

January 2, 2020

Jake Janicek
EH&S Specialist
143 Diamond Avenue
Parachute, Colorado 81635

**RE: Flowline Release Excavation Summary (Remediation Number 14788)
C16OU
Caerus Oil & Gas, LLC
Mesa County, Colorado**

Dear Mr. Janicek:

LT Environmental, Inc. (LTE) was contracted by Caerus Oil and Gas, LLC (Caerus) to conduct excavation oversight and soil sampling activities associated with the release of produced water and condensate from a flowline (Remediation Number 14788) at the C16OU (Site). The Site is located in Caerus's Orchard area of operation located in Mesa County, Colorado (Figure 1). On November 15, 2019, during a routine pressure test of the production pipeline infrastructure at the Site, the leaking flowline to the production tank was found, resulting in the release of approximately 985 barrels (bbls) of produced water and condensate into the soil beneath the pad surface.

Excavation and Soil Sampling Activities

On December 17, 2019, Caerus and LTE personnel conducted potholing activities at the Site in an attempt to delineate hydrocarbon impacts associated with the flowline release. A total of five potholes were advanced to delineate the release extent. Stricklan Service Company (SSC) was on site with a track-hoe to assist in delineation and pothole soil sample collection. Four of the pothole locations were advanced to 20 feet below ground surface (bgs) and the fifth pothole location was advanced to 21 feet bgs. During advancement of each pothole location the soil was inspected for the presence or absence of petroleum hydrocarbon odor and/or staining. The soil was characterized by visually inspecting the soil sample and field screening the soil headspace using a photoionization detector (PID) to monitor for the presence of volatile organic vapors. One soil sample was collected from the terminus of each pothole location. All soil samples were submitted in laboratory-prepared containers to Pace Analytical (Pace) in Mt. Juliet, Tennessee for laboratory analysis of total petroleum hydrocarbons-gasoline range organics (TPH-GRO), TPH-diesel range organics (DRO), benzene, toluene, ethylbenzene, total xylenes (BTEX), electrical conductivity (EC), sodium adsorption ratio (SAR), and pH. The pothole locations are depicted on the attached Figure 2.



From December 18 through 20, 2019, LTE personnel conducted excavation oversight of the removal of hydrocarbon impacted soil beneath the failed flowline at the Site. SSC was on site with a track-hoe to assist in excavation delineation and confirmation soil sample collection. The excavation was directed by an LTE geologist who inspected the soil for the presence or absence of petroleum hydrocarbon odor and/or staining. The soil was characterized by visually inspecting the soil sample and field screening the soil headspace using a PID to monitor for the presence of volatile organic vapors. When field screening techniques indicated the removal of hydrocarbon impacted soil, excavation confirmation soil samples were collected. A total of five excavation confirmation soil samples were collected at depths ranging from 16 feet to 21 feet bgs: four sidewall samples and one floor sample. The total depth of the excavation extent was approximately 21 feet bgs. Approximately 756 cubic yards of excavated soil were transported to Greenleaf Environmental Services for disposal. All soil samples were submitted in laboratory-prepared containers to Pace in Mt. Juliet, Tennessee for laboratory analysis of TPH-GRO, TPH-DRO, BTEX, EC, SAR, and pH. The excavation extent and confirmation soil sample locations are depicted on the attached Figure 2.

Groundwater Sampling

On December 30, 2019, Caerus and LTE personnel collected three spring and two domestic water well samples from locations identified downgradient of the Site. Sample locations were selected based on their proximity to the Site and estimated groundwater flow direction. During field activities two locations (Down Gradient Sample and Up Gradient Sample) within Alkali Creek west of the Site were inspected to confirm the presence or absence of flowing water. These two locations were verified to be dry with no evidence of flowing water. Field parameters were collected at each spring sampling location where water was present. No hydrocarbon odor or sheen were observed at any of the spring locations. Two of the three spring samples (20191230 – C16OU - RED ROOF BARN SPRING and 201912230 – C16OU - VANHOOSE/KEINATH SPRING) were collected downgradient of their respective spring locations from the outfall of a polyvinyl chloride (PVC) pipe which is connected to a cistern where the spring water is stored. The two domestic water well samples were collected from within the landowners water treatment buildings, from the ball valve closest to each well location using clean, disposable tubing. LTE purged approximately 20 gallons of groundwater from each well prior to sample collection. Field parameters were collected during well purging activities to ensure formation water was being sampled. No hydrocarbon odor or sheen were observed at the domestic well locations. All water samples were submitted to Pace in Mt. Juliet, Tennessee for analysis of constituents identified in the Colorado Oil and Gas Conservation Commission (COGCC) Initial 609 Baseline Sampling Suite. The Alkali Creek, spring, and domestic well sample locations are depicted on the attached Figures 3 and 4. Laboratory analytical results are expected in the following two weeks. Once laboratory analytical results are reported a report of work completed (ROWC) will be submitted discussing the results.





Analytical Results

Laboratory analytical results of the pothole soil samples indicate concentrations of analytes that are either below the laboratory detection limit or within the COGCC Table 910-1 Concentration Levels except for EC, SAR, and pH. EC exceedances range from 4.530 millimhos per centimeter (mmhos/cm) in soil sample 20191217-C16OU-E-PH@20' to 4.680 mmhos/cm in soil sample 20191217-C16OU-POR@21'. SAR exceedances range from 13.9 in soil sample 20191217-C16OU-W-PH@20' to 52.20 in soil sample 20191217-C16OU-E-PH@20'. Soil sample 20191217-C16OU-E-PH@20' exceeds the COGCC Table 910-1 Concentration Level for pH with a value of 9.05. Laboratory analytical reports are included as an attachment and summarized in Table 1.

Laboratory analytical results of all excavation confirmation soil samples indicate concentrations of analytes that are either below the laboratory detection limit or within the COGCC Table 910-1 Concentration Levels except for TPH, EC and SAR. Excavation confirmation soil sample 20191220-C16OU (NBOTTOM) @ 21' exceeds the COGCC Table 910-1 Concentration Level for TPH with a concentration of 2,252 milligram per kilogram (mg/kg). EC exceedances range from 4.110 mmhos/cm in soil sample 20191218-C16OU (WWALL) @ 17' to 4.660 mmhos/cm in soil sample 20191220-C16OU (NBOTTOM) @ 21'. SAR exceedances range from 24.9 in soil sample 20191220-C16OU (NBOTTOM) @ 21' to 61.6 in soil sample 20191219-C16OU (EWALL) @ 16'. Laboratory analytical reports are included as an attachment and summarized in Table 1.





Please call us at (970) 285-9985 if you have any questions regarding this report or require additional information.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read 'D Held'.

Dustin Held
Project Geologist

A handwritten signature in black ink, appearing to read 'Chris McKisson'.

Chris McKisson
Western Slope Manager

Attachments:

Figure 1 – Site Location Map

Figure 2 – Site Map

Figure 3 – Domestic Water Well Sampling

Figure 4 – Alkali Creek Sampling

Table 1 – Laboratory Results Summary Table

Attachment 1 – Laboratory Analytical Reports



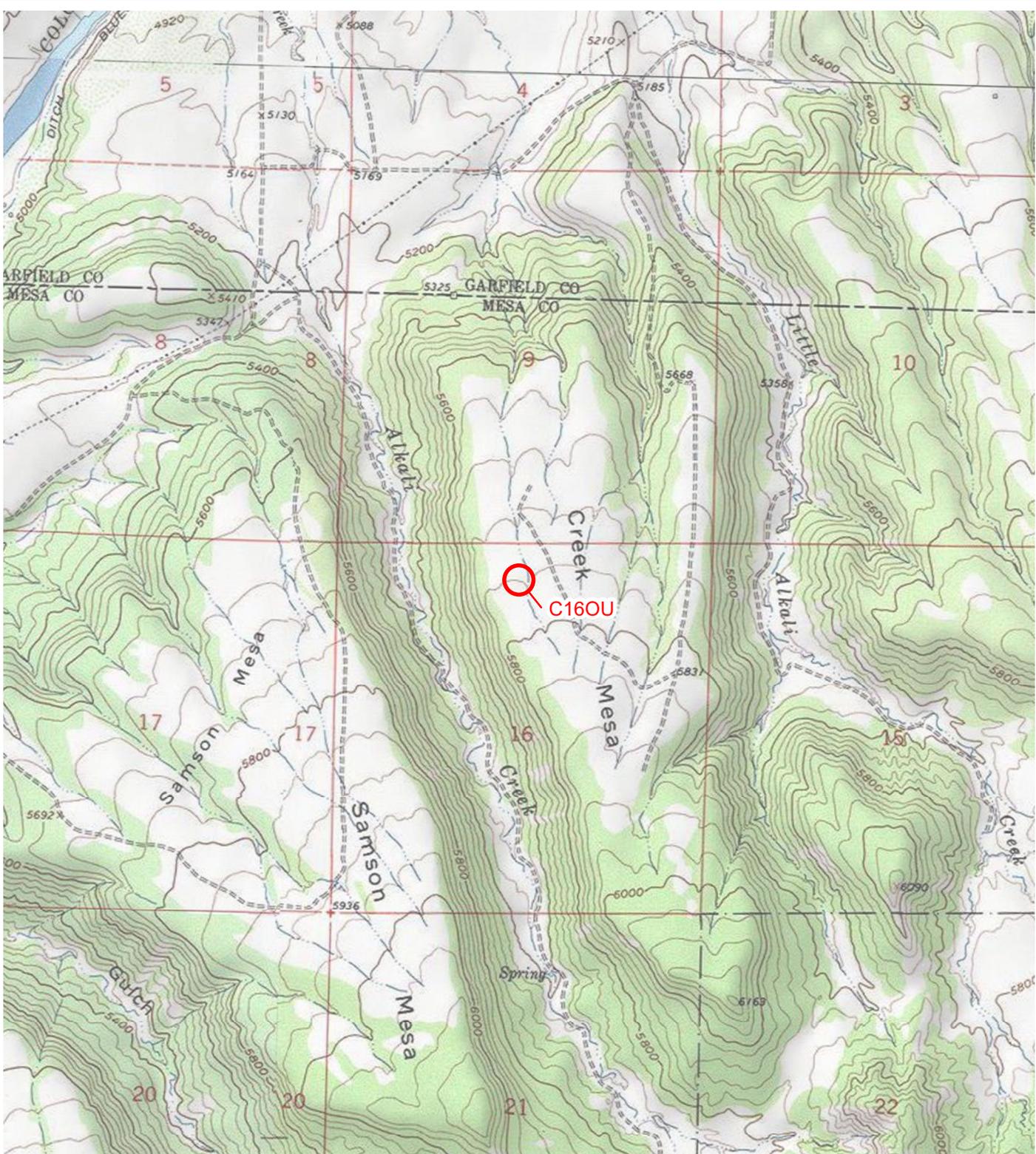


IMAGE COURTESY OF ESRI/USGS

LEGEND

 SITE LOCATION

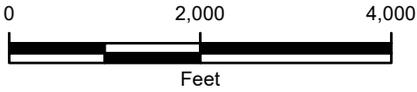


FIGURE 1
SITE LOCATION MAP
C160U
NENW SEC 16-T8S-R96W
MESA COUNTY, COLORADO
CAERUS OIL AND GAS, LLC



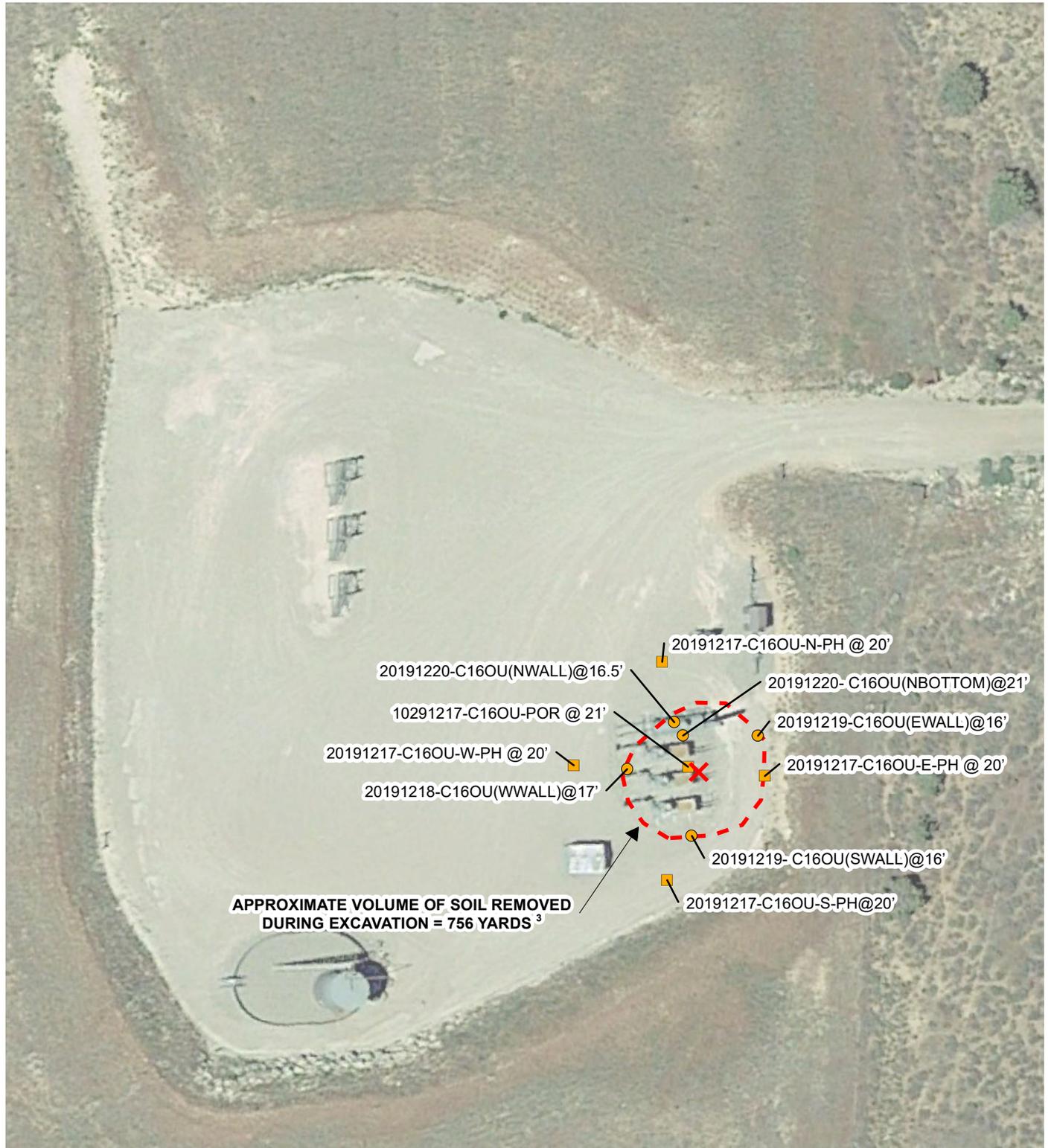


IMAGE COURTESY OF GOOGLE EARTH 2016

LEGEND

-  RELEASE LOCATION
-  SOIL SAMPLE
-  POTHOLE
-  EXCAVATION EXTENT (12/20/2019)

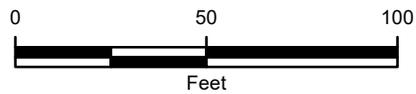


FIGURE 2
SITE MAP
C16OU
NENW SEC 16-T8S-R96W
MESA COUNTY, COLORADO
CAERUS OIL AND GAS, LLC



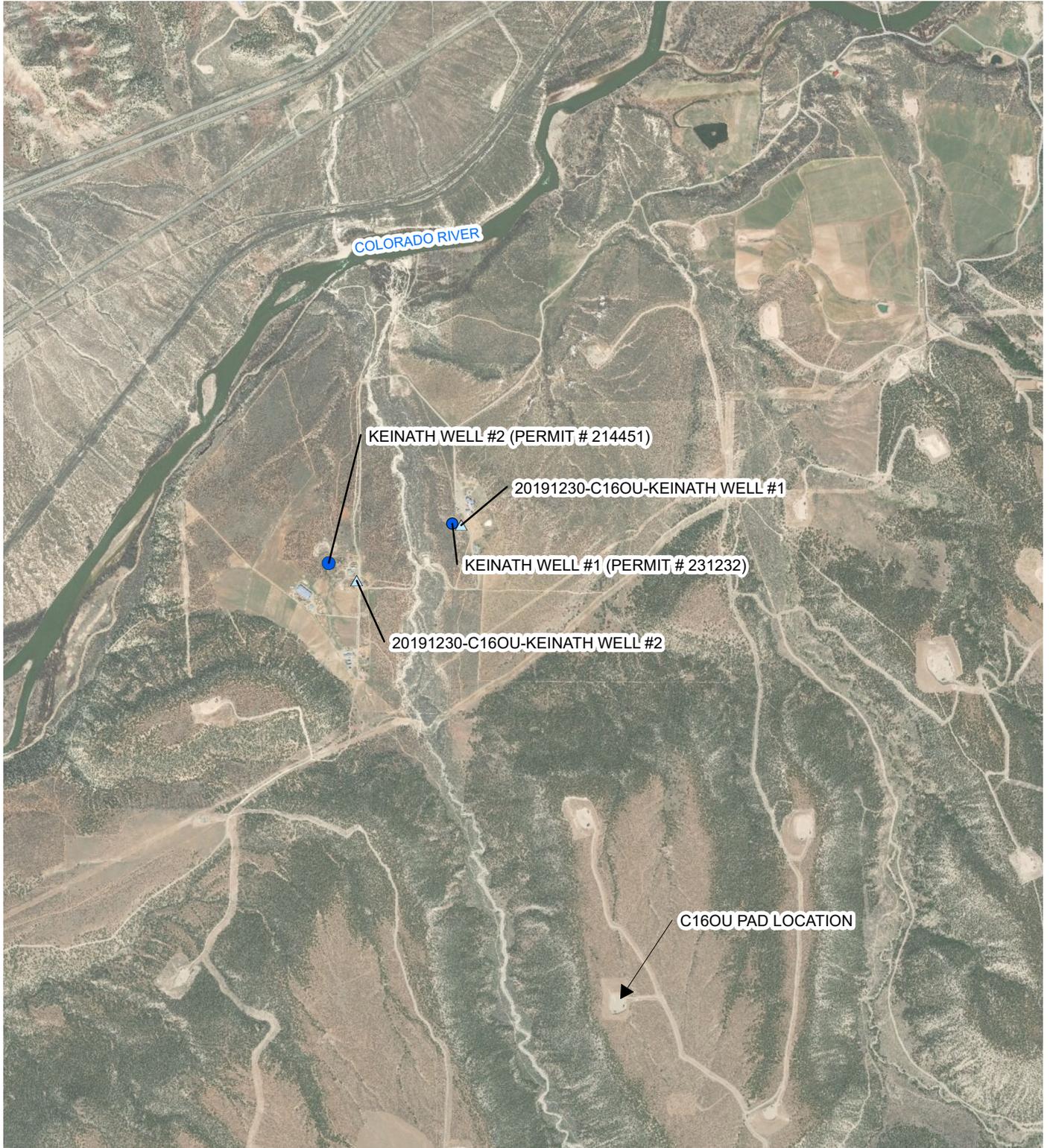


IMAGE COURTESY OF GOOGLE EARTH 2016

LEGEND

- DOMESTIC WATER WELL LOCATION
- ▲ DOMESTIC WATER WELL SAMPLING LOCATION

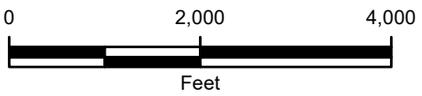


FIGURE 3
DOMESTIC WATER WELL SAMPLING
C16OU
NENW SEC 16-T8S-R96W
MESA COUNTY, COLORADO
CAERUS OIL AND GAS, LLC





IMAGE COURTESY OF GOOGLE EARTH 2016

LEGEND

-  ALKALI CREEK SAMPLE LOCATION
-  SPRING
-  SPRING SAMPLE LOCATION

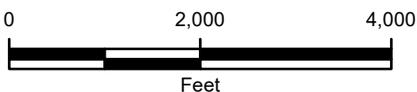


FIGURE 4
ALKALI CREEK SAMPLING
C16OU
NENW SEC 16-T8S-R96W
MESA COUNTY, COLORADO
CAERUS OIL AND GAS, LLC



**TABLE 1
LABORATORY RESULTS SUMMARY TABLE**

**C16OU
MESA COUNTY, COLORADO
CAERUS OIL GAS, LLC**

PARAMETER	COGCC CONCENTRATION LEVELS	UNITS	CONFIRMATION SOIL SAMPLES									
			20191217-C16OU-POR@21'	20191217-C16OU-N-PH@20'	20191217-C16OU-E-PH@20'	20191217-C16OU-S-PH@20'	20191217-C16OU-W-PH@20'	20191218-C16OU(WWALL) @ 17'	20191219-C16OU(SWALL) @ 16'	20191219-C16OU(EWALL) @ 16'	20191220-C16OU(NWALL) @ 16.5'	20191220-C16OU(NBOTTOM) @ 21'
Sample Date			12/17/2019	12/17/2019	12/17/2019	12/17/2019	12/17/2019	12/18/2019	12/19/2019	12/19/2019	12/20/2019	12/20/2019
Sample Depth		FEET	21'	20'	20'	20'	20'	17'	16'	16'	16.5'	21'
Arsenic	0.39	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	15,000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	70	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (III)	120,000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (VI)	23	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	3,100	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	400	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	23	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	1,600	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	390	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	390	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	23,000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EC	4.0	mmhos/cm	4.680	3.420	4.530	2.640	3.050	4.110	4.400	4.130	3.460	4.660
pH	6 - 9	SU	8.69	8.47	9.05	8.56	8.84	8.09	8.66	8.74	8.53	8.14
SAR	12	unitless	33.6	10.3	52.2	11.0	13.9	7.45	34.7	61.6	55.2	24.9
TPH-GRO		mg/kg	70.3	0.156	0.489	0.357	0.213	0.142	0.231	0.245	0.383	362
TPH-DRO		mg/kg	187	ND	ND	ND	ND	ND	ND	ND	ND	1,890
TPH	500	mg/kg	257.3	0.156	0.489	0.357	0.213	0.142	0.231	0.245	0.383	2,252
Benzene	0.17	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0575
Toluene	85	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.827
Ethylbenzene	100	mg/kg	0.0226	ND	ND	ND	ND	ND	ND	ND	ND	0.679
Total Xylenes	175	mg/kg	0.350	ND	ND	ND	ND	ND	ND	ND	ND	9.25
Acenaphthene	1000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)anthracene	0.22	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(B)fluoranthene	0.22	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(K)fluoranthene	2.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(A)pyrene	0.022	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	22	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(A,H)anthracene	0.022	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	1000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	1000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3,C,D)pyrene	0.22	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	23	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	1000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
 ND - analyte not detected above the stated reporting limit
 COGCC - Colorado Oil and Gas Conservation Commission
BOLD - indicates result exceeds the COGCC concentration level
 EC- electrical conductivity
 mmhos/cm - millimhos per centimeter
 NA - not analyzed
 SU - standard unit
 mg/kg - milligrams per kilogram
 SAR - sodium adsorption ratio





December 26, 2019

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Caerus Oil and Gas

Sample Delivery Group: L1172636
Samples Received: 12/19/2019
Project Number: C160U
Description: C160U Dumpline Release
Site: C160U
Report To: Jake Janicek
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jared Starkey
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.



Cp: Cover Page	1	¹Cp
Tc: Table of Contents	2	²Tc
Ss: Sample Summary	3	³Ss
Cn: Case Narrative	4	⁴Cn
Sr: Sample Results	5	⁵Sr
20191217-C160U-W-PH@20' L1172636-01	5	⁴Cn
Qc: Quality Control Summary	6	⁶Qc
Wet Chemistry by Method 9045D	6	⁵Sr
Wet Chemistry by Method 9050AMod	7	⁶Qc
Volatile Organic Compounds (GC) by Method 8015D/GRO	8	⁷Gl
Volatile Organic Compounds (GC/MS) by Method 8260B	9	⁸Al
Semi-Volatile Organic Compounds (GC) by Method 8015	10	⁹Sc
Gl: Glossary of Terms	11	
Al: Accreditations & Locations	12	
Sc: Sample Chain of Custody	13	

SAMPLE SUMMARY



20191217-C160U-W-PH@20' L1172636-01 Solid

Collected by Dustin H.	Collected date/time 12/17/19 14:45	Received date/time 12/19/19 09:30
---------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1398971	1	12/23/19 19:49	12/23/19 19:49	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400566	1	12/20/19 08:39	12/21/19 19:54	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1401651	1	12/20/19 08:39	12/23/19 18:27	JHH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1400911	1	12/22/19 10:07	12/22/19 13:40	JDG	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.

Jared Starkey
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	13.9		1	12/23/2019 19:49	WG1398971

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.84	<u>T8</u>	1	12/23/2019 14:40	WG1401558

Sample Narrative:

L1172636-01 WG1401558: 8.84 at 23.6C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	3050		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.213		0.100	1	12/21/2019 19:54	WG1400566
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	97.2		77.0-120		12/21/2019 19:54	WG1400566

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND	<u>J3</u>	0.00100	1	12/23/2019 18:27	WG1401651
Toluene	ND	<u>J3</u>	0.00500	1	12/23/2019 18:27	WG1401651
Ethylbenzene	ND	<u>J3</u>	0.00250	1	12/23/2019 18:27	WG1401651
Total Xylenes	ND	<u>J3</u>	0.00650	1	12/23/2019 18:27	WG1401651
(S) <i>Toluene-d8</i>	103		75.0-131		12/23/2019 18:27	WG1401651
(S) <i>4-Bromofluorobenzene</i>	96.9		67.0-138		12/23/2019 18:27	WG1401651
(S) <i>1,2-Dichloroethane-d4</i>	107		70.0-130		12/23/2019 18:27	WG1401651

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/22/2019 13:40	WG1400911
(S) <i>o</i> -Terphenyl	62.0		18.0-148		12/22/2019 13:40	WG1400911

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



L1172636-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172636-01 12/23/19 14:40 • (DUP) R3485400-2 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.84	8.87	1	0.339		1

Sample Narrative:

OS: 8.84 at 23.6C
 DUP: 8.87 at 21.4C

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

L1172995-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172995-01 12/23/19 14:40 • (DUP) R3485400-3 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.09	8.12	1	0.370		1

Sample Narrative:

OS: 8.09 at 21.4C
 DUP: 8.12 at 20.5C

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3485400-1 12/23/19 14:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.5C



Method Blank (MB)

(MB) R3485665-1 12/24/19 13:00

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

¹ Cp

² Tc

³ Ss

Laboratory Control Sample (LCS)

(LCS) R3485665-2 12/24/19 13:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Specific Conductance	475	474	99.8	85.0-115	

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3484978-3 12/21/19 13:41

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)	99.7			77.0-120

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

(LCS) R3484978-1 12/21/19 12:30 • (LCSD) R3484978-2 12/21/19 12:53

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 %
TPH (GC/FID) Low Fraction	5.50	5.77	5.20	105	94.5	72.0-127			10.4	20
^(S) a,a,a-Trifluorotoluene(FID)				107	108	77.0-120				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3485549-2 12/23/19 13:22

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000400	0.00100
Ethylbenzene	U		0.000530	0.00250
Toluene	U		0.00125	0.00500
Xylenes, Total	U		0.00478	0.00650
<i>(S) Toluene-d8</i>	102			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	94.8			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	115			70.0-130

Laboratory Control Sample (LCS)

(LCS) R3485549-1 12/23/19 12:05

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.125	0.144	115	70.0-123	
Ethylbenzene	0.125	0.141	113	74.0-126	
Toluene	0.125	0.132	106	75.0-121	
Xylenes, Total	0.375	0.327	87.2	72.0-127	
<i>(S) Toluene-d8</i>			106	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			94.5	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			123	70.0-130	

L1172636-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1172636-01 12/23/19 18:27 • (MS) R3485549-3 12/23/19 21:09 • (MSD) R3485549-4 12/23/19 21:29

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	ND	0.114	0.0520	91.2	41.6	1	10.0-149	<u>J3</u>	<u>J3</u>	74.7	37
Ethylbenzene	0.125	ND	0.133	0.0461	106	36.9	1	10.0-160	<u>J3</u>	<u>J3</u>	97.0	38
Toluene	0.125	ND	0.106	0.0489	84.8	39.1	1	10.0-156	<u>J3</u>	<u>J3</u>	73.7	38
Xylenes, Total	0.375	ND	0.294	0.135	78.4	36.0	1	10.0-160	<u>J3</u>	<u>J3</u>	74.1	38
<i>(S) Toluene-d8</i>					105	105		75.0-131				
<i>(S) 4-Bromofluorobenzene</i>					93.9	97.5		67.0-138				
<i>(S) 1,2-Dichloroethane-d4</i>					104	106		70.0-130				

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



Method Blank (MB)

(MB) R3485015-1 12/22/19 13:15

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>	69.1			18.0-148

Laboratory Control Sample (LCS)

(LCS) R3485015-2 12/22/19 13:28

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	36.8	73.6	50.0-150	
<i>(S) o-Terphenyl</i>		61.3		18.0-148	

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



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.

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

Qualifier Description

J3	The associated batch QC was outside the established quality control range for precision.
T8	Sample(s) received past/too close to holding time expiration.



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

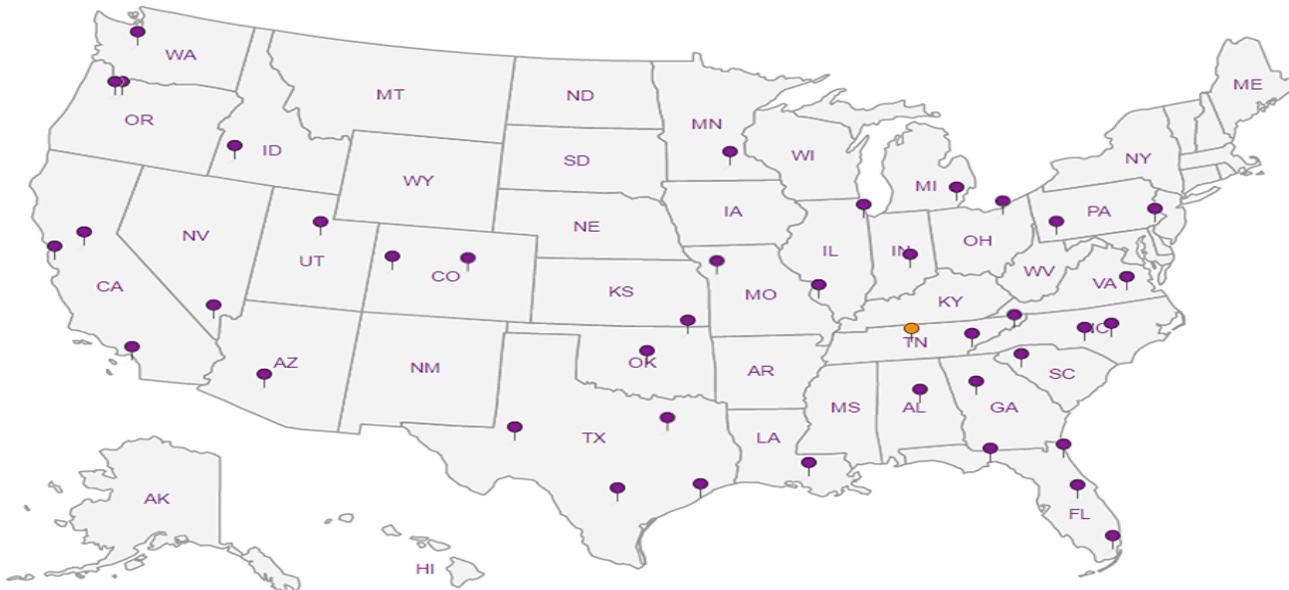
Third Party Federal Accreditations

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

Caerus Oil and Gas

Sample Delivery Group: L1172645
Samples Received: 12/19/2019
Project Number: C160U DUMPLINE RELEA
Description:

Report To: Jake Janicek
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jared Starkey
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.



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SAMPLE SUMMARY



20191217-C160U-POR@21' L1172645-01 Solid

Collected by
Collected date/time
Received date/time

12/17/19 10:15
12/19/19 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1398971	1	12/23/19 19:52	12/23/19 19:52	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400712	100	12/20/19 08:50	12/21/19 16:43	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1400471	8	12/20/19 08:50	12/21/19 07:08	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1400332	1	12/20/19 15:37	12/20/19 22:29	KME	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

20191217-C160U-N-PH@20' L1172645-02 Solid

Collected by
Collected date/time
Received date/time

12/17/19 10:55
12/19/19 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1398971	1	12/23/19 19:55	12/23/19 19:55	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400712	1	12/20/19 08:50	12/21/19 17:04	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1400471	1	12/20/19 08:50	12/21/19 07:28	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1400332	1	12/20/19 15:37	12/20/19 22:42	KME	Mt. Juliet, TN

20191217-C160U-E-PH@20' L1172645-03 Solid

Collected by
Collected date/time
Received date/time

12/17/19 12:52
12/19/19 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1398971	1	12/23/19 19:58	12/23/19 19:58	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400712	1	12/20/19 08:50	12/21/19 17:24	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1400471	1	12/20/19 08:50	12/21/19 07:49	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1400332	1	12/20/19 15:37	12/20/19 22:54	KME	Mt. Juliet, TN

20191217-C160U-S-PH@20' L1172645-04 Solid

Collected by
Collected date/time
Received date/time

12/17/19 13:41
12/19/19 09:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1398971	1	12/23/19 20:00	12/23/19 20:00	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400712	1	12/20/19 08:50	12/21/19 17:45	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1400471	1	12/20/19 08:50	12/21/19 08:09	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1400332	1	12/20/19 15:37	12/20/19 23:07	KME	Mt. Juliet, TN



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.

Jared Starkey
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	33.6		1	12/23/2019 19:52	WG1398971

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.69	T8	1	12/23/2019 14:40	WG1401558

Sample Narrative:

L1172645-01 WG1401558: 8.69 at 23.7C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4680		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	70.3		10.0	100	12/21/2019 16:43	WG1400712
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	96.2		77.0-120		12/21/2019 16:43	WG1400712

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00800	8	12/21/2019 07:08	WG1400471
Toluene	ND		0.0400	8	12/21/2019 07:08	WG1400471
Ethylbenzene	0.0226		0.0200	8	12/21/2019 07:08	WG1400471
Total Xylenes	0.350		0.0520	8	12/21/2019 07:08	WG1400471
(S) <i>Toluene-d8</i>	109		75.0-131		12/21/2019 07:08	WG1400471
(S) <i>4-Bromofluorobenzene</i>	108		67.0-138		12/21/2019 07:08	WG1400471
(S) <i>1,2-Dichloroethane-d4</i>	101		70.0-130		12/21/2019 07:08	WG1400471

Sample Narrative:

L1172645-01 WG1400471: Non-target compounds too high to run at a lower dilution.

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	187		4.00	1	12/20/2019 22:29	WG1400332
(S) <i>o</i> -Terphenyl	69.7		18.0-148		12/20/2019 22:29	WG1400332

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	10.3		1	12/23/2019 19:55	WG1398971

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.47	<u>T8</u>	1	12/23/2019 14:40	WG1401558

Sample Narrative:

L1172645-02 WG1401558: 8.47 at 23.5C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	3420		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.156	<u>B</u>	0.100	1	12/21/2019 17:04	WG1400712
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	89.8		77.0-120		12/21/2019 17:04	WG1400712

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	12/21/2019 07:28	WG1400471
Toluene	ND		0.00500	1	12/21/2019 07:28	WG1400471
Ethylbenzene	ND		0.00250	1	12/21/2019 07:28	WG1400471
Total Xylenes	ND		0.00650	1	12/21/2019 07:28	WG1400471
(S) <i>Toluene-d8</i>	107		75.0-131		12/21/2019 07:28	WG1400471
(S) <i>4-Bromofluorobenzene</i>	105		67.0-138		12/21/2019 07:28	WG1400471
(S) <i>1,2-Dichloroethane-d4</i>	92.3		70.0-130		12/21/2019 07:28	WG1400471

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/20/2019 22:42	WG1400332
(S) <i>o</i> -Terphenyl	63.4		18.0-148		12/20/2019 22:42	WG1400332

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	52.2		1	12/23/2019 19:58	WG1398971

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	9.05	T8	1	12/23/2019 14:40	WG1401558

Sample Narrative:

L1172645-03 WG1401558: 9.05 at 22.9C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4530		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.489		0.100	1	12/21/2019 17:24	WG1400712
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	89.5		77.0-120		12/21/2019 17:24	WG1400712

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	12/21/2019 07:49	WG1400471
Toluene	ND		0.00500	1	12/21/2019 07:49	WG1400471
Ethylbenzene	ND		0.00250	1	12/21/2019 07:49	WG1400471
Total Xylenes	ND		0.00650	1	12/21/2019 07:49	WG1400471
(S) <i>Toluene-d8</i>	109		75.0-131		12/21/2019 07:49	WG1400471
(S) <i>4-Bromofluorobenzene</i>	104		67.0-138		12/21/2019 07:49	WG1400471
(S) <i>1,2-Dichloroethane-d4</i>	92.7		70.0-130		12/21/2019 07:49	WG1400471

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/20/2019 22:54	WG1400332
(S) <i>o</i> -Terphenyl	66.9		18.0-148		12/20/2019 22:54	WG1400332

- 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	11.0		1	12/23/2019 20:00	WG1398971

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.56	T8	1	12/23/2019 14:40	WG1401558

Sample Narrative:

L1172645-04 WG1401558: 8.56 at 22.8C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	2640		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.357		0.100	1	12/21/2019 17:45	WG1400712
(S) <i>a,a,a</i> -Trifluorotoluene(FID)	89.5		77.0-120		12/21/2019 17:45	WG1400712

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	12/21/2019 08:09	WG1400471
Toluene	ND		0.00500	1	12/21/2019 08:09	WG1400471
Ethylbenzene	ND		0.00250	1	12/21/2019 08:09	WG1400471
Total Xylenes	ND		0.00650	1	12/21/2019 08:09	WG1400471
(S) <i>Toluene-d8</i>	109		75.0-131		12/21/2019 08:09	WG1400471
(S) <i>4-Bromofluorobenzene</i>	106		67.0-138		12/21/2019 08:09	WG1400471
(S) <i>1,2-Dichloroethane-d4</i>	94.4		70.0-130		12/21/2019 08:09	WG1400471

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/20/2019 23:07	WG1400332
(S) <i>o</i> -Terphenyl	72.3		18.0-148		12/20/2019 23:07	WG1400332

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



L1172636-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172636-01 12/23/19 14:40 • (DUP) R3485400-2 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.84	8.87	1	0.339		1

Sample Narrative:

OS: 8.84 at 23.6C
 DUP: 8.87 at 21.4C

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1172995-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172995-01 12/23/19 14:40 • (DUP) R3485400-3 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
pH	8.09	8.12	1	0.370		1

Sample Narrative:

OS: 8.09 at 21.4C
 DUP: 8.12 at 20.5C

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3485400-1 12/23/19 14:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.5C



Method Blank (MB)

(MB) R3485665-1 12/24/19 13:00

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

Laboratory Control Sample (LCS)

(LCS) R3485665-2 12/24/19 13:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	<u>LCS Qualifier</u>
Specific Conductance	475	474	99.8	85.0-115	

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3485354-2 12/21/19 14:17

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TPH (GC/FID) Low Fraction	0.0221	↓	0.0217	0.100
(S) a,a,a-Trifluorotoluene(FID)	99.4			77.0-120

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS)

(LCS) R3485354-1 12/21/19 13:13

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.88	107	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			106	77.0-120	

5 Sr

6 Qc

7 Gl

L1172756-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1172756-01 12/21/19 18:05 • (MS) R3485354-3 12/21/19 22:12 • (MSD) R3485354-4 12/21/19 22:33

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TPH (GC/FID) Low Fraction	138	0.585	135	156	97.4	113	25	10.0-151			14.4	28
(S) a,a,a-Trifluorotoluene(FID)					112	113		77.0-120				

8 Al

9 Sc



Method Blank (MB)

(MB) R3484902-2 12/21/19 05:07

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/kg		mg/kg	mg/kg
Benzene	U		0.000400	0.00100
Ethylbenzene	U		0.000530	0.00250
Toluene	U		0.00125	0.00500
Xylenes, Total	U		0.00478	0.00650
<i>(S) Toluene-d8</i>	105			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	105			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	97.4			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3484902-1 12/21/19 04:06

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/kg	mg/kg	%	%	
Benzene	0.125	0.131	105	70.0-123	
Ethylbenzene	0.125	0.139	111	74.0-126	
Toluene	0.125	0.129	103	75.0-121	
Xylenes, Total	0.375	0.408	109	72.0-127	
<i>(S) Toluene-d8</i>			107	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			105	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			99.6	70.0-130	

6 Qc

7 Gl

8 Al

9 Sc

L1172623-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1172623-01 12/21/19 06:28 • (MS) R3484902-3 12/21/19 08:29 • (MSD) R3484902-4 12/21/19 08:50

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Benzene	0.125	U	0.0774	0.0742	61.9	59.4	1	10.0-149			4.22	37
Ethylbenzene	0.125	U	0.0872	0.0830	69.8	66.4	1	10.0-160			4.94	38
Toluene	0.125	U	0.0784	0.0751	62.7	60.1	1	10.0-156			4.30	38
Xylenes, Total	0.375	U	0.249	0.240	66.4	64.0	1	10.0-160			3.68	38
<i>(S) Toluene-d8</i>					108	105		75.0-131				
<i>(S) 4-Bromofluorobenzene</i>					108	107		67.0-138				
<i>(S) 1,2-Dichloroethane-d4</i>					94.9	98.9		70.0-130				



Method Blank (MB)

(MB) R3484764-1 12/20/19 21:51

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>	65.5			18.0-148

Laboratory Control Sample (LCS)

(LCS) R3484764-2 12/20/19 22:04

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	45.1	90.2	50.0-150	
<i>(S) o-Terphenyl</i>			69.4	18.0-148	

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



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

B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
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

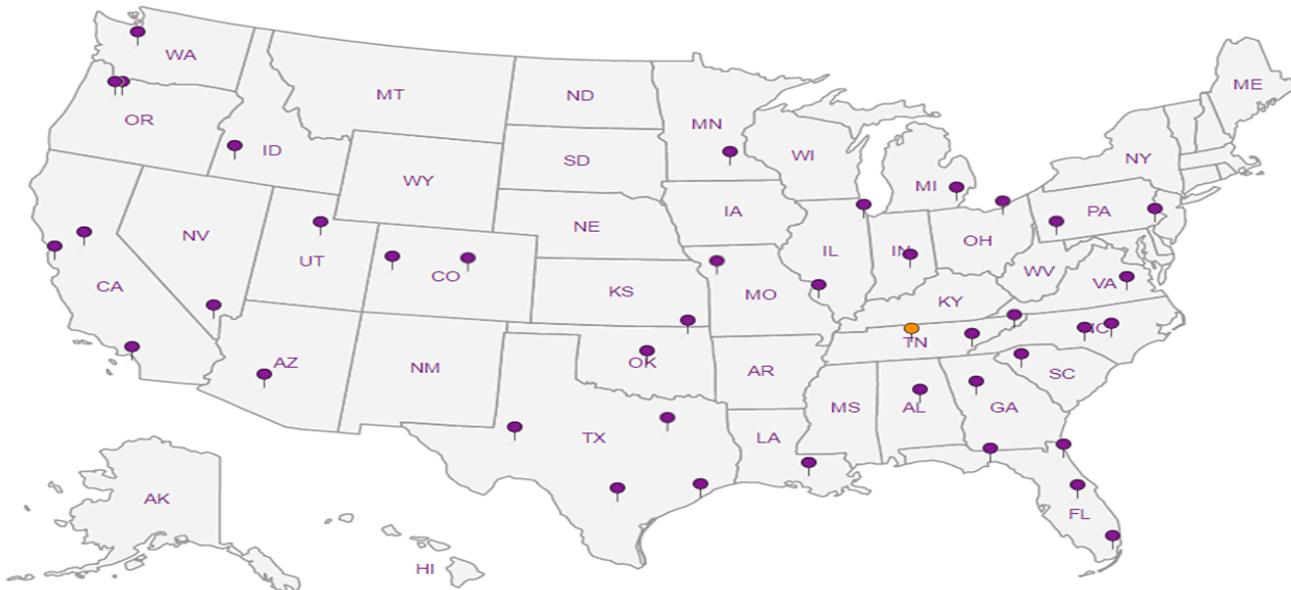
Third Party Federal Accreditations

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

**Pace Analytical National Center for Testing & Innovation
Cooler Receipt Form**

Client:	L1172645		
Cooler Received/Opened On:	12/19/19	Temperature:	03
Received By: WILLIE TAYLOR	0930		
Signature: <i>Willie Taylor</i>			

Receipt Check List	NP	Yes	No
COC Seal Present / Intact?	✓		
COC Signed / Accurate?		✓	
Bottles arrive intact?		✓	
Correct bottles used?		✓	
Sufficient volume sent?		✓	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			

Caerus Oil and Gas

Sample Delivery Group: L1172995
Samples Received: 12/20/2019
Project Number: C16OU DUMPLINE RELEA
Description: C16OU Dumpline Release
Site: C16OU DUMPLINE RELEASE
Report To: Jake Janicek
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jared Starkey
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.



Cp: Cover Page	1	¹Cp
Tc: Table of Contents	2	²Tc
Ss: Sample Summary	3	³Ss
Cn: Case Narrative	4	⁴Cn
Sr: Sample Results	5	⁵Sr
20191218 - C160U (WWALL) @ 17' L1172995-01	5	⁶Qc
Qc: Quality Control Summary	6	⁷Gl
Wet Chemistry by Method 9045D	6	⁸Al
Wet Chemistry by Method 9050AMod	7	⁹Sc
Volatile Organic Compounds (GC) by Method 8015D/GRO	8	
Volatile Organic Compounds (GC/MS) by Method 8260B	9	
Semi-Volatile Organic Compounds (GC) by Method 8015	10	
Gl: Glossary of Terms	11	
Al: Accreditations & Locations	12	
Sc: Sample Chain of Custody	13	

SAMPLE SUMMARY



20191218 - C160U (WWALL) @ 17' L1172995-01 Solid

Collected by Dustin H.	Collected date/time 12/18/19 10:20	Received date/time 12/20/19 09:30
---------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1400657	1	12/26/19 09:03	12/26/19 09:03	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400566	1	12/20/19 16:11	12/21/19 18:42	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1400757	1	12/20/19 16:11	12/21/19 13:02	DWR	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1400911	1	12/22/19 10:07	12/22/19 15:09	JDG	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.

Jared Starkey
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	7.45		1	12/26/2019 09:03	WG1400657

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.09	T8	1	12/23/2019 14:40	WG1401558

Sample Narrative:

L1172995-01 WG1401558: 8.09 at 21.4C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4110		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.142		0.100	1	12/21/2019 18:42	WG1400566
(S) a,a,a-Trifluorotoluene(FID)	97.3		77.0-120		12/21/2019 18:42	WG1400566

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	12/21/2019 13:02	WG1400757
Toluene	ND		0.00500	1	12/21/2019 13:02	WG1400757
Ethylbenzene	ND		0.00250	1	12/21/2019 13:02	WG1400757
Total Xylenes	ND		0.00650	1	12/21/2019 13:02	WG1400757
(S) Toluene-d8	110		75.0-131		12/21/2019 13:02	WG1400757
(S) 4-Bromofluorobenzene	105		67.0-138		12/21/2019 13:02	WG1400757
(S) 1,2-Dichloroethane-d4	93.9		70.0-130		12/21/2019 13:02	WG1400757

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/22/2019 15:09	WG1400911
(S) o-Terphenyl	68.8		18.0-148		12/22/2019 15:09	WG1400911

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



L1172636-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172636-01 12/23/19 14:40 • (DUP) R3485400-2 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
pH	8.84	8.87	1	0.339		1

Sample Narrative:

OS: 8.84 at 23.6C
DUP: 8.87 at 21.4C

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1172995-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172995-01 12/23/19 14:40 • (DUP) R3485400-3 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
pH	8.09	8.12	1	0.370		1

Sample Narrative:

OS: 8.09 at 21.4C
DUP: 8.12 at 20.5C

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3485400-1 12/23/19 14:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
su	su		%	%	
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.5C



Method Blank (MB)

(MB) R3485665-1 12/24/19 13:00

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

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1173003-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173003-01 12/24/19 13:00 • (DUP) R3485665-3 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	6310	6100	1	3.38		20

L1173135-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1173135-05 12/24/19 13:00 • (DUP) R3485665-4 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	298	291	1	2.38		20

Laboratory Control Sample (LCS)

(LCS) R3485665-2 12/24/19 13:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	475	474	99.8	85.0-115	



Method Blank (MB)

(MB) R3484978-3 12/21/19 13:41

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
TPH (GC/FID) Low Fraction	U		0.0217	0.100
^(S) a,a,a-Trifluorotoluene(FID)	99.7			77.0-120

1 Cp

2 Tc

3 Ss

4 Cn

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

(LCS) R3484978-1 12/21/19 12:30 • (LCSD) R3484978-2 12/21/19 12:53

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
TPH (GC/FID) Low Fraction	5.50	5.77	5.20	105	94.5	72.0-127			10.4	20
^(S) a,a,a-Trifluorotoluene(FID)				107	108	77.0-120				

5 Sr

6 Qc

7 Gl

L1172915-06 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1172915-06 12/21/19 22:35 • (MS) R3484978-4 12/21/19 22:59 • (MSD) R3484978-5 12/21/19 23:26

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
TPH (GC/FID) Low Fraction	131	ND	133	123	102	93.9	25	10.0-151			7.81	28
^(S) a,a,a-Trifluorotoluene(FID)					108	108		77.0-120				

8 Al

9 Sc



Method Blank (MB)

(MB) R3484992-2 12/21/19 11:40

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/kg		mg/kg	mg/kg
Benzene	U		0.000400	0.00100
Ethylbenzene	U		0.000530	0.00250
Toluene	U		0.00125	0.00500
Xylenes, Total	U		0.00478	0.00650
<i>(S) Toluene-d8</i>	109			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	106			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	94.9			70.0-130

Laboratory Control Sample (LCS)

(LCS) R3484992-1 12/21/19 10:39

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/kg	mg/kg	%	%	
Benzene	0.125	0.108	86.4	70.0-123	
Ethylbenzene	0.125	0.113	90.4	74.0-126	
Toluene	0.125	0.105	84.0	75.0-121	
Xylenes, Total	0.375	0.337	89.9	72.0-127	
<i>(S) Toluene-d8</i>			108	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			103	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			101	70.0-130	

L1172685-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1172685-01 12/21/19 15:13 • (MS) R3484992-3 12/21/19 21:02 • (MSD) R3484992-4 12/21/19 21:23

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Benzene	0.125	ND	0.0836	0.0890	66.9	71.2	1	10.0-149			6.26	37
Ethylbenzene	0.125	ND	0.498	0.112	398	89.6	1	10.0-160	J5	J3	127	38
Toluene	0.125	ND	0.0915	0.0900	73.2	72.0	1	10.0-156			1.65	38
Xylenes, Total	0.375	ND	3.09	0.410	824	109	1	10.0-160	J5	J3	153	38
<i>(S) Toluene-d8</i>					111	111		75.0-131				
<i>(S) 4-Bromofluorobenzene</i>					96.3	101		67.0-138				
<i>(S) 1,2-Dichloroethane-d4</i>					72.8	89.6		70.0-130				

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



Method Blank (MB)

(MB) R3485015-1 12/22/19 13:15

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>	69.1			18.0-148

¹ Cp

² Tc

³ Ss

⁴ Cn

Laboratory Control Sample (LCS)

(LCS) R3485015-2 12/22/19 13:28

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	36.8	73.6	50.0-150	
<i>(S) o-Terphenyl</i>		61.3		18.0-148	

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



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.

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

Qualifier Description

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.
T8	Sample(s) received past/too close to holding time expiration.



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

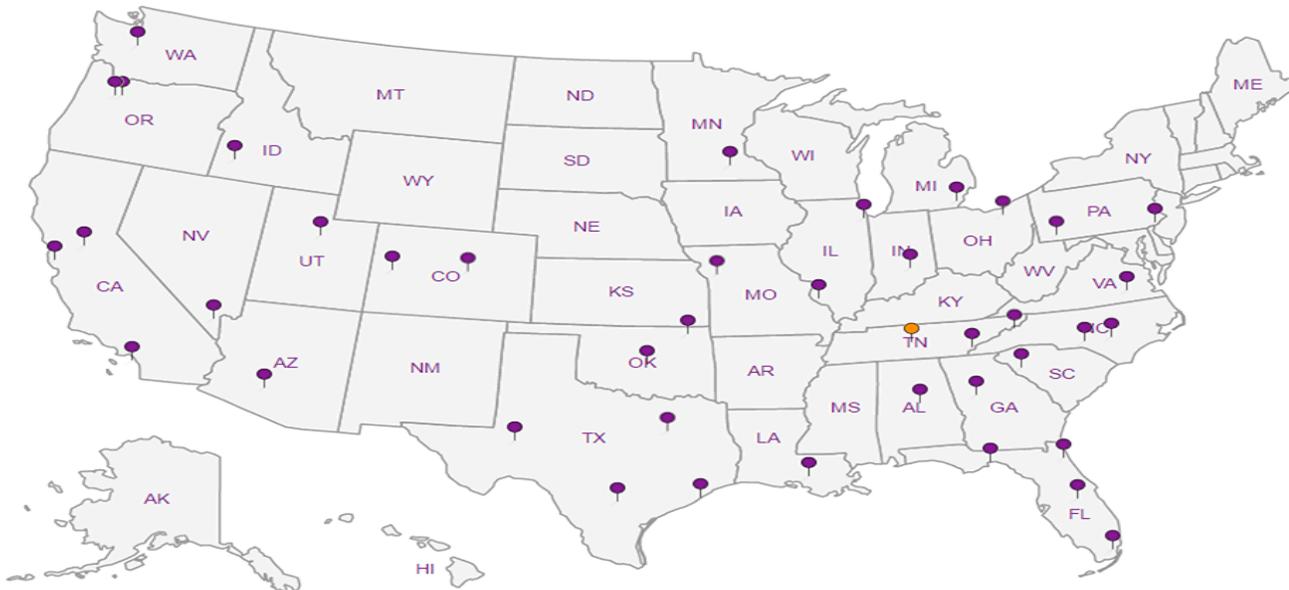
Third Party Federal Accreditations

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

December 27, 2019

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Caerus Oil and Gas

Sample Delivery Group: L1173381
Samples Received: 12/21/2019
Project Number: C16OU DUMPLINE RELEA
Description: C16OU Dumpline Release
Site: C16OU DUMPLINE RELEASE
Report To: Jake Janicek
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jared Starkey
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.



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SAMPLE SUMMARY



20191219 - C160U (SWALL) @ 16' L1173381-01 Solid

Collected by: Dustin H. Collected date/time: 12/19/19 11:02 Received date/time: 12/21/19 10:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1400657	1	12/26/19 09:46	12/26/19 09:46	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1401558	1	12/23/19 14:00	12/23/19 14:40	JIC	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400950	1	12/21/19 15:28	12/22/19 05:30	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1401025	2	12/21/19 15:28	12/22/19 03:16	JHH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1402341	1	12/26/19 07:02	12/26/19 18:11	CLG	Mt. Juliet, TN

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

20191219 - C160U (EWALL) @ 16' L1173381-02 Solid

Collected by: Dustin H. Collected date/time: 12/19/19 14:00 Received date/time: 12/21/19 10:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1400657	1	12/26/19 09:49	12/26/19 09:49	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1402081	1	12/24/19 13:40	12/27/19 12:00	MSP	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400950	1	12/21/19 15:28	12/22/19 05:51	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1401025	1	12/21/19 15:28	12/22/19 03:35	JHH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1402341	1	12/26/19 07:02	12/26/19 18:24	CLG	Mt. Juliet, TN

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.

Jared Starkey
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	34.7		1	12/26/2019 09:46	WG1400657

1 Cp

2 Tc

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.66	T8	1	12/23/2019 14:40	WG1401558

3 Ss

4 Cn

Sample Narrative:

L1173381-01 WG1401558: 8.66 at 20.4C

5 Sr

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4400		10.0	1	12/24/2019 13:00	WG1401857

6 Qc

7 Gl

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.231	B	0.100	1	12/22/2019 05:30	WG1400950
(S) a,a,a-Trifluorotoluene(FID)	99.1		77.0-120		12/22/2019 05:30	WG1400950

8 Al

9 Sc

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00200	2	12/22/2019 03:16	WG1401025
Toluene	ND		0.0100	2	12/22/2019 03:16	WG1401025
Ethylbenzene	ND		0.00500	2	12/22/2019 03:16	WG1401025
Total Xylenes	ND		0.0130	2	12/22/2019 03:16	WG1401025
(S) Toluene-d8	101		75.0-131		12/22/2019 03:16	WG1401025
(S) 4-Bromofluorobenzene	98.0		67.0-138		12/22/2019 03:16	WG1401025
(S) 1,2-Dichloroethane-d4	103		70.0-130		12/22/2019 03:16	WG1401025

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/26/2019 18:11	WG1402341
(S) o-Terphenyl	75.6		18.0-148		12/26/2019 18:11	WG1402341



Collected date/time: 12/19/19 14:00

L1173381

Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	61.6		1	12/26/2019 09:49	WG1400657

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.74	T8	1	12/27/2019 12:00	WG1402081

Sample Narrative:

L1173381-02 WG1402081: 8.74 at 19.4C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4130		10.0	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.245	B	0.100	1	12/22/2019 05:51	WG1400950
(S) a,a,a-Trifluorotoluene(FID)	99.6		77.0-120		12/22/2019 05:51	WG1400950

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	12/22/2019 03:35	WG1401025
Toluene	ND		0.00500	1	12/22/2019 03:35	WG1401025
Ethylbenzene	ND		0.00250	1	12/22/2019 03:35	WG1401025
Total Xylenes	ND		0.00650	1	12/22/2019 03:35	WG1401025
(S) Toluene-d8	102		75.0-131		12/22/2019 03:35	WG1401025
(S) 4-Bromofluorobenzene	91.8		67.0-138		12/22/2019 03:35	WG1401025
(S) 1,2-Dichloroethane-d4	98.8		70.0-130		12/22/2019 03:35	WG1401025

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/26/2019 18:24	WG1402341
(S) o-Terphenyl	78.4		18.0-148		12/26/2019 18:24	WG1402341

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



L1172636-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172636-01 12/23/19 14:40 • (DUP) R3485400-2 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
pH	8.84	8.87	1	0.339		1

Sample Narrative:

OS: 8.84 at 23.6C
 DUP: 8.87 at 21.4C

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

L1172995-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1172995-01 12/23/19 14:40 • (DUP) R3485400-3 12/23/19 14:40

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
su	su			%		%
pH	8.09	8.12	1	0.370		1

Sample Narrative:

OS: 8.09 at 21.4C
 DUP: 8.12 at 20.5C

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3485400-1 12/23/19 14:40

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
su	su		%	%	
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.5C



L1173383-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173383-01 12/27/19 12:00 • (DUP) R3486338-2 12/27/19 12:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
pH	8.53	8.75	1	2.55	J3	1

Sample Narrative:

OS: 8.53 at 19.4C
DUP: 8.75 at 19.4C

Laboratory Control Sample (LCS)

(LCS) R3486338-1 12/27/19 12:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.4C

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3485665-1 12/24/19 13:00

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

L1173003-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173003-01 12/24/19 13:00 • (DUP) R3485665-3 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	6310	6100	1	3.38		20

L1173135-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1173135-05 12/24/19 13:00 • (DUP) R3485665-4 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	298	291	1	2.38		20

Laboratory Control Sample (LCS)

(LCS) R3485665-2 12/24/19 13:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	475	474	99.8	85.0-115	



Method Blank (MB)

(MB) R3484970-3 12/21/19 23:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	0.0303	<u>J</u>	0.0217	0.100
^(S) a,a,a-Trifluorotoluene(FID)	101			77.0-120

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS)

(LCS) R3484970-2 12/21/19 22:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.35	97.3	72.0-127	
^(S) a,a,a-Trifluorotoluene(FID)			112	77.0-120	

5 Sr

6 Qc

7 Gl

L1173173-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173173-01 12/22/19 06:52 • (MS) R3484970-6 12/22/19 08:14 • (MSD) R3484970-7 12/22/19 08:35

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	1790	3490	4660	4830	65.2	74.6	250	10.0-151	<u>E</u>	<u>E</u>	3.56	28
^(S) a,a,a-Trifluorotoluene(FID)					113	113		77.0-120				

8 Al

9 Sc



Method Blank (MB)

(MB) R3485684-2 12/21/19 22:15

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	mg/kg		mg/kg	mg/kg
Benzene	U		0.000400	0.00100
Ethylbenzene	U		0.000530	0.00250
Toluene	U		0.00125	0.00500
Xylenes, Total	U		0.00478	0.00650
<i>(S) Toluene-d8</i>	99.7			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	88.9			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	98.4			70.0-130

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

Laboratory Control Sample (LCS)

(LCS) R3485684-1 12/21/19 20:52

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mg/kg	mg/kg	%	%	
Benzene	0.125	0.127	102	70.0-123	
Ethylbenzene	0.125	0.121	96.8	74.0-126	
Toluene	0.125	0.121	96.8	75.0-121	
Xylenes, Total	0.375	0.336	89.6	72.0-127	
<i>(S) Toluene-d8</i>			96.6	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			96.6	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			111	70.0-130	

6 Qc

7 Gl

8 Al

9 Sc

L1173381-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173381-02 12/22/19 03:35 • (MS) R3485684-3 12/22/19 05:10 • (MSD) R3485684-4 12/22/19 05:29

Analyte	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
	mg/kg	mg/kg	mg/kg	mg/kg	%	%		%			%	%
Benzene	0.125	ND	0.142	0.151	114	121	1	10.0-149			6.14	37
Ethylbenzene	0.125	ND	0.143	0.155	114	124	1	10.0-160			8.05	38
Toluene	0.125	ND	0.142	0.154	114	123	1	10.0-156			8.11	38
Xylenes, Total	0.375	ND	0.399	0.436	106	116	1	10.0-160			8.86	38
<i>(S) Toluene-d8</i>					96.3	99.7		75.0-131				
<i>(S) 4-Bromofluorobenzene</i>					96.7	98.7		67.0-138				
<i>(S) 1,2-Dichloroethane-d4</i>					99.2	97.4		70.0-130				



Method Blank (MB)

(MB) R3486340-1 12/26/19 17:20

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>	80.8			18.0-148

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS)

(LCS) R3486340-2 12/26/19 17:33

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	44.5	89.0	50.0-150	
<i>(S) o-Terphenyl</i>			67.3	18.0-148	

5 Sr

6 Qc

L1173003-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173003-01 12/26/19 19:27 • (MS) R3486340-3 12/26/19 19:39 • (MSD) R3486340-4 12/26/19 19:52

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	48.3	7.15	50.2	50.8	89.1	90.4	1	50.0-150			1.19	20
<i>(S) o-Terphenyl</i>					53.6	55.1		18.0-148				

7 Gl

8 Al

9 Sc



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.

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

Qualifier	Description
B	The same analyte is found in the associated blank.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
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.
T8	Sample(s) received past/too close to holding time expiration.



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

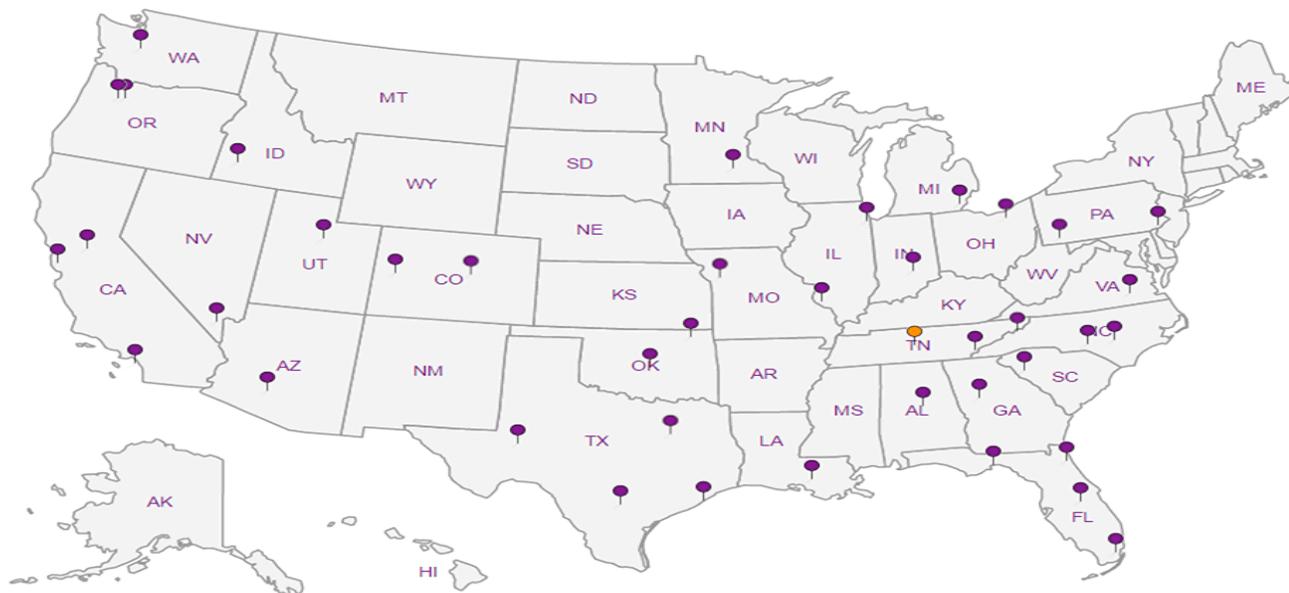
Third Party Federal Accreditations

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

Caerus Oil and Gas

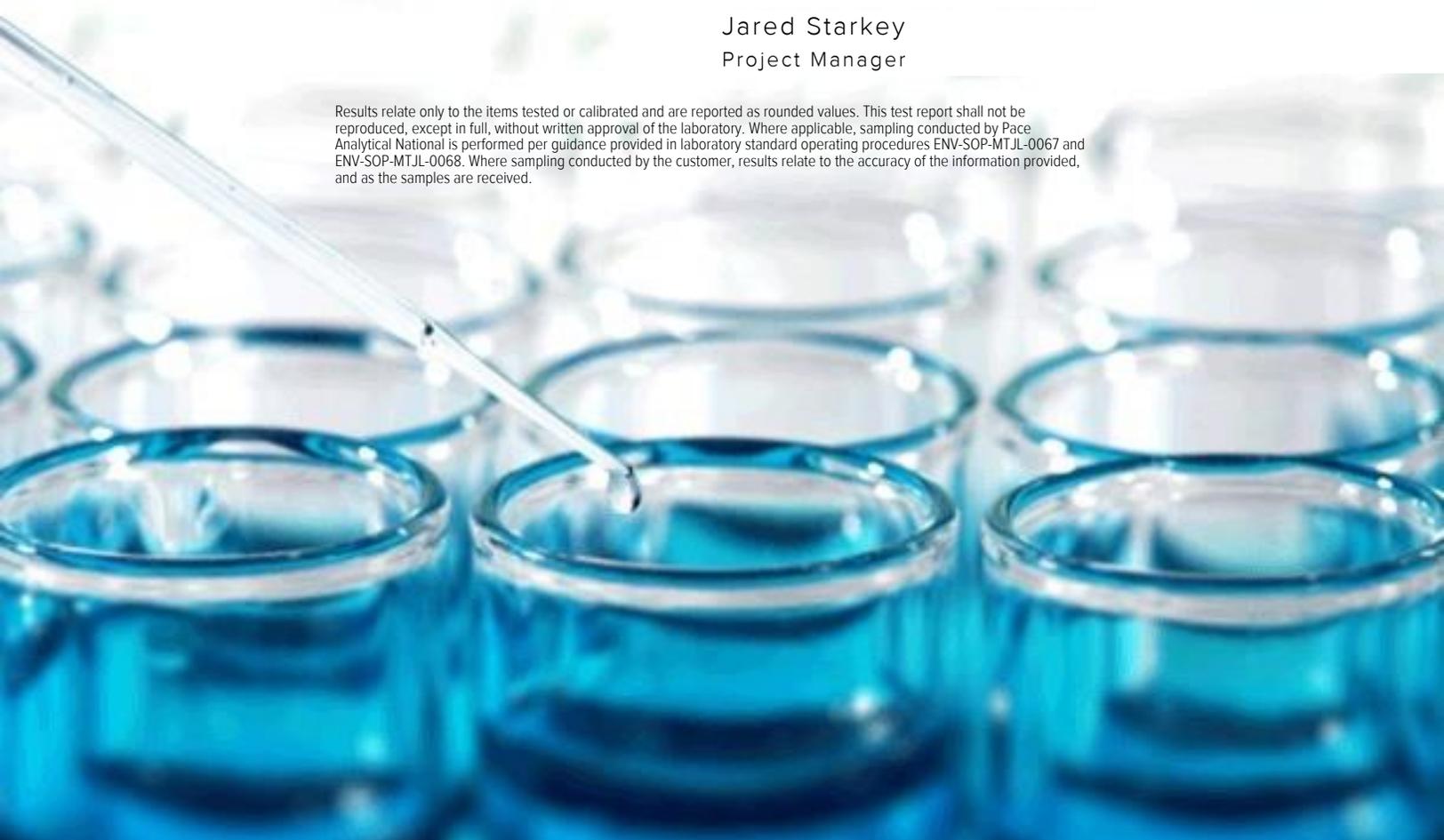
Sample Delivery Group: L1173383
Samples Received: 12/21/2019
Project Number: C16OU DUMPLINE RELEA
Description: C16OU Dumpline Release
Site: C16OU DUMPLINE RELEASE
Report To: Jake Janicek
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jared Starkey
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.





Cp: Cover Page	1	¹Cp
Tc: Table of Contents	2	²Tc
Ss: Sample Summary	3	³Ss
Cn: Case Narrative	4	⁴Cn
Sr: Sample Results	5	⁵Sr
20191220 - C16OU (NWALL) @ 16.5' L1173383-01	5	⁴Cn
Qc: Quality Control Summary	6	⁵Sr
Wet Chemistry by Method 9045D	6	⁶Qc
Wet Chemistry by Method 9050AMod	7	⁷Gl
Volatile Organic Compounds (GC) by Method 8015D/GRO	8	⁸Al
Volatile Organic Compounds (GC/MS) by Method 8260B	9	⁹Sc
Semi-Volatile Organic Compounds (GC) by Method 8015	10	
Gl: Glossary of Terms	11	
Al: Accreditations & Locations	12	
Sc: Sample Chain of Custody	13	

SAMPLE SUMMARY



20191220 - C16OU (NWALL) @ 16.5' L1173383-01 Solid

Collected by: Dustin H.
 Collected date/time: 12/20/19 10:50
 Received date/time: 12/21/19 10:30

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1400657	1	12/26/19 09:52	12/26/19 09:52	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1402081	1	12/24/19 13:40	12/27/19 12:00	MSP	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400950	1	12/21/19 15:31	12/22/19 06:11	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1401025	1	12/21/19 15:31	12/22/19 03:54	JHH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1402341	1	12/26/19 07:02	12/26/19 17:58	CLG	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.

Jared Starkey
Project Manager

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



Collected date/time: 12/20/19 10:50

L1173383

Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	55.2		1	12/26/2019 09:52	WG1400657

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.53	J3 T8	1	12/27/2019 12:00	WG1402081

Sample Narrative:

L1173383-01 WG1402081: 8.53 at 19.4C

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	umhos/cm		umhos/cm	1	12/24/2019 13:00	WG1401857

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	0.383		0.100	1	12/22/2019 06:11	WG1400950
(S) <i>a,a</i> -Trifluorotoluene(FID)	98.9		77.0-120		12/22/2019 06:11	WG1400950

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	ND		0.00100	1	12/22/2019 03:54	WG1401025
Toluene	ND		0.00500	1	12/22/2019 03:54	WG1401025
Ethylbenzene	ND		0.00250	1	12/22/2019 03:54	WG1401025
Total Xylenes	ND		0.00650	1	12/22/2019 03:54	WG1401025
(S) Toluene-d8	101		75.0-131		12/22/2019 03:54	WG1401025
(S) 4-Bromofluorobenzene	95.3		67.0-138		12/22/2019 03:54	WG1401025
(S) 1,2-Dichloroethane-d4	106		70.0-130		12/22/2019 03:54	WG1401025

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	ND		4.00	1	12/26/2019 17:58	WG1402341
(S) <i>o</i> -Terphenyl	80.1		18.0-148		12/26/2019 17:58	WG1402341





L1173383-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173383-01 12/27/19 12:00 • (DUP) R3486338-2 12/27/19 12:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
pH	8.53	8.75	1	2.55	<u>J3</u>	1

Sample Narrative:

OS: 8.53 at 19.4C
DUP: 8.75 at 19.4C

Laboratory Control Sample (LCS)

(LCS) R3486338-1 12/27/19 12:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.4C

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3485665-1 12/24/19 13:00

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

L1173003-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173003-01 12/24/19 13:00 • (DUP) R3485665-3 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	6310	6100	1	3.38		20

L1173135-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1173135-05 12/24/19 13:00 • (DUP) R3485665-4 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	298	291	1	2.38		20

Laboratory Control Sample (LCS)

(LCS) R3485665-2 12/24/19 13:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	475	474	99.8	85.0-115	



Method Blank (MB)

(MB) R3484970-3 12/21/19 23:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	0.0303	<u>J</u>	0.0217	0.100
^(S) a,a,a-Trifluorotoluene(FID)	101			77.0-120

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS)

(LCS) R3484970-2 12/21/19 22:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.35	97.3	72.0-127	
^(S) a,a,a-Trifluorotoluene(FID)			112	77.0-120	

5 Sr

6 Qc

7 Gl

L1173173-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173173-01 12/22/19 06:52 • (MS) R3484970-6 12/22/19 08:14 • (MSD) R3484970-7 12/22/19 08:35

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	1790	3490	4660	4830	65.2	74.6	250	10.0-151	<u>E</u>	<u>E</u>	3.56	28
^(S) a,a,a-Trifluorotoluene(FID)					113	113		77.0-120				

8 Al

9 Sc



Method Blank (MB)

(MB) R3485684-2 12/21/19 22:15

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000400	0.00100
Ethylbenzene	U		0.000530	0.00250
Toluene	U		0.00125	0.00500
Xylenes, Total	U		0.00478	0.00650
<i>(S) Toluene-d8</i>	99.7			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	88.9			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	98.4			70.0-130

Laboratory Control Sample (LCS)

(LCS) R3485684-1 12/21/19 20:52

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.125	0.127	102	70.0-123	
Ethylbenzene	0.125	0.121	96.8	74.0-126	
Toluene	0.125	0.121	96.8	75.0-121	
Xylenes, Total	0.375	0.336	89.6	72.0-127	
<i>(S) Toluene-d8</i>			96.6	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			96.6	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			111	70.0-130	

L1173381-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173381-02 12/22/19 03:35 • (MS) R3485684-3 12/22/19 05:10 • (MSD) R3485684-4 12/22/19 05:29

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	ND	0.142	0.151	114	121	1	10.0-149			6.14	37
Ethylbenzene	0.125	ND	0.143	0.155	114	124	1	10.0-160			8.05	38
Toluene	0.125	ND	0.142	0.154	114	123	1	10.0-156			8.11	38
Xylenes, Total	0.375	ND	0.399	0.436	106	116	1	10.0-160			8.86	38
<i>(S) Toluene-d8</i>					96.3	99.7		75.0-131				
<i>(S) 4-Bromofluorobenzene</i>					96.7	98.7		67.0-138				
<i>(S) 1,2-Dichloroethane-d4</i>					99.2	97.4		70.0-130				

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3486340-1 12/26/19 17:20

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>	80.8			18.0-148

1 Cp

2 Tc

3 Ss

Laboratory Control Sample (LCS)

(LCS) R3486340-2 12/26/19 17:33

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	44.5	89.0	50.0-150	
<i>(S) o-Terphenyl</i>			67.3	18.0-148	

4 Cn

5 Sr

6 Qc

L1173003-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173003-01 12/26/19 19:27 • (MS) R3486340-3 12/26/19 19:39 • (MSD) R3486340-4 12/26/19 19:52

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	48.3	7.15	50.2	50.8	89.1	90.4	1	50.0-150			1.19	20
<i>(S) o-Terphenyl</i>					53.6	55.1		18.0-148				

7 Gl

8 Al

9 Sc



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
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
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.
T8	Sample(s) received past/too close to holding time expiration.





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

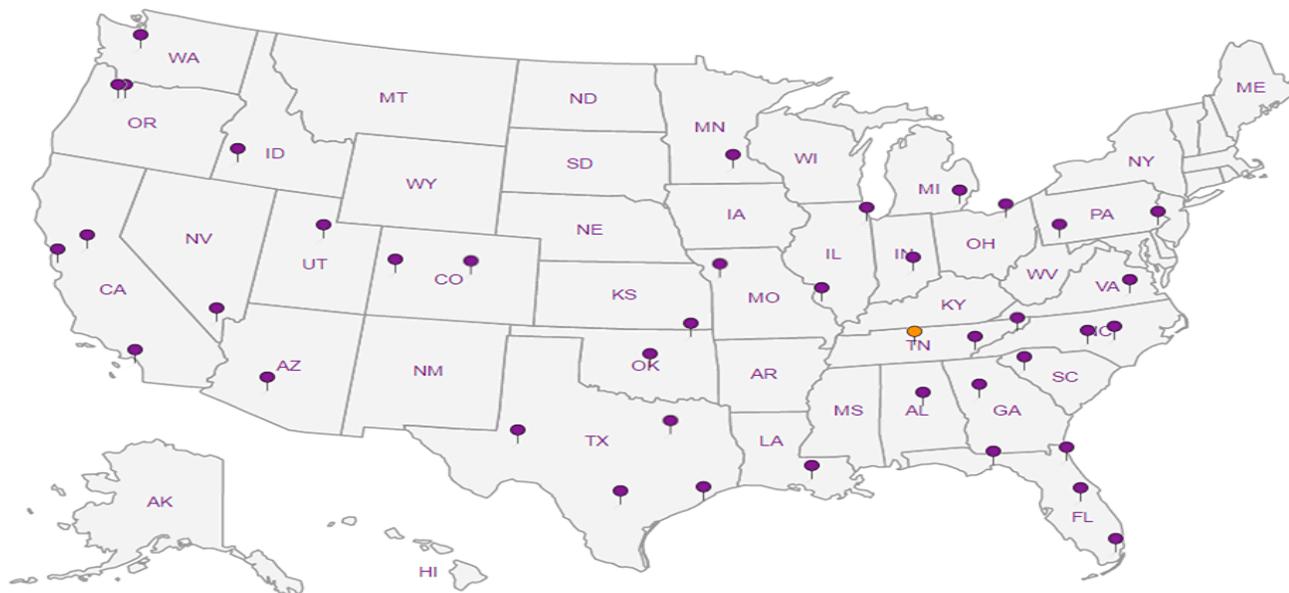
Third Party Federal Accreditations

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

December 27, 2019

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Caerus Oil and Gas

Sample Delivery Group: L1173384
Samples Received: 12/21/2019
Project Number: C16OU DUMPLINE RELEA
Description: C16OU Dumpline Release
Site: C16OU DUMPLINE RELEASE
Report To: Jake Janicek
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Jared Starkey
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.



Cp: Cover Page	1	¹Cp
Tc: Table of Contents	2	²Tc
Ss: Sample Summary	3	³Ss
Cn: Case Narrative	4	⁴Cn
Sr: Sample Results	5	⁵Sr
20191220 - C160U (NBOTTOM) @ 21' L1173384-01	5	⁶Qc
Qc: Quality Control Summary	6	⁷Gl
Wet Chemistry by Method 9045D	6	⁸Al
Wet Chemistry by Method 9050AMod	7	⁹Sc
Volatile Organic Compounds (GC) by Method 8015D/GRO	8	
Volatile Organic Compounds (GC/MS) by Method 8260B	9	
Semi-Volatile Organic Compounds (GC) by Method 8015	11	
Gl: Glossary of Terms	12	
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Sc: Sample Chain of Custody	14	

SAMPLE SUMMARY



20191220 - C160U (NBOTTOM) @ 21' L1173384-01 Solid

Collected by Dustin H.	Collected date/time 12/20/19 10:00	Received date/time 12/21/19 10:30
---------------------------	---------------------------------------	--------------------------------------

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Calculated Results	WG1400657	1	12/26/19 09:55	12/26/19 09:55	TRB	Mt. Juliet, TN
Wet Chemistry by Method 9045D	WG1402081	1	12/24/19 13:40	12/27/19 12:00	MSP	Mt. Juliet, TN
Wet Chemistry by Method 9050AMod	WG1401857	1	12/24/19 08:20	12/24/19 13:00	SL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1400950	250	12/21/19 15:33	12/22/19 07:13	DWR	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1401025	20	12/21/19 15:33	12/22/19 04:51	JHH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1402177	20	12/21/19 15:33	12/24/19 19:48	JHH	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 8015	WG1402341	10	12/26/19 07:02	12/27/19 10:50	CLG	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.

Jared Starkey
Project Manager

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



Collected date/time: 12/20/19 10:00

L1173384

Calculated Results

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
Sodium Adsorption Ratio	24.9		1	12/26/2019 09:55	WG1400657

1 Cp

2 Tc

Wet Chemistry by Method 9045D

Analyte	Result	Qualifier	Dilution	Analysis date / time	Batch
pH	8.14	T8	1	12/27/2019 12:00	WG1402081

3 Ss

4 Cn

Sample Narrative:

L1173384-01 WG1402081: 8.14 at 19.3C

5 Sr

Wet Chemistry by Method 9050AMod

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Specific Conductance	4660		10.0	1	12/24/2019 13:00	WG1401857

6 Qc

7 Gl

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) Low Fraction	362		25.0	250	12/22/2019 07:13	WG1400950
(S) a,a,a-Trifluorotoluene(FID)	100		77.0-120		12/22/2019 07:13	WG1400950

8 Al

9 Sc

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
Benzene	0.0575		0.0200	20	12/22/2019 04:51	WG1401025
Toluene	0.827		0.100	20	12/22/2019 04:51	WG1401025
Ethylbenzene	0.679		0.0500	20	12/24/2019 19:48	WG1402177
Total Xylenes	9.25		0.130	20	12/22/2019 04:51	WG1401025
(S) Toluene-d8	96.3		75.0-131		12/22/2019 04:51	WG1401025
(S) Toluene-d8	109		75.0-131		12/24/2019 19:48	WG1402177
(S) 4-Bromofluorobenzene	114		67.0-138		12/22/2019 04:51	WG1401025
(S) 4-Bromofluorobenzene	101		67.0-138		12/24/2019 19:48	WG1402177
(S) 1,2-Dichloroethane-d4	103		70.0-130		12/22/2019 04:51	WG1401025
(S) 1,2-Dichloroethane-d4	99.9		70.0-130		12/24/2019 19:48	WG1402177

Semi-Volatile Organic Compounds (GC) by Method 8015

Analyte	Result	Qualifier	RDL	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	1890		40.0	10	12/27/2019 10:50	WG1402341
(S) o-Terphenyl	129		18.0-148		12/27/2019 10:50	WG1402341



L1173383-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173383-01 12/27/19 12:00 • (DUP) R3486338-2 12/27/19 12:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
pH	8.53	8.75	1	2.55	<u>J3</u>	1

Sample Narrative:

OS: 8.53 at 19.4C
DUP: 8.75 at 19.4C

Laboratory Control Sample (LCS)

(LCS) R3486338-1 12/27/19 12:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.03 at 19.4C

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



Method Blank (MB)

(MB) R3485665-1 12/24/19 13:00

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

1 Cp

2 Tc

3 Ss

4 Cn

L1173003-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1173003-01 12/24/19 13:00 • (DUP) R3485665-3 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	6310	6100	1	3.38		20

5 Sr

6 Qc

L1173135-05 Original Sample (OS) • Duplicate (DUP)

(OS) L1173135-05 12/24/19 13:00 • (DUP) R3485665-4 12/24/19 13:00

Analyte	Original Result umhos/cm	DUP Result umhos/cm	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits
Specific Conductance	298	291	1	2.38		20

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3485665-2 12/24/19 13:00

Analyte	Spike Amount umhos/cm	LCS Result umhos/cm	LCS Rec. %	Rec. Limits %	LCS Qualifier
Specific Conductance	475	474	99.8	85.0-115	



Method Blank (MB)

(MB) R3484970-3 12/21/19 23:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/FID) Low Fraction	0.0303	<u>J</u>	0.0217	0.100
^(S) a,a,a-Trifluorotoluene(FID)	101			77.0-120

1 Cp

2 Tc

3 Ss

4 Cn

Laboratory Control Sample (LCS)

(LCS) R3484970-2 12/21/19 22:29

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	5.35	97.3	72.0-127	
^(S) a,a,a-Trifluorotoluene(FID)			112	77.0-120	

5 Sr

6 Qc

7 Gl

L1173173-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173173-01 12/22/19 06:52 • (MS) R3484970-6 12/22/19 08:14 • (MSD) R3484970-7 12/22/19 08:35

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry) mg/kg	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	1790	3490	4660	4830	65.2	74.6	250	10.0-151	<u>E</u>	<u>E</u>	3.56	28
^(S) a,a,a-Trifluorotoluene(FID)					113	113		77.0-120				

8 Al

9 Sc



Method Blank (MB)

(MB) R3485684-2 12/21/19 22:15

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Benzene	U		0.000400	0.00100
Toluene	U		0.00125	0.00500
Xylenes, Total	U		0.00478	0.00650
<i>(S) Toluene-d8</i>	99.7			75.0-131
<i>(S) 4-Bromofluorobenzene</i>	88.9			67.0-138
<i>(S) 1,2-Dichloroethane-d4</i>	98.4			70.0-130

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

Laboratory Control Sample (LCS)

(LCS) R3485684-1 12/21/19 20:52

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.125	0.127	102	70.0-123	
Toluene	0.125	0.121	96.8	75.0-121	
Xylenes, Total	0.375	0.336	89.6	72.0-127	
<i>(S) Toluene-d8</i>			96.6	75.0-131	
<i>(S) 4-Bromofluorobenzene</i>			96.6	67.0-138	
<i>(S) 1,2-Dichloroethane-d4</i>			111	70.0-130	

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1173381-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173381-02 12/22/19 03:35 • (MS) R3485684-3 12/22/19 05:10 • (MSD) R3485684-4 12/22/19 05:29

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	ND	0.142	0.151	114	121	1	10.0-149			6.14	37
Toluene	0.125	ND	0.142	0.154	114	123	1	10.0-156			8.11	38
Xylenes, Total	0.375	ND	0.399	0.436	106	116	1	10.0-160			8.86	38
<i>(S) Toluene-d8</i>					96.3	99.7		75.0-131				
<i>(S) 4-Bromofluorobenzene</i>					96.7	98.7		67.0-138				
<i>(S) 1,2-Dichloroethane-d4</i>					99.2	97.4		70.0-130				



Method Blank (MB)

(MB) R3485930-2 12/24/19 15:47

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Ethylbenzene	U		0.000530	0.00250
(S) Toluene-d8	108			75.0-131
(S) 4-Bromofluorobenzene	100			67.0-138
(S) 1,2-Dichloroethane-d4	101			70.0-130

Laboratory Control Sample (LCS)

(LCS) R3485930-1 12/24/19 13:09

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Ethylbenzene	0.125	0.112	89.6	74.0-126	
(S) Toluene-d8			108	75.0-131	
(S) 4-Bromofluorobenzene			102	67.0-138	
(S) 1,2-Dichloroethane-d4			104	70.0-130	

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3486340-1 12/26/19 17:20

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>	80.8			18.0-148

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Laboratory Control Sample (LCS)

(LCS) R3486340-2 12/26/19 17:33

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) High Fraction	50.0	44.5	89.0	50.0-150	
<i>(S) o-Terphenyl</i>			67.3	18.0-148	

L1173003-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1173003-01 12/26/19 19:27 • (MS) R3486340-3 12/26/19 19:39 • (MSD) R3486340-4 12/26/19 19:52

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	48.3	7.15	50.2	50.8	89.1	90.4	1	50.0-150			1.19	20
<i>(S) o-Terphenyl</i>					53.6	55.1		18.0-148				



Guide to Reading and Understanding Your Laboratory Report

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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.

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

Qualifier	Description
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
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.
T8	Sample(s) received past/too close to holding time expiration.



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

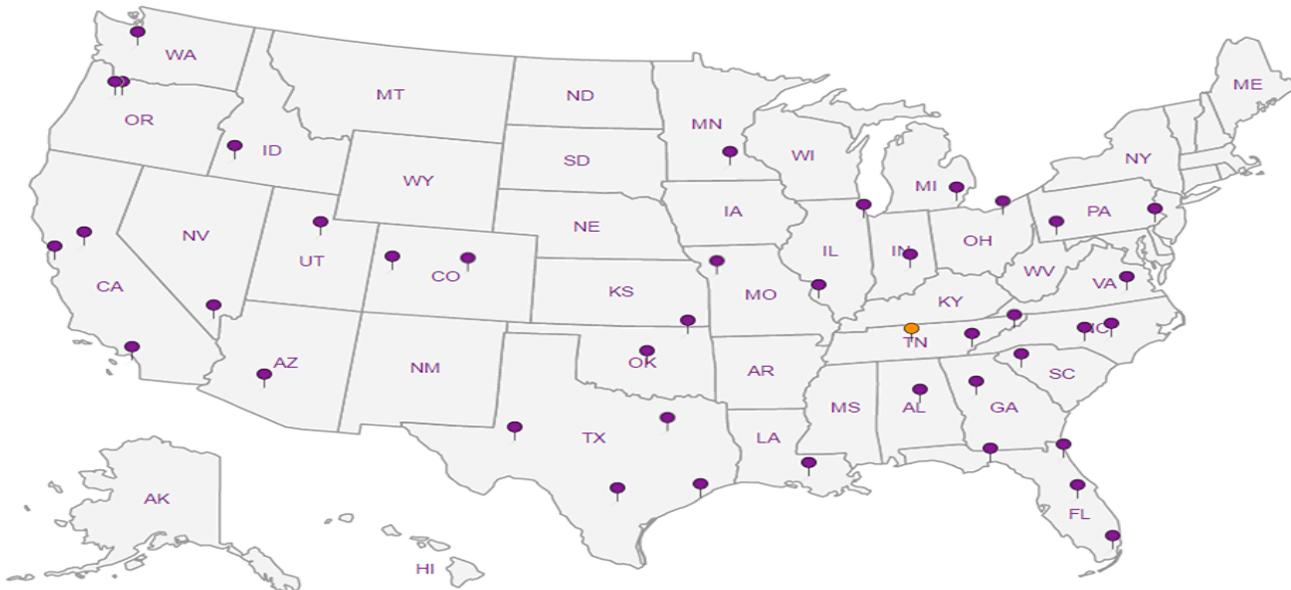
Third Party Federal Accreditations

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

