

Caerus Oil and Gas

Sample Delivery Group: L1163609
Samples Received: 11/21/2019
Project Number:
Description: C16OU Investigation
Site: C16OU
Report To: Blair Rollins
143 Diamond Avenue
Parachute, CO 81635










Entire Report Reviewed By:

Chris Ward

Chris Ward
Project Manager

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SAMPLE SUMMARY

20191120-C16OU POR L1163609-01 Solid

Collected by Blair Rollins
 Collected date/time 11/20/19 12:30
 Received date/time 11/21/19 08:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1385785	1	11/25/19 18:11	11/25/19 18:11	EL	Mt. Juliet, TN
Calculated Results	WG1385770	1	11/23/19 05:18	11/26/19 09:26	CCE	Mt. Juliet, TN
Wet Chemistry by Method 3060A/7196A	WG1385605	1	11/23/19 11:00	11/23/19 23:32	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1386956	1	11/27/19 12:00	11/27/19 14:00	MSP	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1387975	1	11/27/19 11:03	11/27/19 14:37	EEM	Mt. Juliet, TN
Mercury by Method 7471A	WG1386366	1	11/25/19 14:50	11/25/19 20:08	TCT	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1385770	1	11/23/19 05:18	11/26/19 09:26	CCE	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015/8021	WG1388162	250	11/22/19 12:01	11/28/19 05:22	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1385572	50	11/22/19 21:29	11/24/19 01:31	KME	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG1385793	1	11/23/19 08:39	11/23/19 12:30	LEA	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



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

- 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	35.9		1	11/25/2019 18:11	WG1385785

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Calculated Results

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chromium, Trivalent	16.6		1.00	1	11/26/2019 09:26	WG1385770

Wet Chemistry by Method 3060A/7196A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Chromium, Hexavalent	ND		2.00	1	11/23/2019 23:32	WG1385605

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.09	<u>T8</u>	1	11/27/2019 14:00	WG1386956

Sample Narrative:

L1163609-01 WG1386956: 8.09 at 21.6C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4950		10.0	1	11/27/2019 14:37	WG1387975

Mercury by Method 7471A

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Mercury	ND		0.0300	1	11/25/2019 20:08	WG1386366

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Arsenic	6.16		2.00	1	11/26/2019 09:26	WG1385770
Barium	381		0.500	1	11/26/2019 09:26	WG1385770
Cadmium	ND		0.500	1	11/26/2019 09:26	WG1385770
Chromium	16.6		1.00	1	11/26/2019 09:26	WG1385770
Copper	11.2		2.00	1	11/26/2019 09:26	WG1385770
Lead	7.79		0.500	1	11/26/2019 09:26	WG1385770
Nickel	12.3		2.00	1	11/26/2019 09:26	WG1385770
Selenium	ND		2.00	1	11/26/2019 09:26	WG1385770
Silver	ND		1.00	1	11/26/2019 09:26	WG1385770
Zinc	28.4		5.00	1	11/26/2019 09:26	WG1385770

Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	6.73		0.125	250	11/28/2019 05:22	WG1388162
Toluene	36.1		1.25	250	11/28/2019 05:22	WG1388162
Ethylbenzene	5.21		0.125	250	11/28/2019 05:22	WG1388162
Total Xylene	101		0.375	250	11/28/2019 05:22	WG1388162
TPH (GC/FID) Low Fraction	1560		25.0	250	11/28/2019 05:22	WG1388162



Volatile Organic Compounds (GC) by Method 8015/8021

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	98.5		77.0-120		11/28/2019 05:22	WG1388162
(S) <i>a,a,a</i> -Trifluorotoluene(PID)	97.3		72.0-128		11/28/2019 05:22	WG1388162

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result mg/kg	Qualifier	RDL mg/kg	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	8220		200	50	11/24/2019 01:31	WG1385572
(S) <i>o</i> -Terphenyl	252	J7	18.0-148		11/24/2019 01:31	WG1385572

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	11/23/2019 12:30	WG1385793
Acenaphthene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Acenaphthylene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Benzo(a)anthracene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Benzo(a)pyrene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Benzo(b)fluoranthene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Benzo(g,h,i)perylene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Benzo(k)fluoranthene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Chrysene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Dibenz(a,h)anthracene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Fluoranthene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Fluorene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Indeno(1,2,3-cd)pyrene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Naphthalene	ND		0.0200	1	11/23/2019 12:30	WG1385793
Phenanthrene	ND		0.00600	1	11/23/2019 12:30	WG1385793
Pyrene	ND		0.00600	1	11/23/2019 12:30	WG1385793
1-Methylnaphthalene	ND		0.0200	1	11/23/2019 12:30	WG1385793
2-Methylnaphthalene	ND		0.0200	1	11/23/2019 12:30	WG1385793
2-Chloronaphthalene	ND		0.0200	1	11/23/2019 12:30	WG1385793
(S) <i>p</i> -Terphenyl-d14	88.4		23.0-120		11/23/2019 12:30	WG1385793
(S) Nitrobenzene-d5	64.1		14.0-149		11/23/2019 12:30	WG1385793
(S) 2-Fluorobiphenyl	78.8		34.0-125		11/23/2019 12:30	WG1385793

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3475448-1 11/23/19 23:22

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Chromium,Hexavalent	U		0.640	2.00

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1162959-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1162959-01 11/23/19 23:24 • (DUP) R3475448-3 11/23/19 23:24

Analyte	Original Result (dry)	DUP Result (dry)	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Chromium,Hexavalent	ND	0.000	1	0.000		20

L1162959-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1162959-11 11/23/19 23:31 • (DUP) R3475448-8 11/23/19 23:31

Analyte	Original Result (dry)	DUP Result (dry)	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Chromium,Hexavalent	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3475448-2 11/23/19 23:23

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Chromium,Hexavalent	24.0	22.3	92.8	80.0-120	

L1162959-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1162959-02 11/23/19 23:24 • (MS) R3475448-4 11/23/19 23:26 • (MSD) R3475448-5 11/23/19 23:26

Analyte	Spike Amount (dry)	Original Result (dry)	MS Result (dry)	MSD Result (dry)	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Chromium,Hexavalent	23.0	ND	19.8	19.4	86.1	84.3	1	75.0-125			2.13	20



L1162959-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1162959-02 11/23/19 23:24 • (MS) R3475448-6 11/23/19 23:27

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MS Rec. %	Dilution	Rec. Limits %	<u>MS Qualifier</u>
Chromium,Hexavalent	740	ND	682	92.2	50	75.0-125	

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



L1163609-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1163609-01 11/27/19 14:00 • (DUP) R3477009-2 11/27/19 14:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.09	8.06	1	0.372		1

Sample Narrative:

OS: 8.09 at 21.6C

DUP: 8.06 at 22C

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1163943-25 Original Sample (OS) • Duplicate (DUP)

(OS) L1163943-25 11/27/19 14:00 • (DUP) R3477009-3 11/27/19 14:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.29	8.31	1	0.241		1

Sample Narrative:

OS: 8.29 at 21C

DUP: 8.31 at 20.9C

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3477009-1 11/27/19 14:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
pH	10.0	9.92	99.2	99.0-101	

Sample Narrative:

LCS: 9.92 at 19.8C



Method Blank (MB)

(MB) R3477023-1 11/27/19 14:37

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

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1163543-10 Original Sample (OS) • Duplicate (DUP)

(OS) L1163543-10 11/27/19 14:37 • (DUP) R3477023-3 11/27/19 14:37

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	2610	2600	1	0.346		20

L1164425-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1164425-03 11/27/19 14:37 • (DUP) R3477023-4 11/27/19 14:37

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	107	107	1	0.560		20

Laboratory Control Sample (LCS)

(LCS) R3477023-2 11/27/19 14:37

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	475	477	100	85.0-115	



Method Blank (MB)

(MB) R3476184-1 11/25/19 19:29

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Mercury	U		0.00280	0.0300

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

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

(LCS) R3476184-2 11/25/19 19:35 • (LCSD) R3476184-3 11/25/19 19:37

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Mercury	0.500	0.550	0.505	110	101	80.0-120			8.42	20

L1163656-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163656-01 11/25/19 19:39 • (MS) R3476184-4 11/25/19 19:41 • (MSD) R3476184-5 11/25/19 19:43

Analyte	Spike Amount (dry)	Original Result (dry)	MS Result (dry)	MSD Result (dry)	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Mercury	0.603	0.00884	0.619	0.560	101	91.3	1	75.0-125			10.0	20

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3476449-1 11/26/19 08:52

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Arsenic	U		0.460	2.00
Barium	U		0.170	0.500
Cadmium	U		0.0700	0.500
Chromium	U		0.140	1.00
Copper	U		0.530	2.00
Lead	U		0.190	0.500
Nickel	U		0.490	2.00
Selenium	U		0.620	2.00
Silver	U		0.120	1.00
Zinc	U		0.590	5.00

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

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

(LCS) R3476449-2 11/26/19 08:55 • (LCSD) R3476449-3 11/26/19 08:57

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 %
Arsenic	100	94.0	94.2	94.0	94.2	80.0-120			0.210	20
Barium	100	104	104	104	104	80.0-120			0.0197	20
Cadmium	100	95.8	96.3	95.8	96.3	80.0-120			0.514	20
Chromium	100	96.2	96.6	96.2	96.6	80.0-120			0.376	20
Copper	100	93.5	93.8	93.5	93.8	80.0-120			0.221	20
Lead	100	95.5	96.0	95.5	96.0	80.0-120			0.491	20
Nickel	100	98.6	98.8	98.6	98.8	80.0-120			0.185	20
Selenium	100	98.2	98.2	98.2	98.2	80.0-120			0.0166	20
Silver	20.0	17.2	17.2	85.8	86.2	80.0-120			0.427	20
Zinc	100	97.9	98.0	97.9	98.0	80.0-120			0.137	20

L1163779-37 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163779-37 11/26/19 09:00 • (MS) R3476449-6 11/26/19 09:07 • (MSD) R3476449-7 11/26/19 09:10

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	4.92	101	97.4	95.6	92.4	1	75.0-125			3.19	20
Barium	100	82.0	181	163	98.8	80.9	1	75.0-125			10.4	20
Cadmium	100	ND	98.7	96.2	98.5	95.9	1	75.0-125			2.66	20
Chromium	100	12.4	108	105	95.5	92.9	1	75.0-125			2.45	20
Copper	100	12.1	109	106	97.1	93.5	1	75.0-125			3.37	20
Lead	100	9.53	109	106	99.7	96.2	1	75.0-125			3.23	20
Nickel	100	15.3	119	115	103	100	1	75.0-125			2.80	20



L1163779-37 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163779-37 11/26/19 09:00 • (MS) R3476449-6 11/26/19 09:07 • (MSD) R3476449-7 11/26/19 09:10

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 %
Selenium	100	ND	100	97.1	100	97.1	1	75.0-125			3.14	20
Silver	20.0	ND	18.2	17.4	90.9	87.0	1	75.0-125			4.46	20
Zinc	100	51.7	135	133	83.4	81.0	1	75.0-125			1.79	20

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3477708-3 11/28/19 01:37

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000120	0.000500
Toluene	0.000317	↓	0.000150	0.00500
Ethylbenzene	U		0.000110	0.000500
Total Xylene	U		0.000460	0.00150
TPH (GC/FID) Low Fraction	0.0315	↓	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	101			77.0-120
(S) a,a,a-Trifluorotoluene(PID)	94.7			72.0-128

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

Laboratory Control Sample (LCS)

(LCS) R3477708-1 11/28/19 00:35

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0500	0.0546	109	76.0-121	
Toluene	0.0500	0.0494	98.8	80.0-120	
Ethylbenzene	0.0500	0.0510	102	80.0-124	
Total Xylene	0.150	0.139	92.7	37.0-160	
(S) a,a,a-Trifluorotoluene(FID)			101	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			101	72.0-128	

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3477708-2 11/28/19 00:56

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.04	91.6	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			111	77.0-120	
(S) a,a,a-Trifluorotoluene(PID)			122	72.0-128	



L1163489-09 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163489-09 11/28/19 02:38 • (MS) R3477708-4 11/28/19 09:08 • (MSD) R3477708-5 11/28/19 09:28

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	0.725	ND	0.676	0.683	93.2	94.2	25	10.0-155			1.03	32
Toluene	0.725	ND	0.645	0.645	89.0	89.0	25	10.0-160			0.000	34
Ethylbenzene	0.725	ND	0.673	0.676	92.8	93.2	25	10.0-160			0.445	32
Total Xylene	2.18	ND	1.83	1.85	83.9	84.9	25	10.0-160			1.09	32
(S) a,a,a-Trifluorotoluene(FID)					101	102		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					103	104		72.0-128				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1163489-09 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163489-09 11/28/19 02:38 • (MS) R3477708-6 11/28/19 09:49 • (MSD) R3477708-7 11/28/19 10:09

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	79.8	ND	69.9	60.4	87.6	75.7	25	10.0-151			14.6	28
(S) a,a,a-Trifluorotoluene(FID)					110	107		77.0-120				
(S) a,a,a-Trifluorotoluene(PID)					122	121		72.0-128				

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3475517-1 11/23/19 17:54

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) High Fraction	U		0.769	4.00
<i>(S) o-Terphenyl</i>	75.1			18.0-148

1 Cp

2 Tc

3 Ss

Laboratory Control Sample (LCS)

(LCS) R3475517-2 11/23/19 18:07

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	43.3	86.6	50.0-150	
<i>(S) o-Terphenyl</i>			77.3	18.0-148	

4 Cn

5 Sr

6 Qc

L1163543-13 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163543-13 11/23/19 20:31 • (MS) R3475517-3 11/23/19 20:45 • (MSD) R3475517-4 11/23/19 20:58

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) High Fraction	50.0	31.7	85.3	60.5	107	57.6	1	50.0-150		J3	34.0	20
<i>(S) o-Terphenyl</i>					70.0	72.5		18.0-148				

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3475432-2 11/23/19 12:08

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Anthracene	U		0.00600	0.00600
Acenaphthene	U		0.00600	0.00600
Acenaphthylene	U		0.00600	0.00600
Benzo(a)anthracene	U		0.00600	0.00600
Benzo(a)pyrene	U		0.00600	0.00600
Benzo(b)fluoranthene	U		0.00600	0.00600
Benzo(g,h,i)perylene	U		0.00600	0.00600
Benzo(k)fluoranthene	U		0.00600	0.00600
Chrysene	U		0.00600	0.00600
Dibenz(a,h)anthracene	U		0.00600	0.00600
Fluoranthene	U		0.00600	0.00600
Fluorene	U		0.00600	0.00600
Indeno(1,2,3-cd)pyrene	U		0.00600	0.00600
Naphthalene	U		0.00200	0.0200
Phenanthrene	U		0.00600	0.00600
Pyrene	U		0.00600	0.00600
1-Methylnaphthalene	U		0.00200	0.0200
2-Methylnaphthalene	U		0.00200	0.0200
2-Chloronaphthalene	U		0.00200	0.0200
(S) Nitrobenzene-d5	70.0			14.0-149
(S) 2-Fluorobiphenyl	87.6			34.0-125
(S) p-Terphenyl-d14	108			23.0-120

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3475432-1 11/23/19 11:46

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Anthracene	0.0800	0.0751	93.9	50.0-126	
Acenaphthene	0.0800	0.0686	85.8	50.0-120	
Acenaphthylene	0.0800	0.0733	91.6	50.0-120	
Benzo(a)anthracene	0.0800	0.0779	97.4	45.0-120	
Benzo(a)pyrene	0.0800	0.0665	83.1	42.0-120	
Benzo(b)fluoranthene	0.0800	0.0719	89.9	42.0-121	
Benzo(g,h,i)perylene	0.0800	0.0737	92.1	45.0-125	
Benzo(k)fluoranthene	0.0800	0.0719	89.9	49.0-125	
Chrysene	0.0800	0.0757	94.6	49.0-122	
Dibenz(a,h)anthracene	0.0800	0.0749	93.6	47.0-125	
Fluoranthene	0.0800	0.0828	104	49.0-129	



Laboratory Control Sample (LCS)

(LCS) R3475432-1 11/23/19 11:46

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Fluorene	0.0800	0.0782	97.8	49.0-120	
Indeno(1,2,3-cd)pyrene	0.0800	0.0732	91.5	46.0-125	
Naphthalene	0.0800	0.0680	85.0	50.0-120	
Phenanthrene	0.0800	0.0735	91.9	47.0-120	
Pyrene	0.0800	0.0781	97.6	43.0-123	
1-Methylnaphthalene	0.0800	0.0747	93.4	51.0-121	
2-Methylnaphthalene	0.0800	0.0724	90.5	50.0-120	
2-Chloronaphthalene	0.0800	0.0700	87.5	50.0-120	
<i>(S) Nitrobenzene-d5</i>			72.9	14.0-149	
<i>(S) 2-Fluorobiphenyl</i>			91.5	34.0-125	
<i>(S) p-Terphenyl-d14</i>			105	23.0-120	

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1163617-13 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1163617-13 11/23/19 17:17 • (MS) R3475432-3 11/23/19 17:39 • (MSD) R3475432-4 11/23/19 18:01

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 %
Anthracene	0.0800	ND	0.0646	0.0625	80.7	78.1	1	10.0-145			3.30	30
Acenaphthene	0.0800	ND	0.0592	0.0591	74.0	73.9	1	14.0-127			0.169	27
Acenaphthylene	0.0800	ND	0.0632	0.0631	79.0	78.9	1	21.0-124			0.158	25
Benzo(a)anthracene	0.0800	ND	0.0666	0.0663	83.3	82.9	1	10.0-139			0.451	30
Benzo(a)pyrene	0.0800	ND	0.0622	0.0593	77.8	74.1	1	10.0-141			4.77	31
Benzo(b)fluoranthene	0.0800	ND	0.0594	0.0590	74.3	73.8	1	10.0-140			0.676	36
Benzo(g,h,i)perylene	0.0800	ND	0.0646	0.0629	80.7	78.6	1	10.0-140			2.67	33
Benzo(k)fluoranthene	0.0800	ND	0.0636	0.0595	79.5	74.4	1	10.0-137			6.66	31
Chrysene	0.0800	ND	0.0663	0.0640	82.9	80.0	1	10.0-145			3.53	30
Dibenz(a,h)anthracene	0.0800	ND	0.0674	0.0646	84.3	80.7	1	10.0-132			4.24	31
Fluoranthene	0.0800	ND	0.0687	0.0695	85.9	86.9	1	10.0-153			1.16	33
Fluorene	0.0800	ND	0.0656	0.0655	82.0	81.9	1	11.0-130			0.153	29
Indeno(1,2,3-cd)pyrene	0.0800	ND	0.0643	0.0627	80.4	78.4	1	10.0-137			2.52	32
Naphthalene	0.0800	ND	0.0619	0.0597	77.4	74.6	1	10.0-135			3.62	27
Phenanthrene	0.0800	ND	0.0631	0.0633	78.9	79.1	1	10.0-144			0.316	31
Pyrene	0.0800	ND	0.0625	0.0628	78.1	78.5	1	10.0-148			0.479	35
1-Methylnaphthalene	0.0800	ND	0.0652	0.0650	81.5	81.3	1	10.0-142			0.307	28
2-Methylnaphthalene	0.0800	ND	0.0643	0.0628	80.4	78.5	1	10.0-137			2.36	28
2-Chloronaphthalene	0.0800	ND	0.0614	0.0613	76.8	76.6	1	29.0-120			0.163	24
<i>(S) Nitrobenzene-d5</i>					68.1	68.8		14.0-149				
<i>(S) 2-Fluorobiphenyl</i>					79.7	79.1		34.0-125				
<i>(S) p-Terphenyl-d14</i>					83.7	83.7		23.0-120				



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

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
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.
J3	The associated batch QC was outside the established quality control range for precision.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
T8	Sample(s) received past/too close to holding time expiration.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* 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 National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico ¹	n/a
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}	90010	South Carolina	84004
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1,4}	2006
Louisiana ¹	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas ⁵	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

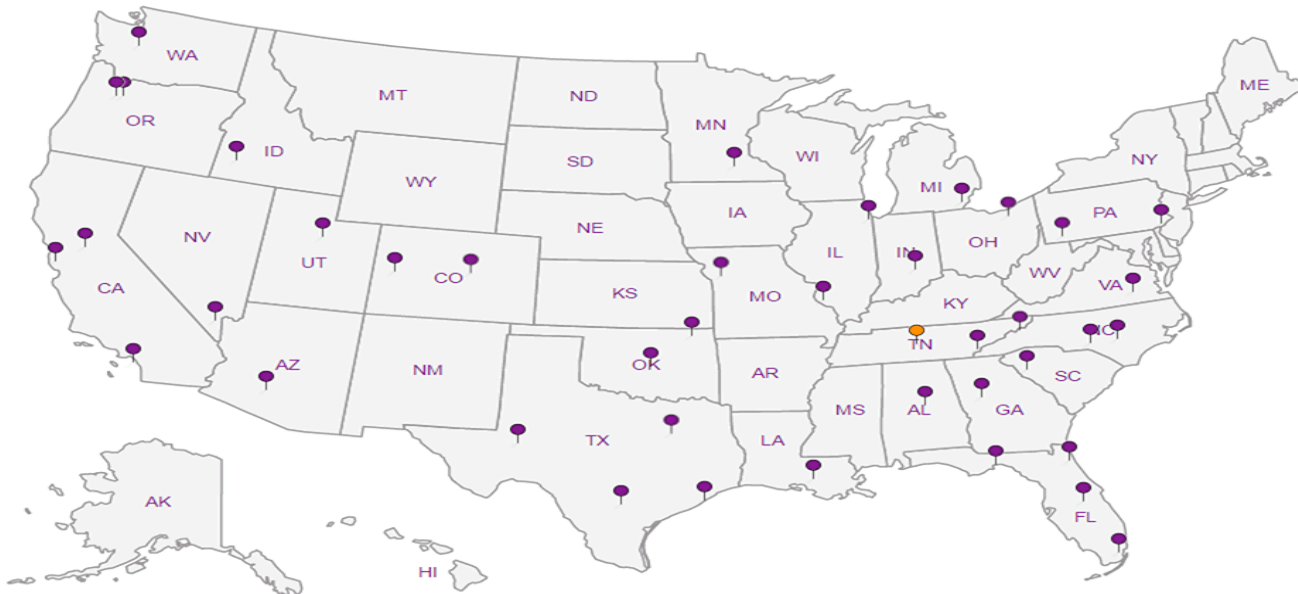
Third Party Federal Accreditations

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

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

