels with the exception of SAR, pH, arsenic, and barium. SAR exceeds at 12.9, pH exceeds at 9.26, arsenic exceeds at 2.42 mg/kg, and barium exceeds at 495 mg/kg.

Analysis and Recommendations

Additional soil sample collection is warranted to delineate inorganic impacts vertically adjacent to the vault. Due to the rocks encountered during initial investigation, a hydrovacuum no longer appears to be a viable method for sample collection. Based on the documented lithology at the Location, Confluence recommends the use of a drill rig to advance soil borings adjacent to the vault valve to delineate identified impacts.

Confluence also recommends the collection of background soil samples to characterize the native levels of inorganic constituents of concern during additional characterization.

Confluence is grateful for the opportunity to support you with this project. If you have any questions about the methods, results or recommendations presented here, please do not hesitate to contact me.

Regards,



Chris McKisson
Managing Partner
(720) 490-6758

chris.mckisson@confluence-cc.com

Attachments

- Topographic Location Diagram
- Site Diagram – Soil Sample Locations
- Analytical Results Summary Table - Soil
- Laboratory Reports



Topographic Location Map

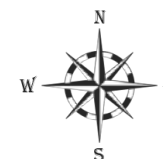
Caerus Oil and Gas LLC

A03 Vault Valve Release

COGCC Location ID: 481663

Garfield County

NESE Sec. 3 T5S-R96W



Topographic map sourced from 2020 Earth Point
using data provided by United States Geological
Survey

Created by: Sage Maher on 06/16/2022.

Site Diagram Soil Sample Locations

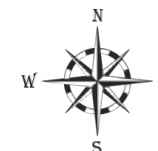
Caerus Oil and Gas LLC

A03 Vault Valve Release



COGCC Location ID: NA

Garfield County

NESE Sec. 3 T5S-R96W



Legend

-  Soil Sample – 03/09/2022
-  Soil Sample – 05/06/2022

Spatial data was collected using a handheld GPS unit with submeter accuracy. Illustration discrepancies may be present in this diagram due to the inherent limitations of data accuracy for both project data and the underlying aerial imagery. The position of illustrated data may have been manually adjusted to align with the aerial imagery in a manner more representative of field conditions for presentation purposes only.

Map created by: Sage Maher on 06/22/2022.

20220309-A03_VAULT-POR@12'

20220506-A03_VAULT-SW@1.5

Soil Screening and Remediation Limits				Organic Compounds (mg/kg [ppm])																		
COGCC Table 915-1 Groundwater Protection -->			NA	500	NA	NA	NA	0.0026	0.69	0.78	9.9	0.0081	0.0087	0.55	5.8	0.011	0.24	0.3	2.9	9	0.096	8.9
Sample Date	Solid/Soil Source (Equipment) [Vault/Sump, Separator, Tank, Battery, Dump Line, Pit, Cuttings, Background, etc.]	Sample ID	PID (ppm)	TPH (total volatile and extractable petroleum hydrocarbons) (GRO+DRO+ORO)	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C28) High Fraction	TPH-ORO (C28-C36) High Fraction	Benzene	Toluene	Ethylbenzene	Xylenes - total (sum of o-, m-, p- isomers)	1,2,4-trimethylbenzene	1,3,5-trimethylbenzene	Acenaphthene	Anthracene	Benzo(A)anthracene	Benzo(A)pyrene	Benzo(B)fluoranthene	Benzo(K)fluoranthene	Chrysene	Dibenzo(A,H)anthracene	Fluoranthene
3/9/2022	Vault Valve	20220309-A03_VAULT-POR@12'	106.8	220	9.01	150	60.7	0.0632	0.197	0.0105	0.304	0.0803	0.145	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600	<0.00600
5/6/2022	Vault Valve	20220506-A03_Vault-BASE_SW@1.5'	1.5	73.9	0.122	39.1	34.7	0.00247	0.00630	<0.00250	<0.00650	<0.00500	<0.00500	<0.00600	<0.00600	<0.00600	0.00618	0.00741	<0.00600	<0.00600	<0.00600	0.0103

Soil Screening and Remediation Limits				Organic Compounds (mg/kg [ppm])						Soil Suitability for Reclamation				Metals (mg/kg [ppm])									
COGCC Table 915-1 Groundwater Protection -->			NA	0.54	0.98	0.006	0.019	0.0038	1.3	4	6	6-8.3	2	0.29	82	0.38	0.00067	46	14	26	0.26	0.8	370
Sample Date	Solid/Soil Source (Equipment) [Vault/Sump, Separator, Tank, Battery, Dump Line, Pit, Cuttings, Background, etc.]	Sample ID	PID (ppm)	Fluorene	Indeno(1,2,3-C,D)pyrene	1- Methyl-naphthalene	2- Methyl-naphthalene	Naphthalene	Pyrene	EC (Specific Conductance) (millimhos/centimeter) (by saturated paste method)	SAR (Sodium Adsorption Ratio) (calculation) (by saturated paste method)	pH (pH Units) (by saturated paste method)	Boron - Hot Water Soluble (mg/L)	Arsenic	Barium	Cadmium (mg/Kg)	Chromium (VI)	Copper	Lead	Nickel	Selenium	Silver	Zinc
3/9/2022	Vault Valve	20220309-A03_VAULT-POR@12'	106.8	0.0130	<0.00600	0.0260	0.0741	0.0453	<0.00600	1.960	18.0	8.24	1.98	2.61	1860	0.527	<1.00	19.2	12.0	22.5	<2.00	<1.00	42.9
5/6/2022	Vault Valve	20220506-A03_Vault-BASE_SW@1.5'	1.5	<0.00600	<0.00600	<0.0200	<0.0200	<0.0200	0.00831	1.120	12.9	9.26	0.865	2.42	495	<0.500	<1.00	14.2	12.4	17.3	<2.00	<1.00	45.3

Caerus Oil and Gas

Sample Delivery Group: L1470575
Samples Received: 03/11/2022
Project Number: A03
Description: A03 Vault Release
Site: A03
Report To: Brett Middleton
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jason Romer
Project Manager

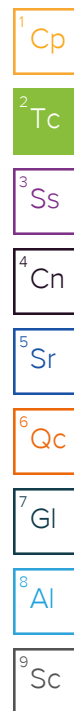
Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

Pace Analytical National

12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

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SAMPLE SUMMARY

20220309-A03_VAULT-POR@12' L1470575-01 Solid

Collected by
A. Smith

Collected date/time
03/09/22 11:15

Received date/time
03/11/22 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1833778	1	03/18/22 09:57	03/18/22 09:57	CCE	Mt. Juliet, TN
Wet Chemistry by Method 7199	WG1832260	1	03/14/22 19:00	03/15/22 18:14	JER	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1832390	1	03/15/22 12:00	03/15/22 14:00	GI	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1833017	1	03/16/22 03:20	03/16/22 06:44	ARD	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1833199	1	03/16/22 16:31	03/17/22 16:21	KMG	Mt. Juliet, TN
Metals (ICP) by Method 6010B-NE493 Ch 2	WG1833773	2	03/17/22 07:58	03/18/22 12:53	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG1833204	5	03/16/22 16:58	03/16/22 20:09	LD	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1831716	1	03/12/22 16:34	03/15/22 13:06	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1831659	1	03/12/22 16:34	03/14/22 02:20	ADM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015M	WG1833061	1	03/17/22 04:50	03/17/22 16:58	JAS	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1833068	1	03/17/22 08:11	03/18/22 00:44	ADF	Mt. Juliet, TN

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.



Jason Romer
Project Manager

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	18.0		1	03/18/2022 09:57	WG1833778

Wet Chemistry by Method 7199

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Hexavalent Chromium	ND		1.00	1	03/15/2022 18:14	WG1832260

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.24	T8	1	03/15/2022 14:00	WG1832390

Sample Narrative:

L1470575-01 WG1832390: 8.24 at 19.9C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	1960		10.0	1	03/16/2022 06:44	WG1833017

Sample Narrative:

L1470575-01 WG1833017: at 25C

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Barium	1860		0.500	1	03/17/2022 16:21	WG1833199
Cadmium	0.527		0.500	1	03/17/2022 16:21	WG1833199
Copper	19.2		2.00	1	03/17/2022 16:21	WG1833199
Lead	12.0		0.500	1	03/17/2022 16:21	WG1833199
Nickel	22.5		2.00	1	03/17/2022 16:21	WG1833199
Selenium	ND		2.00	1	03/17/2022 16:21	WG1833199
Silver	ND		1.00	1	03/17/2022 16:21	WG1833199
Zinc	42.9		5.00	1	03/17/2022 16:21	WG1833199

Metals (ICP) by Method 6010B-NE493 Ch 2

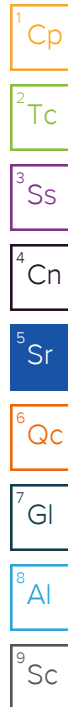
Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Hot Water Sol. Boron	1.98		0.400	2	03/18/2022 12:53	WG1833773

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Arsenic	2.61		1.00	5	03/16/2022 20:09	WG1833204

Volatile Organic Compounds (GC) by Method 8015D/GRO

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	9.01		0.100	1	03/15/2022 13:06	WG1831716
(S) a,a,a-Trifluorotoluene(FID)	97.2		77.0-120		03/15/2022 13:06	WG1831716



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.0632		0.00100	1	03/14/2022 02:20	WG1831659
Toluene	0.197	J5	0.00500	1	03/14/2022 02:20	WG1831659
Ethylbenzene	0.0105		0.00250	1	03/14/2022 02:20	WG1831659
Xylenes, Total	0.304	J5	0.00650	1	03/14/2022 02:20	WG1831659
1,2,4-Trimethylbenzene	0.0803	J5	0.00500	1	03/14/2022 02:20	WG1831659
1,3,5-Trimethylbenzene	0.145	J5	0.00500	1	03/14/2022 02:20	WG1831659
(S) Toluene-d8	97.4		75.0-131		03/14/2022 02:20	WG1831659
(S) 4-Bromofluorobenzene	110		67.0-138		03/14/2022 02:20	WG1831659
(S) 1,2-Dichloroethane-d4	96.8		70.0-130		03/14/2022 02:20	WG1831659

Semi-Volatile Organic Compounds (GC) by Method 8015M

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	150		4.00	1	03/17/2022 16:58	WG1833061
C28-C36 Motor Oil Range	60.7		4.00	1	03/17/2022 16:58	WG1833061
(S) o-Terphenyl	53.9		18.0-148		03/17/2022 16:58	WG1833061

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Acenaphthene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Anthracene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Benzo(a)anthracene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Benzo(b)fluoranthene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Benzo(k)fluoranthene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Benzo(a)pyrene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Chrysene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Dibenz(a,h)anthracene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Fluoranthene	ND		0.00600	1	03/18/2022 00:44	WG1833068
Fluorene	0.0130		0.00600	1	03/18/2022 00:44	WG1833068
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	03/18/2022 00:44	WG1833068
1-Methylnaphthalene	0.0260		0.0200	1	03/18/2022 00:44	WG1833068
2-Methylnaphthalene	0.0741		0.0200	1	03/18/2022 00:44	WG1833068
Naphthalene	0.0453		0.0200	1	03/18/2022 00:44	WG1833068
Pyrene	ND		0.00600	1	03/18/2022 00:44	WG1833068
(S) p-Terphenyl-d14	105		23.0-120		03/18/2022 00:44	WG1833068
(S) Nitrobenzene-d5	205	J1	14.0-149		03/18/2022 00:44	WG1833068
(S) 2-Fluorobiphenyl	92.4		34.0-125		03/18/2022 00:44	WG1833068

Sample Narrative:

L1470575-01 WG1833068: Surrogate failure due to matrix interference

1
Cp2
Tc3
Ss4
Cn5
Sr6
Qc7
Gl8
Al9
Sc

Method Blank (MB)

(MB) R3770417-1 03/15/22 17:41

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Hexavalent Chromium	U		0.255	1.00

L1470518-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1470518-01 03/15/22 18:04 • (DUP) R3770417-3 03/15/22 18:09

Analyte	Original Result mg/kg	DUP Result mg/kg	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hexavalent Chromium	ND	ND	1	200	P1	20

L1470660-09 Original Sample (OS) • Duplicate (DUP)

(OS) L1470660-09 03/15/22 20:19 • (DUP) R3770417-8 03/15/22 20:24

Analyte	Original Result mg/kg	DUP Result mg/kg	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hexavalent Chromium	ND	ND	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3770417-2 03/15/22 17:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Hexavalent Chromium	10.0	10.5	105	80.0-120	

L1470660-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1470660-01 03/15/22 19:06 • (MS) R3770417-4 03/15/22 19:11 • (MSD) R3770417-5 03/15/22 19:16

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Hexavalent Chromium	20.0	ND	15.4	12.0	77.0	59.9	1	75.0-125		J3 J6	25.0	20

L1470660-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1470660-01 03/15/22 19:06 • (MS) R3770417-6 03/15/22 19:22

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Hexavalent Chromium	680	ND	569	83.7	50	75.0-125	

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

L1470523-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1470523-02 03/15/22 14:00 • (DUP) R3769968-3 03/15/22 14:00

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	su	su		%		%
pH	7.22	7.22	1	0.000		1

Sample Narrative:

OS: 7.22 at 20.2C

DUP: 7.22 at 20.2C

Laboratory Control Sample (LCS)

(LCS) R3769968-1 03/15/22 14:00

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
Analyte	su	su	%	%	
pH	10.0	9.99	99.9	99.0-101	

Sample Narrative:

LCS: 9.99 at 19.3C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Method Blank (MB)

(MB) R3770187-1 03/16/22 06:44

Analyte	MB Result umhos/cm	MB Qualifier	MB MDL umhos/cm	MB RDL umhos/cm
Specific Conductance	U		10.0	10.0

Sample Narrative:

BLANK: at 25C

L1470438-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1470438-11 03/16/22 06:44 • (DUP) R3770187-3 03/16/22 06:44

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	2360	2380	1	0.971		20

Sample Narrative:

OS: at 25C

DUP: at 25C

L1470660-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1470660-01 03/16/22 06:44 • (DUP) R3770187-4 03/16/22 06:44

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	409	398	1	2.73		20

Sample Narrative:

OS: at 25C

DUP: at 25C

Laboratory Control Sample (LCS)

(LCS) R3770187-2 03/16/22 06:44

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	268	267	99.6	85.0-115	

Sample Narrative:

LCS: at 25C



Method Blank (MB)

(MB) R3771186-1 03/17/22 15:57

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Barium	U		0.0852	0.500
Cadmium	U		0.0471	0.500
Copper	U		0.400	2.00
Lead	U		0.208	0.500
Nickel	U		0.132	2.00
Selenium	U		0.764	2.00
Silver	U		0.127	1.00
Zinc	U		0.832	5.00

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3771186-2 03/17/22 15:59

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Barium	100	92.9	92.9	80.0-120	
Cadmium	100	88.5	88.5	80.0-120	
Copper	100	94.1	94.1	80.0-120	
Lead	100	90.3	90.3	80.0-120	
Nickel	100	94.2	94.2	80.0-120	
Selenium	100	90.6	90.6	80.0-120	
Silver	20.0	17.3	86.3	80.0-120	
Zinc	100	88.0	88.0	80.0-120	

L1470579-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1470579-07 03/17/22 16:02 • (MS) R3771186-5 03/17/22 16:10 • (MSD) R3771186-6 03/17/22 16:13

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Barium	100	208	362	360	154	152	1	75.0-125	J5	J5	0.638	20
Cadmium	100	ND	89.0	91.1	88.6	90.6	1	75.0-125			2.28	20
Copper	100	18.8	119	114	99.8	95.6	1	75.0-125			3.60	20
Lead	100	13.0	106	106	93.0	92.6	1	75.0-125			0.366	20
Nickel	100	16.7	113	107	96.5	90.2	1	75.0-125			5.75	20
Selenium	100	ND	90.7	94.0	90.7	94.0	1	75.0-125			3.54	20
Silver	20.0	ND	17.6	17.8	88.0	89.2	1	75.0-125			1.36	20
Zinc	100	40.0	131	123	91.1	83.3	1	75.0-125			6.16	20

Method Blank (MB)

(MB) R3771490-1 03/18/22 12:46

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Hot Water Sol. Boron	U		0.0167	0.200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3771490-2 03/18/22 12:48 • (LCSD) R3771490-3 03/18/22 12:51

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Hot Water Sol. Boron	1.00	0.990	0.988	99.0	98.8	80.0-120			0.165	20

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Method Blank (MB)

(MB) R3770640-1 03/16/22 19:39

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Arsenic	U		0.100	1.00

Laboratory Control Sample (LCS)

(LCS) R3770640-2 03/16/22 19:42

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Arsenic	100	85.2	85.2	80.0-120	

L1470579-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1470579-07 03/16/22 19:46 • (MS) R3770640-5 03/16/22 19:56 • (MSD) R3770640-6 03/16/22 19:59

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Arsenic	100	15.8	97.6	95.0	81.8	79.2	5	75.0-125			2.63	20

1

Cp

2

Tc

3

Ss

4

Cn

5

Sr

6

Qc

7

Gl

8

Al

9

Sc

Method Blank (MB)

(MB) R3769790-3 03/15/22 06:18

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	U		0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	103			77.0-120

Laboratory Control Sample (LCS)

(LCS) R3769790-2 03/15/22 04:42

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	6.19	113	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			103	77.0-120	

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3770286-3 03/13/22 20:53

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000467	0.00100
Toluene	U		0.00130	0.00500
Ethylbenzene	U		0.000737	0.00250
Xylenes, Total	U		0.000880	0.00650
1,2,4-Trimethylbenzene	U		0.00158	0.00500
1,3,5-Trimethylbenzene	U		0.00200	0.00500
(S) Toluene-d8	100			75.0-131
(S) 4-Bromofluorobenzene	98.8			67.0-138
(S) 1,2-Dichloroethane-d4	93.1			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3770286-1 03/13/22 19:27 • (LCSD) R3770286-2 03/13/22 19:48

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.125	0.116	0.119	92.8	95.2	70.0-123			2.55	20
Toluene	0.125	0.111	0.119	88.8	95.2	75.0-121			6.96	20
Ethylbenzene	0.125	0.113	0.117	90.4	93.6	74.0-126			3.48	20
Xylenes, Total	0.375	0.346	0.367	92.3	97.9	72.0-127			5.89	20
1,2,4-Trimethylbenzene	0.125	0.104	0.117	83.2	93.6	70.0-126			11.8	20
1,3,5-Trimethylbenzene	0.125	0.110	0.121	88.0	96.8	73.0-127			9.52	20
(S) Toluene-d8				95.6	97.7	75.0-131				
(S) 4-Bromofluorobenzene				99.4	100	67.0-138				
(S) 1,2-Dichloroethane-d4				97.9	100	70.0-130				

L1470575-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1470575-01 03/14/22 02:20 • (MS) R3770286-4 03/14/22 04:27 • (MSD) R3770286-5 03/14/22 04:48

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.125	0.0632	0.222	0.207	127	115	1	10.0-149			6.99	37
Toluene	0.125	0.197	0.515	0.487	254	232	1	10.0-156	J5	J5	5.59	38
Ethylbenzene	0.125	0.0105	0.138	0.138	102	102	1	10.0-160			0.000	38
Xylenes, Total	0.375	0.304	0.995	0.938	184	169	1	10.0-160	J5	J5	5.90	38
1,2,4-Trimethylbenzene	0.125	0.0803	0.427	0.387	277	245	1	10.0-160	J5	J5	9.83	36
1,3,5-Trimethylbenzene	0.125	0.145	0.380	0.359	188	171	1	10.0-160	J5	J5	5.68	38
(S) Toluene-d8					100	98.8		75.0-131				
(S) 4-Bromofluorobenzene					114	112		67.0-138				
(S) 1,2-Dichloroethane-d4					98.8	99.7		70.0-130				

Cp

Tc

Ss

Cn

Sr

Qc

Gl

Al

Sc

Method Blank (MB)

(MB) R3770979-1 03/17/22 11:33

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
C10-C28 Diesel Range	U		1.61	4.00
C28-C36 Motor Oil Range	0.358	⬇	0.274	4.00
(S) o-Terphenyl	85.0			18.0-148

Laboratory Control Sample (LCS)

(LCS) R3770979-2 03/17/22 11:46

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
C10-C28 Diesel Range	50.0	35.9	71.8	50.0-150	
(S) o-Terphenyl			84.5	18.0-148	

L1470076-05 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1470076-05 03/17/22 15:15 • (MS) R3770979-3 03/17/22 15:28 • (MSD) R3770979-4 03/17/22 15:41

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
C10-C28 Diesel Range	49.0	ND	37.1	36.5	72.1	70.1	1	50.0-150			1.63	20
(S) o-Terphenyl					74.2	75.8		18.0-148				

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Cp

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Tc

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Ss

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Cn

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Sr

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Qc

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Gl

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Al

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Sc

Method Blank (MB)

(MB) R3771199-2 03/17/22 19:22

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Acenaphthene	U		0.00209	0.00600
Anthracene	U		0.00230	0.00600
Benzo(a)anthracene	U		0.00173	0.00600
Benzo(b)fluoranthene	U		0.00153	0.00600
Benzo(k)fluoranthene	U		0.00215	0.00600
Benzo(a)pyrene	U		0.00179	0.00600
Chrysene	U		0.00232	0.00600
Dibenz(a,h)anthracene	U		0.00172	0.00600
Fluoranthene	U		0.00227	0.00600
Fluorene	U		0.00205	0.00600
Indeno(1,2,3-cd)pyrene	U		0.00181	0.00600
1-Methylnaphthalene	U		0.00449	0.0200
2-Methylnaphthalene	U		0.00427	0.0200
Naphthalene	U		0.00408	0.0200
Pyrene	U		0.00200	0.00600
(S) p-Terphenyl-d14	126	J1		23.0-120
(S) Nitrobenzene-d5	90.6			14.0-149
(S) 2-Fluorobiphenyl	107			34.0-125

1
Cp

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Tc

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Ss

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Cn

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Sr

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Qc

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Gl

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Al

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Sc

Laboratory Control Sample (LCS)

(LCS) R3771199-1 03/17/22 19:04

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acenaphthene	0.0800	0.0834	104	50.0-120	
Anthracene	0.0800	0.0801	100	50.0-126	
Benzo(a)anthracene	0.0800	0.0829	104	45.0-120	
Benzo(b)fluoranthene	0.0800	0.0861	108	42.0-121	
Benzo(k)fluoranthene	0.0800	0.0842	105	49.0-125	
Benzo(a)pyrene	0.0800	0.0827	103	42.0-120	
Chrysene	0.0800	0.0856	107	49.0-122	
Dibenz(a,h)anthracene	0.0800	0.0846	106	47.0-125	
Fluoranthene	0.0800	0.0888	111	49.0-129	
Fluorene	0.0800	0.0866	108	49.0-120	
Indeno(1,2,3-cd)pyrene	0.0800	0.0909	114	46.0-125	
1-Methylnaphthalene	0.0800	0.0798	99.8	51.0-121	
2-Methylnaphthalene	0.0800	0.0814	102	50.0-120	
Naphthalene	0.0800	0.0786	98.2	50.0-120	
Pyrene	0.0800	0.0938	117	43.0-123	

Laboratory Control Sample (LCS)

(LCS) R3771199-1 03/17/22 19:04

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
(S) p-Terphenyl-d14			122	23.0-120	J1
(S) Nitrobenzene-d5			93.4	14.0-149	
(S) 2-Fluorobiphenyl			109	34.0-125	

L1470205-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1470205-01 03/17/22 19:40 • (MS) R3771199-3 03/17/22 19:58 • (MSD) R3771199-4 03/17/22 20:16

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Acenaphthene	0.0804	ND	0.0646	0.0550	80.7	68.8	1	14.0-127			16.1	27
Anthracene	0.0804	ND	0.0632	0.0571	79.0	71.4	1	10.0-145			10.1	30
Benzo(a)anthracene	0.0804	ND	0.0664	0.0598	83.0	74.8	1	10.0-139			10.5	30
Benzo(b)fluoranthene	0.0804	ND	0.0645	0.0573	80.6	71.6	1	10.0-140			11.8	36
Benzo(k)fluoranthene	0.0804	ND	0.0683	0.0645	85.4	80.6	1	10.0-137			5.72	31
Benzo(a)pyrene	0.0804	ND	0.0740	0.0689	92.5	86.1	1	10.0-141			7.14	31
Chrysene	0.0804	ND	0.0711	0.0665	88.9	83.1	1	10.0-145			6.69	30
Dibenz(a,h)anthracene	0.0804	ND	0.0778	0.0664	97.3	83.0	1	10.0-132			15.8	31
Fluoranthene	0.0804	ND	0.0686	0.0579	85.8	72.4	1	10.0-153			16.9	33
Fluorene	0.0804	ND	0.0666	0.0551	83.3	68.9	1	11.0-130			18.9	29
Indeno(1,2,3-cd)pyrene	0.0804	ND	0.0709	0.0655	88.6	81.9	1	10.0-137			7.92	32
1-Methylnaphthalene	0.0804	ND	0.0661	0.0558	81.1	68.2	1	10.0-142			16.9	28
2-Methylnaphthalene	0.0804	ND	0.0675	0.0591	82.1	71.6	1	10.0-137			13.3	28
Naphthalene	0.0804	ND	0.0680	0.0627	85.0	78.4	1	10.0-135			8.11	27
Pyrene	0.0804	ND	0.0719	0.0611	89.9	76.4	1	10.0-148			16.2	35
(S) p-Terphenyl-d14					105	106		23.0-120				
(S) Nitrobenzene-d5					85.1	82.9		14.0-149				
(S) 2-Fluorobiphenyl					94.8	96.3		34.0-125				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

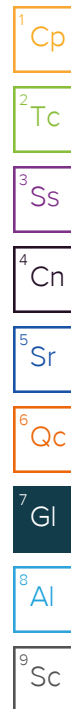
The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.
J1	Surrogate recovery limits have been exceeded; values are outside upper control limits.
J3	The associated batch QC was outside the established quality control range for precision.
J5	The sample matrix interfered with the ability to make any accurate determination; spike value is high.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
P1	RPD value not applicable for sample concentrations less than 5 times the reporting limit.
T8	Sample(s) received past/too close to holding time expiration.



ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey--NELAP	TN002
California	2932	New Mexico ¹	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina ¹	DW21704
Georgia	NELAP	North Carolina ³	41
Georgia ¹	923	North Dakota	R-140
Idaho	TN00003	Ohio--VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky ^{1 6}	KY90010	South Carolina	84004002
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1 4}	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas ⁵	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA -- ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA -- ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA--Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ⁶ Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.



Caerus Oil and Gas

Sample Delivery Group: L1492313
Samples Received: 05/10/2022
Project Number:
Description: A03 VAULT VALVE
Site: A03 VAULT VALVE
Report To: Brett Middleton
143 Diamond Avenue
Parachute, CO 81635

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc

Entire Report Reviewed By:



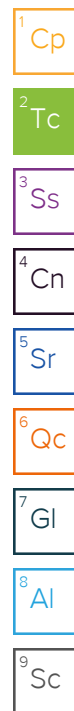
Chris Ward
Project Manager

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Pace Analytical National12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

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SAMPLE SUMMARY

20220506-A03_VAULTBASE_SW@1.5' L1492313-01 Solid

Collected by
Alex Slorby

Collected date/time
05/06/22 10:40

Received date/time
05/10/22 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1864053	1	05/20/22 04:24	05/20/22 04:24	CCE	Mt. Juliet, TN
Wet Chemistry by Method 7199	WG1864659	1	05/17/22 23:57	05/19/22 11:22	SCM	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1865007	1	05/17/22 11:03	05/17/22 15:50	EPW	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1864048	1	05/15/22 13:54	05/15/22 17:17	ARD	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1864463	1	05/17/22 07:23	05/18/22 18:47	ZSA	Mt. Juliet, TN
Metals (ICP) by Method 6010B-NE493 Ch 2	WG1863785	1	05/15/22 10:55	05/18/22 11:08	CCE	Mt. Juliet, TN
Metals (ICPMS) by Method 6020	WG1864465	5	05/17/22 07:42	05/17/22 17:46	LD	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1864210	1	05/11/22 18:20	05/17/22 17:02	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1863765	1	05/11/22 18:20	05/14/22 11:22	ADM	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015M	WG1865840	5	05/19/22 13:35	05/20/22 10:54	JAS	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1865508	1	05/18/22 13:17	05/19/22 01:19	AMG	Mt. Juliet, TN

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

CASE NARRATIVE

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.



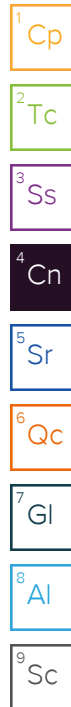
Chris Ward
Project Manager

Report Revision History

Level II Report - Version 1: 05/20/22 15:36

Project Narrative

Rerun to correct sample ID



Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	12.9		1	05/20/2022 04:24	WG1864053

Wet Chemistry by Method 7199

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Hexavalent Chromium	ND		1.00	1	05/19/2022 11:22	WG1864659

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	9.26	T8	1	05/17/2022 15:50	WG1865007

Sample Narrative:

L1492313-01 WG1865007: 9.26 at 21.2C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	1120		10.0	1	05/15/2022 17:17	WG1864048

Sample Narrative:

L1492313-01 WG1864048: at 25C

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Barium	495		0.500	1	05/18/2022 18:47	WG1864463
Cadmium	ND		0.500	1	05/18/2022 18:47	WG1864463
Copper	14.2		2.00	1	05/18/2022 18:47	WG1864463
Lead	12.4		0.500	1	05/18/2022 18:47	WG1864463
Nickel	17.3		2.00	1	05/18/2022 18:47	WG1864463
Selenium	ND		2.00	1	05/18/2022 18:47	WG1864463
Silver	ND		1.00	1	05/18/2022 18:47	WG1864463
Zinc	45.3		5.00	1	05/18/2022 18:47	WG1864463

Metals (ICP) by Method 6010B-NE493 Ch 2

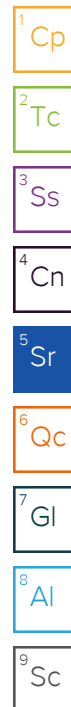
Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Hot Water Sol. Boron	0.865		0.200	1	05/18/2022 11:08	WG1863785

Metals (ICPMS) by Method 6020

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Arsenic	2.42		1.00	5	05/17/2022 17:46	WG1864465

Volatile Organic Compounds (GC) by Method 8015D/GRO

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.122		0.100	1	05/17/2022 17:02	WG1864210
(S) a,a,a-Trifluorotoluene(FID)	111		77.0-120		05/17/2022 17:02	WG1864210



Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Benzene	0.00247		0.00100	1	05/14/2022 11:22	WG1863765
Ethylbenzene	ND	J3	0.00250	1	05/14/2022 11:22	WG1863765
Toluene	0.00630		0.00500	1	05/14/2022 11:22	WG1863765
1,2,4-Trimethylbenzene	ND		0.00500	1	05/14/2022 11:22	WG1863765
1,3,5-Trimethylbenzene	ND		0.00500	1	05/14/2022 11:22	WG1863765
Xylenes, Total	ND	J3	0.00650	1	05/14/2022 11:22	WG1863765
(S) Toluene-d8	108		75.0-131		05/14/2022 11:22	WG1863765
(S) 4-Bromofluorobenzene	102		67.0-138		05/14/2022 11:22	WG1863765
(S) 1,2-Dichloroethane-d4	102		70.0-130		05/14/2022 11:22	WG1863765

Semi-Volatile Organic Compounds (GC) by Method 8015M

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
C10-C28 Diesel Range	39.1		20.0	5	05/20/2022 10:54	WG1865840
C28-C36 Motor Oil Range	34.7		20.0	5	05/20/2022 10:54	WG1865840
(S) o-Terphenyl	81.3		18.0-148		05/20/2022 10:54	WG1865840

Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
Anthracene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Acenaphthene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Benzo(a)anthracene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Benzo(a)pyrene	0.00618		0.00600	1	05/19/2022 01:19	WG1865508
Benzo(b)fluoranthene	0.00741		0.00600	1	05/19/2022 01:19	WG1865508
Benzo(k)fluoranthene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Chrysene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Dibenz(a,h)anthracene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Fluoranthene	0.0103		0.00600	1	05/19/2022 01:19	WG1865508
Fluorene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	05/19/2022 01:19	WG1865508
Naphthalene	ND		0.0200	1	05/19/2022 01:19	WG1865508
Pyrene	0.00831		0.00600	1	05/19/2022 01:19	WG1865508
1-Methylnaphthalene	ND		0.0200	1	05/19/2022 01:19	WG1865508
2-Methylnaphthalene	ND		0.0200	1	05/19/2022 01:19	WG1865508
(S) p-Terphenyl-d14	84.7		23.0-120		05/19/2022 01:19	WG1865508
(S) Nitrobenzene-d5	73.3		14.0-149		05/19/2022 01:19	WG1865508
(S) 2-Fluorobiphenyl	65.4		34.0-125		05/19/2022 01:19	WG1865508

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3793808-1 05/19/22 10:51

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/kg		mg/kg	mg/kg
Hexavalent Chromium	U		0.255	1.00

L1489944-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1489944-01 05/19/22 11:02 • (DUP) R3793808-3 05/19/22 11:07

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/kg	mg/kg		%		%
Hexavalent Chromium	ND	ND	1	9.50		20

L1492939-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1492939-06 05/19/22 12:19 • (DUP) R3793808-4 05/19/22 12:25

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/kg	mg/kg		%		%
Hexavalent Chromium	ND	ND	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3793808-2 05/19/22 10:56

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	mg/kg	mg/kg	%	%	
Hexavalent Chromium	10.0	10.1	101	80.0-120	

L1492955-04 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1492955-04 05/19/22 12:56 • (MS) R3793808-5 05/19/22 13:01 • (MSD) R3793808-6 05/19/22 13:06

	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Analyte	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Hexavalent Chromium	20.0	ND	16.0	13.1	80.0	65.5	1	75.0-125		J6	19.9	20

L1492955-04 Original Sample (OS) • Matrix Spike (MS)

(OS) L1492955-04 05/19/22 12:56 • (MS) R3793808-7 05/19/22 13:11

	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Analyte	mg/kg	mg/kg	mg/kg	%		%	
Hexavalent Chromium	651	ND	656	101	50	75.0-125	

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

L1492691-09 Original Sample (OS) • Duplicate (DUP)

(OS) L1492691-09 05/17/22 15:50 • (DUP) R3792904-2 05/17/22 15:50

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	su	su		%		%
pH	8.02	7.99	1	0.375		1

Sample Narrative:

OS: 8.02 at 20.8C

DUP: 7.99 at 20.4C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1492939-08 Original Sample (OS) • Duplicate (DUP)

(OS) L1492939-08 05/17/22 15:50 • (DUP) R3792904-3 05/17/22 15:50

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	su	su		%		%
pH	8.38	8.32	1	0.719		1

Sample Narrative:

OS: 8.38 at 19.8C

DUP: 8.32 at 20.3C

Laboratory Control Sample (LCS)

(LCS) R3792904-1 05/17/22 15:50

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
Analyte	su	su	%	%	
pH	10.0	9.94	99.4	99.0-101	

Sample Narrative:

LCS: 9.94 at 20.4C

Method Blank (MB)

(MB) R3791979-1 05/15/22 17:17

Analyte	MB Result umhos/cm	MB Qualifier	MB MDL umhos/cm	MB RDL umhos/cm
Specific Conductance	U		10.0	10.0

Sample Narrative:

BLANK: at 25C

L1492308-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1492308-07 05/15/22 17:17 • (DUP) R3791979-3 05/15/22 17:17

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	193	192	1	0.883		20

Sample Narrative:

OS: at 25C

DUP: at 25C

L1492959-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1492959-02 05/15/22 17:17 • (DUP) R3791979-4 05/15/22 17:17

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Specific Conductance	2130	2020	1	5.11		20

Sample Narrative:

OS: at 25C

DUP: at 25C

Laboratory Control Sample (LCS)

(LCS) R3791979-2 05/15/22 17:17

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	268	286	107	85.0-115	

Sample Narrative:

LCS: at 25C

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

Method Blank (MB)

(MB) R3793447-1 05/18/22 18:01

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Barium	U		0.0852	0.500
Cadmium	U		0.0471	0.500
Copper	U		0.400	2.00
Lead	U		0.208	0.500
Nickel	U		0.132	2.00
Selenium	U		0.764	2.00
Silver	U		0.127	1.00
Zinc	U		0.832	5.00

Laboratory Control Sample (LCS)

(LCS) R3793447-2 05/18/22 18:03

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Barium	100	104	104	80.0-120	
Cadmium	100	100	100	80.0-120	
Copper	100	102	102	80.0-120	
Lead	100	100	100	80.0-120	
Nickel	100	102	102	80.0-120	
Selenium	100	104	104	80.0-120	
Silver	20.0	19.9	99.7	80.0-120	
Zinc	100	98.2	98.2	80.0-120	

L1492937-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1492937-01 05/18/22 18:06 • (MS) R3793447-5 05/18/22 18:15 • (MSD) R3793447-6 05/18/22 18:17

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Barium	100	423	612	500	189	77.2	1	75.0-125	V	J3	20.1	20
Cadmium	100	0.687	109	101	109	100	1	75.0-125			7.75	20
Copper	100	23.0	138	130	115	107	1	75.0-125			6.58	20
Lead	100	16.3	127	118	111	102	1	75.0-125			7.42	20
Nickel	100	16.0	130	121	114	105	1	75.0-125			7.00	20
Selenium	100	ND	113	105	113	105	1	75.0-125			7.57	20
Silver	20.0	ND	21.8	20.3	109	102	1	75.0-125			6.96	20
Zinc	100	58.0	166	156	108	97.6	1	75.0-125			6.48	20

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3793214-1 05/18/22 10:01

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Hot Water Sol. Boron	U		0.0167	0.200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3793214-2 05/18/22 10:03 • (LCSD) R3793214-3 05/18/22 10:06

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Hot Water Sol. Boron	1.00	1.04	1.05	104	105	80.0-120			0.909	20

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Method Blank (MB)

(MB) R3792911-1 05/17/22 16:53

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Arsenic	U		0.100	1.00

Laboratory Control Sample (LCS)

(LCS) R3792911-2 05/17/22 16:56

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Arsenic	100	88.7	88.7	80.0-120	

L1492937-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1492937-01 05/17/22 17:00 • (MS) R3792911-5 05/17/22 17:10 • (MSD) R3792911-6 05/17/22 17:13

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Arsenic	100	5.47	96.6	86.0	91.2	80.6	5	75.0-125			11.6	20

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3792908-2 05/17/22 16:18

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	U		0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	112			77.0-120

Laboratory Control Sample (LCS)

(LCS) R3792908-1 05/17/22 15:28

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.01	91.1	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			109	77.0-120	

L1493451-09 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1493451-09 05/17/22 19:10 • (MS) R3792908-3 05/17/22 23:50 • (MSD) R3792908-4 05/18/22 00:12

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	5.50	ND	6.01	5.73	109	105	1	10.0-151			4.77	28
(S) a,a,a-Trifluorotoluene(FID)					101	99.3		77.0-120				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3792623-3 05/14/22 08:06

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000467	0.00100
Toluene	U		0.00130	0.00500
Ethylbenzene	U		0.000737	0.00250
Xylenes, Total	U		0.000880	0.00650
1,2,4-Trimethylbenzene	U		0.00158	0.00500
1,3,5-Trimethylbenzene	U		0.00200	0.00500
(S) Toluene-d8	106			75.0-131
(S) 4-Bromofluorobenzene	99.7			67.0-138
(S) 1,2-Dichloroethane-d4	104			70.0-130

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3792623-1 05/14/22 06:48 • (LCSD) R3792623-2 05/14/22 07:07

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCSD Result mg/kg	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.125	0.127	0.117	102	93.6	70.0-123			8.20	20
Toluene	0.125	0.117	0.113	93.6	90.4	75.0-121			3.48	20
Ethylbenzene	0.125	0.118	0.118	94.4	94.4	74.0-126			0.000	20
Xylenes, Total	0.375	0.383	0.315	102	84.0	72.0-127			19.5	20
1,2,4-Trimethylbenzene	0.125	0.123	0.118	98.4	94.4	70.0-126			4.15	20
1,3,5-Trimethylbenzene	0.125	0.121	0.116	96.8	92.8	73.0-127			4.22	20
(S) Toluene-d8				98.6	102	75.0-131				
(S) 4-Bromofluorobenzene				99.5	102	67.0-138				
(S) 1,2-Dichloroethane-d4				108	109	70.0-130				

L1492313-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1492313-01 05/14/22 11:22 • (MS) R3792623-4 05/14/22 14:56 • (MSD) R3792623-5 05/14/22 15:16

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Benzene	0.125	0.00247	0.145	0.105	114	82.0	1	10.0-149			32.0	37
Toluene	0.125	0.00630	0.176	0.132	136	101	1	10.0-156			28.6	38
Ethylbenzene	0.125	ND	0.134	0.0799	107	63.9	1	10.0-160		J3	50.6	38
Xylenes, Total	0.375	ND	0.421	0.267	111	70.1	1	10.0-160		J3	44.8	38
1,2,4-Trimethylbenzene	0.125	ND	0.135	0.0955	108	76.4	1	10.0-160			34.3	36
1,3,5-Trimethylbenzene	0.125	ND	0.130	0.0905	104	72.4	1	10.0-160			35.8	38
(S) Toluene-d8					102	101		75.0-131				
(S) 4-Bromofluorobenzene					101	97.6		67.0-138				
(S) 1,2-Dichloroethane-d4					104	103		70.0-130				

Cp

Tc

Ss

Cn

Sr

Qc

Gl

Al

Sc

Method Blank (MB)

(MB) R3794143-1 05/19/22 17:46

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
C10-C28 Diesel Range	U		1.61	4.00
C28-C36 Motor Oil Range	U		0.274	4.00
(S) o-Terphenyl	81.8			18.0-148

Laboratory Control Sample (LCS)

(LCS) R3794143-2 05/19/22 17:59

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
C10-C28 Diesel Range	50.0	38.0	76.0	50.0-150	
(S) o-Terphenyl			95.9	18.0-148	

L1493514-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1493514-01 05/19/22 20:23 • (MS) R3794143-3 05/19/22 20:36 • (MSD) R3794143-4 05/19/22 20:49

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
C10-C28 Diesel Range	50.0	63.2	110	69.2	93.6	12.0	2	50.0-150		J3 J6	45.5	20
(S) o-Terphenyl					57.6	54.4		18.0-148				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3793502-2 05/18/22 19:18

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Acenaphthene	U		0.00209	0.00600
Anthracene	U		0.00230	0.00600
Benzo(a)anthracene	U		0.00173	0.00600
Benzo(b)fluoranthene	U		0.00153	0.00600
Benzo(k)fluoranthene	U		0.00215	0.00600
Benzo(a)pyrene	U		0.00179	0.00600
Chrysene	U		0.00232	0.00600
Dibenz(a,h)anthracene	U		0.00172	0.00600
Fluoranthene	U		0.00227	0.00600
Fluorene	U		0.00205	0.00600
Indeno(1,2,3-cd)pyrene	U		0.00181	0.00600
1-Methylnaphthalene	U		0.00449	0.0200
2-Methylnaphthalene	U		0.00427	0.0200
Naphthalene	U		0.00408	0.0200
Pyrene	U		0.00200	0.00600
(S) p-Terphenyl-d14	98.6			23.0-120
(S) Nitrobenzene-d5	79.0			14.0-149
(S) 2-Fluorobiphenyl	78.4			34.0-125

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Laboratory Control Sample (LCS)

(LCS) R3793502-1 05/18/22 18:58

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acenaphthene	0.0800	0.0697	87.1	50.0-120	
Anthracene	0.0800	0.0742	92.8	50.0-126	
Benzo(a)anthracene	0.0800	0.0766	95.8	45.0-120	
Benzo(b)fluoranthene	0.0800	0.0675	84.4	42.0-121	
Benzo(k)fluoranthene	0.0800	0.0662	82.8	49.0-125	
Benzo(a)pyrene	0.0800	0.0616	77.0	42.0-120	
Chrysene	0.0800	0.0699	87.4	49.0-122	
Dibenz(a,h)anthracene	0.0800	0.0623	77.9	47.0-125	
Fluoranthene	0.0800	0.0727	90.9	49.0-129	
Fluorene	0.0800	0.0728	91.0	49.0-120	
Indeno(1,2,3-cd)pyrene	0.0800	0.0659	82.4	46.0-125	
1-Methylnaphthalene	0.0800	0.0703	87.9	51.0-121	
2-Methylnaphthalene	0.0800	0.0688	86.0	50.0-120	
Naphthalene	0.0800	0.0685	85.6	50.0-120	
Pyrene	0.0800	0.0711	88.9	43.0-123	

Laboratory Control Sample (LCS)

(LCS) R3793502-1 05/18/22 18:58

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
(S) p-Terphenyl-d14			98.0	23.0-120	
(S) Nitrobenzene-d5			89.8	14.0-149	
(S) 2-Fluorobiphenyl			83.9	34.0-125	

L1491183-08 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1491183-08 05/18/22 19:38 • (MS) R3793502-3 05/18/22 19:58 • (MSD) R3793502-4 05/18/22 20:18

Analyte	Spike Amount mg/kg	Original Result mg/kg	MS Result mg/kg	MSD Result mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>	<u>MSD Qualifier</u>	RPD %	RPD Limits %
Acenaphthene	0.0796	ND	0.0657	0.0600	82.5	75.8	1	14.0-127			9.07	27
Anthracene	0.0796	ND	0.0690	0.0603	86.7	76.1	1	10.0-145			13.5	30
Benzo(a)anthracene	0.0796	ND	0.0699	0.0609	87.8	76.9	1	10.0-139			13.8	30
Benzo(b)fluoranthene	0.0796	ND	0.0602	0.0523	75.6	66.0	1	10.0-140			14.0	36
Benzo(k)fluoranthene	0.0796	ND	0.0599	0.0580	75.3	73.2	1	10.0-137			3.22	31
Benzo(a)pyrene	0.0796	ND	0.0632	0.0589	79.4	74.4	1	10.0-141			7.04	31
Chrysene	0.0796	ND	0.0672	0.0601	84.4	75.9	1	10.0-145			11.2	30
Dibenz(a,h)anthracene	0.0796	ND	0.0660	0.0630	82.9	79.5	1	10.0-132			4.65	31
Fluoranthene	0.0796	ND	0.0691	0.0605	86.8	76.4	1	10.0-153			13.3	33
Fluorene	0.0796	ND	0.0671	0.0604	84.3	76.3	1	11.0-130			10.5	29
Indeno(1,2,3-cd)pyrene	0.0796	ND	0.0687	0.0625	86.3	78.9	1	10.0-137			9.45	32
1-Methylnaphthalene	0.0796	ND	0.0670	0.0613	84.2	77.4	1	10.0-142			8.89	28
2-Methylnaphthalene	0.0796	ND	0.0638	0.0579	80.2	73.1	1	10.0-137			9.70	28
Naphthalene	0.0796	ND	0.0649	0.0590	81.5	74.5	1	10.0-135			9.52	27
Pyrene	0.0796	ND	0.0673	0.0588	84.5	74.2	1	10.0-148			13.5	35
(S) p-Terphenyl-d14					95.2	84.4		23.0-120				
(S) Nitrobenzene-d5					80.5	68.8		14.0-149				
(S) 2-Fluorobiphenyl					79.8	70.8		34.0-125				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

GLOSSARY OF TERMS

Guide to Reading and Understanding Your Laboratory Report

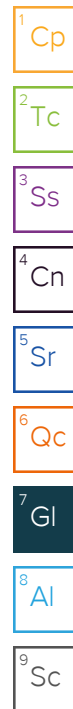
The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J3	The associated batch QC was outside the established quality control range for precision.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
T8	Sample(s) received past/too close to holding time expiration.
V	The sample concentration is too high to evaluate accurate spike recoveries.



ACCREDITATIONS & LOCATIONS

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey--NELAP	TN002
California	2932	New Mexico ¹	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina ¹	DW21704
Georgia	NELAP	North Carolina ³	41
Georgia ¹	923	North Dakota	R-140
Idaho	TN00003	Ohio--VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky ^{1 6}	KY90010	South Carolina	84004002
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1 4}	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas ⁵	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA -- ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA -- ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA--Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ⁶ Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.



Non Conformance(s):	Page:
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