**VIA ELECTRONIC MAIL –**

February 28, 2022

Jake Janicek
EH&S Specialist
Caerus Oil and Gas LLC
143 Diamond Avenue
Parachute, Colorado 81635

**Subject:** **Report of Work Completed**
**Dumpline Release H7**
**Mamm Creek Field**
**Garfield County, Colorado**

Dear Mr. Janicek:

WSP USA Inc. (WSP), on behalf of Caerus Oil and Gas LLC (Caerus), conducted delineation soil sampling to define hydrocarbon impacts associated with the production well KRK 7-7A dumpline release discovered at the KRK-67S92W7SENE (H7) (Facility ID: 334864) pad location (Site). These activities were completed as a continuation assessment associated with a previous drilling assessment conducted west of the separator production unit at the Site. This document serves as a report of work completed (ROWC) which details the investigative assessment activities completed in the first quarter of 2022. This document also serves as a remediation workplan which outlines planned remediation activities to remove the defined hydrocarbon impacts at Site. All previous investigative activities can be referenced under Colorado Oil and Gas Conservation Commission (COGCC) Site Investigation and Remediation Workplan (Initial Form) Document Number 402845415 and Site Investigation and Remediation Work Plan (Supplemental Form) Document Number 402898845. The Site is located in the Caerus Mamm Creek area of operation in Garfield County, Colorado (Figure 1).

## ASSESSMENT SOIL SAMPLING ACTIVITIES – H7 DUMPLINE RELEASE

On January 6, 2022, WSP personnel visited the Site to complete additional assessment activities to define remaining hydrocarbon impacts in previously advanced soil boring 20211119-H7 (SB-W) located directly west of the separator production equipment associated with the production well KRK 7-7A dumpline release. With the assistance of Western Slope Field Services, Inc. (WCO), one hydro-vacuum (hydro-vac) pothole (PH01) was advanced directly west of the separator and meter house production equipment to a total depth of 16.5 feet below ground surface (bgs). During advancement of the pothole, soil samples were collected using a hand auger at depths of 7.5 feet to 9.5 feet, 11.5 feet to 13.5 feet, and 16 feet to 16.5 feet bgs. Two soil samples were submitted for laboratory analysis from the pothole; one which was determined to be most impacted based on field screening, and one from the terminus of the boring. The pothole soil sampling activities were conducted by a WSP geologist who inspected the soil samples for the presence or absence of petroleum hydrocarbons odor and/or staining. The soil samples were characterized by visually inspecting the confirmation soil samples and field screening the soil head space using a photoionization detector (PID) to monitor for the presence or absence of volatile organic vapors. All soil samples were submitted to Pace Analytical (Pace) of Mount Juliet, Tennessee for analysis of a reduced analytical suite previously approved by the Director which included barium, chromium (VI), total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and total xylenes (BTEX), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, sodium adsorption ratio (SAR), and pH. The approved analyte list was evaluated under the COGCC Table 915-1 Residential Soil Screening Level Concentrations (RSSLCs). The pothole location is depicted on the enclosed Figure 2.

## ANALYTICAL RESULTS – H7 DUMPLINE RELEASE

Laboratory analytical results of the two pothole soil samples collected on January 6, 2022 indicate that samples 20220106-H7 (PH01) @11.5-13.5' and 20220106-H7 (PH01) @16-16.5' exceeded the COGCC Table 915-1 Clean-up Concentrations for pH with values of 8.72 and 8.94, respectively. Soil sample 20220106-H7 (PH01) @16-16.5' exceeded the COGCC Table 915-1 RSSLC for chromium (VI) with a concentration of 1.88 milligrams per kilogram (mg/kg). The chromium (IV) exceedance mentioned in the sample above was labeled with an analytical qualifier that indicated the batch quality control for the sample was out of the established range to confirm accuracy, so the sample was re-analyzed. The chromium (IV) result from the re-analysis of soil sample 20220106-H7 (PH01) @16-16.5' was below the laboratory detection limit. All other analytes were either below the laboratory detection limit or within the COGCC Table 915-1 RSSLCs. The laboratory analytical results are included in Enclosure A and summarized in Table 1.

## REMEDIATION WORKPLAN ACTIVITIES – H7 DUMPLINE RELEASE

Based on the previous site investigation activities summarized in Supplemental Form 27 Document Numbers 401915028 and 402898845, and the additional soil sampling performed under this ROWC, hydrocarbon impacts at the Site have been delineated. Based on the results of the site assessment activities, WSP proposes that Caerus remove the delineated hydrocarbon impacted soil at the Site through excavation activities and perform landfarm remediation of all excavated soil. Once the landfarmed soil is remediated and meets COGCC Table 915-1 RSSLCs, the soil will then be used to backfill the open excavation.

Proposed remediation activities include the excavation of the delineated hydrocarbon impacted soil associated with the production well KRK 7-7A dumpline release. Hydrocarbon impacted soils are located directly beneath the separator and west of the separator between the meter house and separator production unit. The excavation is anticipated to be advanced to a depth no greater than 30 feet bgs immediately beneath the point of release location and no greater than 15 feet bgs west of the separator between the separator and meter house. Prior to excavation activities, all production equipment immediately within the boundaries of the defined impacts and proposed excavation area will be deenergized and temporarily removed to access the impacted material. WSP will oversee and direct the equipment operator to remove the impacted soil to the known vertical and lateral depths based on the results from the previous drilling assessment. Once the excavation is advanced past the vertical depths of the identified hydrocarbon impacts, soil from all walls and floors will be field screened vertically and laterally at every 2-foot interval. Once field screening techniques indicate compliance with COGCC Table 915-1, confirmation soil samples from the walls and floors of the open excavation will be collected. The proposed excavation extent is depicted on the enclosed Figure 3.

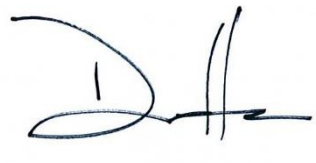
The soil sampling and screening activities will be conducted by a WSP geologist who will inspect each soil sample for the presence or absence of petroleum hydrocarbons odor and/or staining. The soil will be characterized by visually inspecting the soil samples and field screening the soil head space using a PID to monitor for the presence or absence of volatile organic vapors. All soil sampling equipment will be properly decontaminated between sampling intervals to ensure representative samples are collected. All soil samples will be submitted under a reduced sampling suite approved by the Director (Document Number 402898845) for the analysis of TPH, BTEX, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, SAR, and pH. All samples submitted under the approved analyte suite will evaluated under the COGCC Table 915-1 RSSLCs.

The number of excavation confirmation soil samples collected will be based on Table 1 referenced in the COGCC Rule 915.e.(2) – *Soil Sampling and Analysis Guidance Document*: one floor sample will be collected for every 500 square feet and one sidewall sample will be collected from each sidewall if the sidewall is less than 40 linear feet. If the sidewall is greater than 40 linear feet, one sidewall sample will be collected every 20 linear feet. Due to safety concerns associated with entering the open excavation, all soil samples will be collected from the excavator bucket. Prior to sample collection using the excavator bucket, all sampling surfaces will be scraped to removed smeared areas and/or weathered material to ensure each sample is representative of an undisturbed, recently exposed surface. All soil samples will be collected, characterized, field screened, and analyzed as previously described.

All excavated soil determined to be impacted will be stored in a containment berm on the working surface of the pad. An estimated 1,500 cubic yards of hydrocarbon impacted soil will be excavated for onsite landfarming. In order to adequately characterize the stockpiled soil for onsite landfarming, five-point composite soil samples will be collected for every 1,000 cubic yards of excavated soil. Each aliquot included in the five-point composite soil sample will be collected at depth of approximately half of the thickness of the stockpile at each sample location. Compliance sampling of the landfarmed soil will continue until all constituents listed under the Director's approved analyte suite are compliant under Table 915-1 RSSLCs. Once the landfarmed soil indicates compliance all previously excavated soil will be used to backfill the open excavation. All composite soil samples will be collected, characterized, field screened, and analyzed as previously described. The proposed area of the interim onsite landfarm is depicted on the enclosed Figure 4.

Please contact us at (970) 618-4514 or (970) 658-7025 if you have any questions regarding this report or require additional information.

Kind regards,



Dustin Held
Sr. Consultant, Environmental Geologist

Parker Coit, P.G.
Sr. Consultant, Geologist

Encl.

# FIGURES

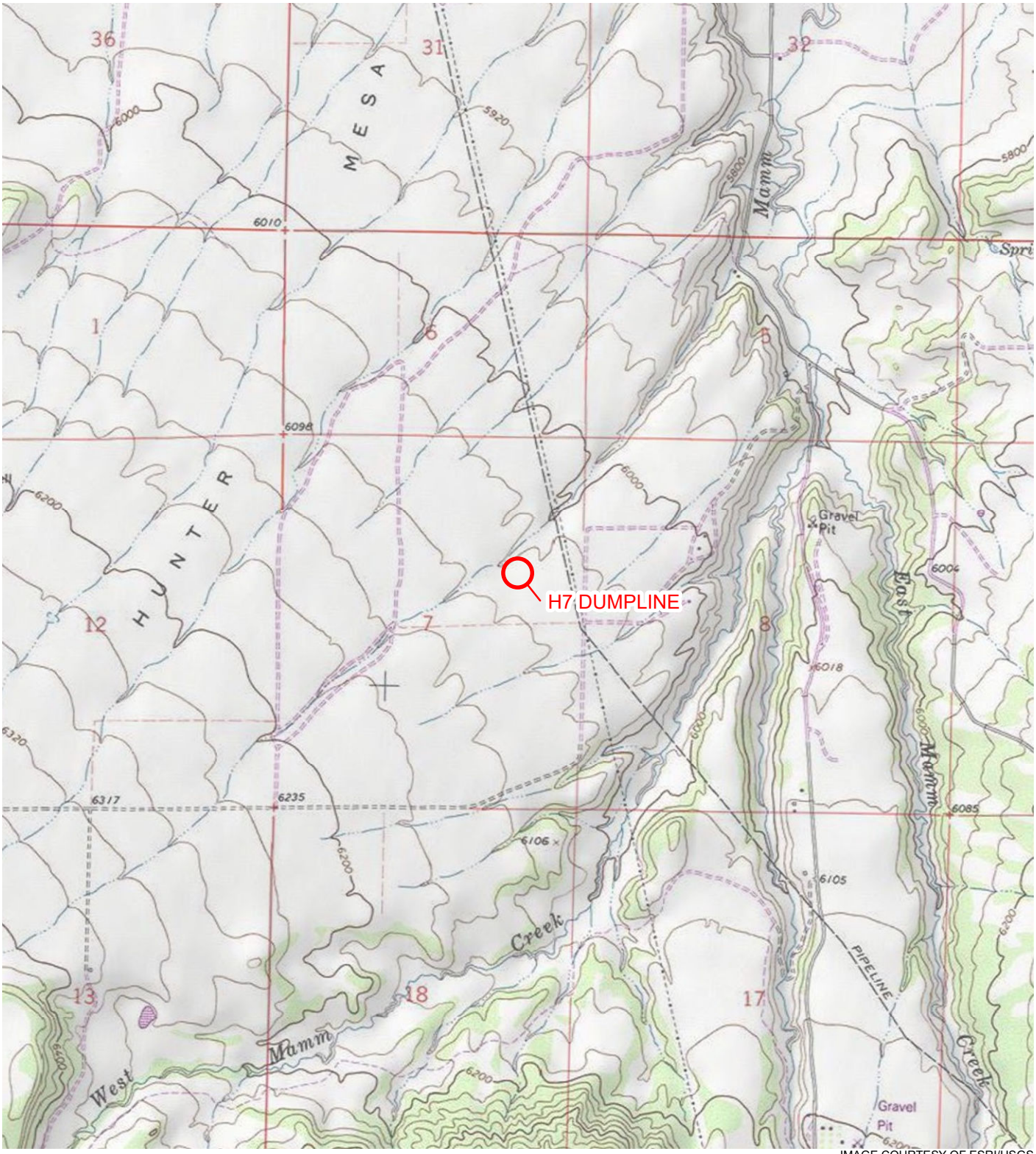



IMAGE COURTESY OF ESRI/USGS

**LEGEND**

SITE LOCATION

0 2,000 4,000

Feet

N

COLORADO

FIGURE 1
SITE LOCATION MAP
H7 DUMPLINE
SENE SEC 7-T7S-R92W
GARFIELD COUNTY, COLORADO
**CAERUS OIL AND GAS LLC**

C:\Users\USTJ689650\OneDrive - WSP O365\CAERUS\31403501.013_H7 DUMPLINE\MXD\31403501.013_FIG01_SL.mxd


IMAGE COURTESY OF ESRI (MAXAR 2018)

**LEGEND**

- POTHOLE SOIL SAMPLE

0 20 40

Feet

N

FIGURE 2
SITE MAP
H7 DUMPLINE
SENE SEC 7-T7S-R92W
GARFIELD COUNTY, COLORADO
**CAERUS OIL AND GAS LLC**

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IMAGE COURTESY OF ESRI (MAXAR 2018)

**LEGEND**

PROPOSED EXCAVATION

0 20 40

Feet

N

FIGURE 3
PROPOSED EXCAVATION SITE MAP
H7 DUMPLINE
SENE SEC 7-T7S-R92W
GARFIELD COUNTY, COLORADO
**CAERUS OIL AND GAS LLC**

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IMAGE COURTESY OF ESRI (MAXAR 2018)

**LEGEND**

PROPOSED LANDFARM LOCATION

0 50 100

Feet

N

FIGURE 4
PROPOSED LANDFARM LOCATION MAP
H7 DUMPLINE
SENE SEC 7-T7S-R92W
GARFIELD COUNTY, COLORADO
**CAERUS OIL AND GAS LLC**

wsp

P:\Caerus Oil & Gas\GIS\31403501.013_H7 DUMPLINE\MXD\31403501.013_FIG04_PROP_LANDFARM_LOC_2022.mxd

TABLE

**TABLE 1**

**SOIL ANALYTICAL RESULTS**
**H7 DUMPLINE**
**GARFIELD COUNTY, COLORADO**
**CAERUS OIL AND GAS LLC**

| PARAMETER | COGCC RESIDENTIAL SOIL SCREENING LEVEL CONCENTRATIONS | COGCC PROTECTION OF GROUNDWATER SOIL SCREENING LEVEL CONCENTRATIONS | UNITS | CONFIRMATION SOIL SAMPLE | | |
|---|---|---|---|---|---|---|
| | | | | **20220106-H7 (PH01) @ 11.5-13.5'** | **20220106-H7 (PH01) @ 16-16.5'** | **20220106-H7 (PH01) @ 16-16.5'** |
| Sample Date | | | | 1/6/2022 | 1/6/2022 | 1/6/2022 |
| Sample Depth (feet) | | | | 11.5-13.5 | 16-16.5 | 16-16.5 |
| Sample Type | | | | Confirmation Sample | Confirmation Sample | Confirmation Sample |
| Arsenic | 0.68 | 0.29 (M) | mg/kg | NA | NA | NA |
| Barium | 15,000 | 82 (M) | mg/kg | 154 | 190 | NA |
| Boron | 2 | 2 | mg/l | NA | NA | NA |
| Cadmium | 71 | 0.38 (M) | mg/kg | NA | NA | NA |
| Chromium (VI) | 0.3 | 0.00067 (R) | mg/kg | ND | **1.88** | ND |
| Copper | 3,100 | 46 (M) | mg/kg | NA | NA | NA |
| Lead | 400 | 14 (M) | mg/kg | NA | NA | NA |
| Nickel | 1,500 | 26 (R) | mg/kg | NA | NA | NA |
| Selenium | 390 | 0.26 (M) | mg/kg | NA | NA | NA |
| Silver | 390 | 0.8 (R) | mg/kg | NA | NA | NA |
| Zinc | 23,000 | 370 (R) | mg/kg | NA | NA | NA |
| EC | <4 | <4 | mmhos/cm | NA | NA | NA |
| pH | 6 - 8.3 | 6 - 8.3 | SU | **8.72** | **8.94** | NA |
| SAR | <6 | <6 | unitless | 3.66 | 5.07 | NA |
| TPH-GRO | | | mg/kg | ND | 0.109 | NA |
| TPH-DRO | | | mg/kg | ND | ND | NA |
| TPH-ORO | | | mg/kg | 8.30 | 6.53 | NA |
| TPH | 500 | 500 | mg/kg | 8.30 | 6.639 | NA |
| Benzene | 1.2 | 0.0026 (M) | mg/kg | ND | ND | NA |
| Toluene | 490 | 0.69 (M) | mg/kg | ND | ND | NA |
| Ethylbenzene | 5.8 | 0.78 (M) | mg/kg | ND | ND | NA |
| Total Xylenes | 58 | 9.9 (M) | mg/kg | ND | ND | NA |
| 1,2,4-trimethylbenzene | 30 | 0.0081 (R) | mg/kg | ND | ND | NA |
| 1,3,5-trimethylbenzene | 27 | 0.0087 (R) | mg/kg | ND | ND | NA |
| Acenaphthene | 360 | 5.8 (R) | mg/kg | NA | NA | NA |
| Anthracene | 1,800 | 0.55 (R) | mg/kg | NA | NA | NA |
| Benzo(A)anthracene | 1.1 | 0.011 (R) | mg/kg | NA | NA | NA |
| Benzo(B)fluoranthene | 1.1 | 0.3 (R) | mg/kg | NA | NA | NA |
| Benzo(K)fluoranthene | 11 | 2.9 (R) | mg/kg | NA | NA | NA |
| Benzo(A)pyrene | 0.11 | 0.24 (M) | mg/kg | NA | NA | NA |
| Chrysene | 110 | 9 (R) | mg/kg | NA | NA | NA |
| Dibenzo(A,H)anthracen | 0.11 | 0.11 (R) | mg/kg | NA | NA | NA |
| Fluoranthene | 240 | 0.096 (R) | mg/kg | NA | NA | NA |
| Fluorene | 240 | 0.54 (R) | mg/kg | NA | NA | NA |
| Indeno(1,2,3,c-d)pyrene | 1.1 | 0.98 (R) | mg/kg | NA | NA | NA |
| 1-methylnaphthalene | 18 | 0.006 (R) | mg/kg | ND | ND | ND |
| 2-methylnaphthalene | 24 | 0.019 (R) | mg/kg | ND | ND | ND |
| Naphthalene | 2 | 0.0038 (R) | mg/kg | ND | ND | ND |
| Pyrene | 180 | 1.3 (R) | mg/kg | NA | NA | NA |

**NOTES:**
ND - less than the stated reporting limit
**BOLD** - indicates result exceeds the COGCC concentration level
COGCC - Colorado Oil and Gas Conservation Commission
EC- electrical conductivity
mg/kg - milligrams per kilogram
mg/l - millgrams per liter
mmhos/cm - millimhos per centimeter
SAR - sodium adsorption ratio
SU - standard unit
TPH-ORO - total petroleum hydrcarbons- oil range orgainc
TPH-GRO - total petroleum hydrocarbons-gasoline range organics
TPH-DRO - total petroleum hydrocarbons-diesel range organics
TPH - combination of TPH-GRO, TPH-DRO, and TPH-ORO
NA - analyte not analyzed
ND - analyte not detected
R - risk based
MCL - maxium containment level (M)

# ENCLOSURE A – LABORATORY ANALYTICAL REPORTS

# ANALYTICAL REPORT

February 02, 2022



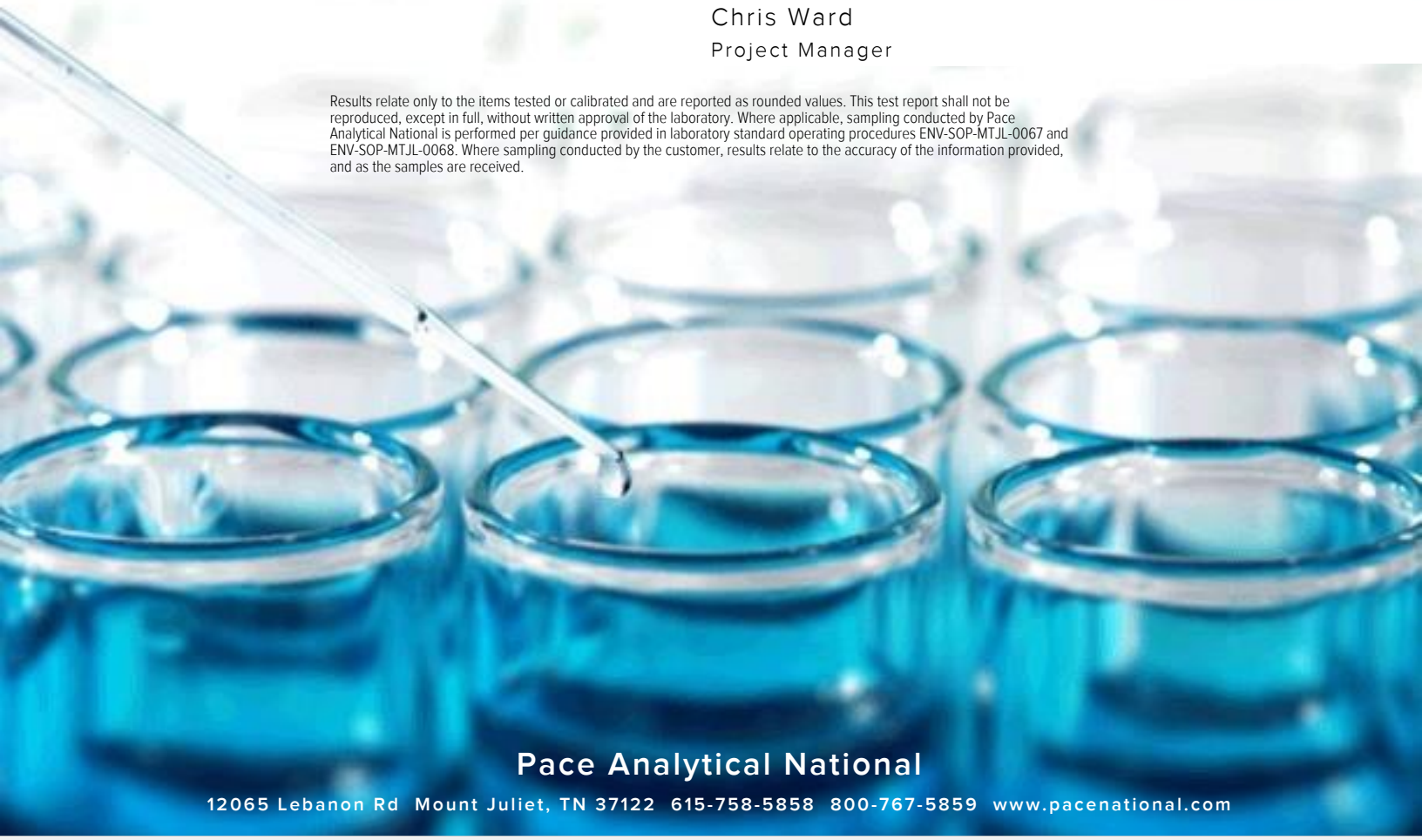
## Caerus Oil and Gas

| | |
|---|---|
| Sample Delivery Group: | L1451511 |
| Samples Received: | 01/14/2022 |
| Project Number: | H7 |
| Description: | H7 |
| Site: | H7 |
| Report To: | Brett Middleton<br>143 Diamond Avenue<br>Parachute, CO 81635 |

Entire Report Reviewed By: Chris Ward

Chris Ward
Project Manager





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

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# SAMPLE SUMMARY

## 20220106-H7(PH01) @ 11.5'-13.5' L1451511-01 Solid

Collected by: K. Moreland
Collected date/time: 01/06/22 09:50
Received date/time: 01/14/22 09:15

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Calculated Results | WG1802746 | 1 | 01/25/22 16:20 | 01/25/22 16:20 | CCE | Mt. Juliet, TN |
| Wet Chemistry by Method 7199 | WG1805166 | 1 | 01/20/22 16:55 | 01/24/22 17:04 | JER | Mt. Juliet, TN |
| Wet Chemistry by Method 9045D | WG1804362 | 1 | 01/19/22 07:06 | 01/19/22 09:00 | GI | Mt. Juliet, TN |
| Metals (ICP) by Method 6010B | WG1803334 | 1 | 01/18/22 17:03 | 01/20/22 13:15 | CCE | Mt. Juliet, TN |
| Volatile Organic Compounds (GC) by Method 8015D/GRO | WG1803638 | 1 | 01/15/22 18:05 | 01/18/22 11:25 | BMB | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1803153 | 1 | 01/15/22 18:05 | 01/17/22 00:38 | ACG | Mt. Juliet, TN |
| Semi-Volatile Organic Compounds (GC) by Method 8015M | WG1811601 | 1 | 01/16/22 14:14 | 01/17/22 04:03 | JDG | Mt. Juliet, TN |
| Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM | WG1802974 | 1 | 01/18/22 16:01 | 01/19/22 16:42 | LEA | Mt. Juliet, TN |

## 20220106-H7(PH01) @ 16'-16.5' L1451511-02 Solid

Collected by: K. Moreland
Collected date/time: 01/06/22 09:50
Received date/time: 01/14/22 09:15

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Calculated Results | WG1802746 | 1 | 01/25/22 16:28 | 01/25/22 16:28 | CCE | Mt. Juliet, TN |
| Wet Chemistry by Method 7199 | WG1805166 | 1 | 01/20/22 16:55 | 01/24/22 17:09 | JER | Mt. Juliet, TN |
| Wet Chemistry by Method 9045D | WG1804362 | 1 | 01/19/22 07:06 | 01/19/22 09:00 | GI | Mt. Juliet, TN |
| Metals (ICP) by Method 6010B | WG1803334 | 1 | 01/18/22 17:03 | 01/20/22 13:18 | CCE | Mt. Juliet, TN |
| Volatile Organic Compounds (GC) by Method 8015D/GRO | WG1803638 | 1 | 01/15/22 18:05 | 01/18/22 11:48 | BMB | Mt. Juliet, TN |
| Volatile Organic Compounds (GC/MS) by Method 8260B | WG1803153 | 1 | 01/15/22 18:05 | 01/17/22 00:58 | ACG | Mt. Juliet, TN |
| Semi-Volatile Organic Compounds (GC) by Method 8015M | WG1811601 | 1 | 01/16/22 14:14 | 01/17/22 03:50 | JDG | Mt. Juliet, TN |
| Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM | WG1802974 | 1 | 01/18/22 16:01 | 01/19/22 17:00 | LEA | Mt. Juliet, TN |

# CASE NARRATIVE

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

Chris Ward
Project Manager

## Calculated Results

| Analyte | Result | Qualifier | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|
| | SAR | | | | |
| Sodium Adsorption Ratio | 3.66 | | 1 | 01/25/2022 16:20 | WG1802746 |

## Wet Chemistry by Method 7199

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Hexavalent Chromium | ND | J4 | 1.00 | 1 | 01/24/2022 17:04 | WG1805166 |

## Wet Chemistry by Method 9045D

| Analyte | Result pH | Qualifier | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|
| pH | 8.72 | T8 | 1 | 01/19/2022 09:00 | WG1804362 |

Sample Narrative:

L1451511-01 WG1804362: 8.72 at 20.3C

## Metals (ICP) by Method 6010B

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Barium | 154 | | 0.500 | 1 | 01/20/2022 13:15 | WG1803334 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| TPH (GC/FID) Low Fraction | ND | | 0.100 | 1 | 01/18/2022 11:25 | WG1803638 |
| *(S) a,a,a-Trifluorotoluene(FID)* | *95.8* | | *77.0-120* | | *01/18/2022 11:25* | WG1803638 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | ND | | 0.00100 | 1 | 01/17/2022 00:38 | WG1803153 |
| Toluene | ND | | 0.00500 | 1 | 01/17/2022 00:38 | WG1803153 |
| Ethylbenzene | ND | | 0.00250 | 1 | 01/17/2022 00:38 | WG1803153 |
| Xylenes, Total | ND | | 0.00650 | 1 | 01/17/2022 00:38 | WG1803153 |
| 1,2,4-Trimethylbenzene | ND | | 0.00500 | 1 | 01/17/2022 00:38 | WG1803153 |
| 1,3,5-Trimethylbenzene | ND | | 0.00500 | 1 | 01/17/2022 00:38 | WG1803153 |
| *(S) Toluene-d8* | *111* | | *75.0-131* | | *01/17/2022 00:38* | WG1803153 |
| *(S) 4-Bromofluorobenzene* | *93.9* | | *67.0-138* | | *01/17/2022 00:38* | WG1803153 |
| *(S) 1,2-Dichloroethane-d4* | *86.9* | | *70.0-130* | | *01/17/2022 00:38* | WG1803153 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| C10-C28 Diesel Range | ND | | 4.00 | 1 | 01/17/2022 04:03 | WG1811601 |
| C28-C36 Motor Oil Range | 8.30 | | 4.00 | 1 | 01/17/2022 04:03 | WG1811601 |
| *(S) o-Terphenyl* | *64.3* | | *18.0-148* | | *01/17/2022 04:03* | WG1811601 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Naphthalene | ND | | 0.0200 | 1 | 01/19/2022 16:42 | WG1802974 |
| 1-Methylnaphthalene | ND | | 0.0200 | 1 | 01/19/2022 16:42 | WG1802974 |
| 2-Methylnaphthalene | ND | | 0.0200 | 1 | 01/19/2022 16:42 | WG1802974 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| *(S) p-Terphenyl-d14* | *90.3* | | *23.0-120* | | *01/19/2022 16:42* | WG1802974 |
| *(S) Nitrobenzene-d5* | *84.2* | | *14.0-149* | | *01/19/2022 16:42* | WG1802974 |
| *(S) 2-Fluorobiphenyl* | *85.7* | | *34.0-125* | | *01/19/2022 16:42* | WG1802974 |

## Calculated Results

| Analyte | Result | Qualifier | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|
| Sodium Adsorption Ratio | 5.07 | | 1 | 01/25/2022 16:28 | WG1802746 |

## Wet Chemistry by Method 7199

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Hexavalent Chromium | 1.88 | J4 | 1.00 | 1 | 01/24/2022 17:09 | WG1805166 |

## Wet Chemistry by Method 9045D

| Analyte | Result pH | Qualifier | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|
| pH | 8.94 | T8 | 1 | 01/19/2022 09:00 | WG1804362 |

Sample Narrative:

L1451511-02 WG1804362: 8.94 at 20.4C

## Metals (ICP) by Method 6010B

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Barium | 190 | | 0.500 | 1 | 01/20/2022 13:18 | WG1803334 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| TPH (GC/FID) Low Fraction | 0.109 | | 0.100 | 1 | 01/18/2022 11:48 | WG1803638 |
| *(S) a,a,a-Trifluorotoluene(FID)* | *95.4* | | *77.0-120* | | *01/18/2022 11:48* | WG1803638 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Benzene | ND | | 0.00100 | 1 | 01/17/2022 00:58 | WG1803153 |
| Toluene | ND | | 0.00500 | 1 | 01/17/2022 00:58 | WG1803153 |
| Ethylbenzene | ND | | 0.00250 | 1 | 01/17/2022 00:58 | WG1803153 |
| Xylenes, Total | ND | | 0.00650 | 1 | 01/17/2022 00:58 | WG1803153 |
| 1,2,4-Trimethylbenzene | ND | | 0.00500 | 1 | 01/17/2022 00:58 | WG1803153 |
| 1,3,5-Trimethylbenzene | ND | | 0.00500 | 1 | 01/17/2022 00:58 | WG1803153 |
| *(S) Toluene-d8* | *112* | | *75.0-131* | | *01/17/2022 00:58* | WG1803153 |
| *(S) 4-Bromofluorobenzene* | *97.9* | | *67.0-138* | | *01/17/2022 00:58* | WG1803153 |
| *(S) 1,2-Dichloroethane-d4* | *88.7* | | *70.0-130* | | *01/17/2022 00:58* | WG1803153 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| C10-C28 Diesel Range | ND | | 4.00 | 1 | 01/17/2022 03:50 | WG1811601 |
| C28-C36 Motor Oil Range | 6.53 | | 4.00 | 1 | 01/17/2022 03:50 | WG1811601 |
| *(S) o-Terphenyl* | *58.4* | | *18.0-148* | | *01/17/2022 03:50* | WG1811601 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Naphthalene | ND | | 0.0200 | 1 | 01/19/2022 17:00 | WG1802974 |
| 1-Methylnaphthalene | ND | | 0.0200 | 1 | 01/19/2022 17:00 | WG1802974 |
| 2-Methylnaphthalene | ND | | 0.0200 | 1 | 01/19/2022 17:00 | WG1802974 |

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

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| *(S) p-Terphenyl-d14* | *112* | | *23.0-120* | | *01/19/2022 17:00* | WG1802974 |
| *(S) Nitrobenzene-d5* | *96.8* | | *14.0-149* | | *01/19/2022 17:00* | WG1802974 |
| *(S) 2-Fluorobiphenyl* | *100* | | *34.0-125* | | *01/19/2022 17:00* | WG1802974 |

# QUALITY CONTROL SUMMARY

L1451511-01,02

## Method Blank (MB)

(MB) R3753227-1 01/24/22 16:51

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

## L1451927-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1451927-01 01/24/22 17:14 • (DUP) R3753227-4 01/24/22 17:19

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

## L1452479-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1452479-07 01/24/22 19:13 • (DUP) R3753227-9 01/24/22 19:19

| Analyte | Original Result mg/kg | DUP Result mg/kg | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| Hexavalent Chromium | ND | ND | 1 | 24.7 | P1 | 20 |

## Laboratory Control Sample (LCS)

(LCS) R3753227-3 01/24/22 16:59

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Hexavalent Chromium | 10.0 | 20.8 | 208 | 80.0-120 | J4 |

## L1452479-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1452479-01 01/24/22 18:11 • (MS) R3753227-5 01/24/22 18:16 • (MSD) R3753227-6 01/24/22 18:22

| Analyte | Spike Amount mg/kg | Original Result mg/kg | MS Result mg/kg | MSD Result mg/kg | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hexavalent Chromium | 20.0 | ND | 15.3 | 25.8 | 76.3 | 129 | 1 | 75.0-125 | | J3 J5 | 51.3 | 20 |

## L1452479-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1452479-01 01/24/22 18:11 • (MS) R3753227-7 01/24/22 18:27

| Analyte | Spike Amount mg/kg | Original Result mg/kg | MS Result mg/kg | MS Rec. % | Dilution | Rec. Limits % | MS Qualifier |
|---|---|---|---|---|---|---|---|
| Hexavalent Chromium | 638 | ND | 534 | 83.7 | 50 | 75.0-125 | |

## L1451452-07 Original Sample (OS) • Duplicate (DUP)

(OS) L1451452-07 01/19/22 09:00 • (DUP) R3751204-2 01/19/22 09:00

| Analyte | Original Result su | DUP Result su | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| pH | 10.2 | 10.2 | 1 | 0.0983 | | 1 |

Sample Narrative:

OS: 10.17 at 19.4C

DUP: 10.18 at 19.3C

## L1451878-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1451878-02 01/19/22 09:00 • (DUP) R3751204-3 01/19/22 09:00

| Analyte | Original Result su | DUP Result su | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| pH | 1.25 | 1.22 | 1 | 2.43 | J3 | 1 |

Sample Narrative:

OS: 1.25 at 20.4C

DUP: 1.22 at 20.3C

## Laboratory Control Sample (LCS)

(LCS) R3751204-1 01/19/22 09:00

| Analyte | Spike Amount su | LCS Result su | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| pH | 10.0 | 9.96 | 99.6 | 99.0-101 | |

Sample Narrative:

LCS: 9.96 at 19.2C

# QUALITY CONTROL SUMMARY

L1451511-01,02

## Method Blank (MB)

(MB) R3752129-1 01/20/22 11:53

| Analyte | MB Result mg/kg | MB Qualifier | MB MDL mg/kg | MB RDL mg/kg |
|---|---|---|---|---|
| Barium | 0.150 | J | 0.0852 | 0.500 |

## Laboratory Control Sample (LCS)

(LCS) R3752129-2 01/20/22 11:56

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Barium | 100 | 99.5 | 99.5 | 80.0-120 | |

## L1451505-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1451505-01 01/20/22 11:59 • (MS) R3752129-5 01/20/22 12:08 • (MSD) R3752129-6 01/20/22 12:10

| Analyte | Spike Amount mg/kg | Original Result mg/kg | MS Result mg/kg | MSD Result mg/kg | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barium | 100 | 159 | 265 | 234 | 106 | 74.9 | 1 | 75.0-125 | | J6 | 12.3 | 20 |

## Method Blank (MB)

(MB) R3751161-3 01/18/22 06:47

| 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)* | *97.3* | | | *77.0-120* |

## Laboratory Control Sample (LCS)

(LCS) R3751161-2 01/18/22 05:36

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| TPH (GC/FID) Low Fraction | 5.50 | 4.77 | 86.7 | 72.0-127 | |
| *(S) a,a,a-Trifluorotoluene(FID)* | | | *96.6* | *77.0-120* | |

## Method Blank (MB)

(MB) R3751019-3 01/17/22 00:18

| Analyte | MB Result mg/kg | MB Qualifier | MB MDL mg/kg | MB RDL mg/kg |
|---|---|---|---|---|
| Benzene | U | | 0.000467 | 0.00100 |
| Ethylbenzene | U | | 0.000737 | 0.00250 |
| Toluene | U | | 0.00130 | 0.00500 |
| 1,2,4-Trimethylbenzene | U | | 0.00158 | 0.00500 |
| 1,3,5-Trimethylbenzene | U | | 0.00200 | 0.00500 |
| Xylenes, Total | U | | 0.000880 | 0.00650 |
| *(S) Toluene-d8* | *111* | | | *75.0-131* |
| *(S) 4-Bromofluorobenzene* | *92.8* | | | *67.0-138* |
| *(S) 1,2-Dichloroethane-d4* | *88.9* | | | *70.0-130* |

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

(LCS) R3751019-1 01/16/22 22:59 • (LCSD) R3751019-2 01/16/22 23:19

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCSD Result mg/kg | LCS Rec. % | LCSD Rec. % | Rec. Limits % | LCS Qualifier | LCSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|
| Benzene | 0.125 | 0.120 | 0.118 | 96.0 | 94.4 | 70.0-123 | | | 1.68 | 20 |
| Ethylbenzene | 0.125 | 0.132 | 0.126 | 106 | 101 | 74.0-126 | | | 4.65 | 20 |
| Toluene | 0.125 | 0.126 | 0.123 | 101 | 98.4 | 75.0-121 | | | 2.41 | 20 |
| 1,2,4-Trimethylbenzene | 0.125 | 0.112 | 0.108 | 89.6 | 86.4 | 70.0-126 | | | 3.64 | 20 |
| 1,3,5-Trimethylbenzene | 0.125 | 0.109 | 0.105 | 87.2 | 84.0 | 73.0-127 | | | 3.74 | 20 |
| Xylenes, Total | 0.375 | 0.370 | 0.356 | 98.7 | 94.9 | 72.0-127 | | | 3.86 | 20 |
| *(S) Toluene-d8* | | | | *108* | *109* | *75.0-131* | | | | |
| *(S) 4-Bromofluorobenzene* | | | | *101* | *97.8* | *67.0-138* | | | | |
| *(S) 1,2-Dichloroethane-d4* | | | | *93.3* | *94.4* | *70.0-130* | | | | |

## L1451531-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1451531-01 01/17/22 02:16 • (MS) R3751019-4 01/17/22 07:09 • (MSD) R3751019-5 01/17/22 07:29

| 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 | 0.113 | ND | 0.0849 | 0.100 | 91.8 | 108 | 1 | 10.0-149 | | | 16.3 | 37 |
| Ethylbenzene | 0.113 | ND | 0.0930 | 0.107 | 101 | 116 | 1 | 10.0-160 | | | 14.0 | 38 |
| Toluene | 0.113 | ND | 0.0913 | 0.107 | 98.7 | 116 | 1 | 10.0-156 | | | 15.8 | 38 |
| 1,2,4-Trimethylbenzene | 0.113 | ND | 0.0717 | 0.0903 | 77.5 | 97.6 | 1 | 10.0-160 | | | 23.0 | 36 |
| 1,3,5-Trimethylbenzene | 0.113 | ND | 0.0776 | 0.0920 | 83.9 | 99.5 | 1 | 10.0-160 | | | 17.0 | 38 |
| Xylenes, Total | 0.337 | ND | 0.252 | 0.291 | 91.0 | 105 | 1 | 10.0-160 | | | 14.4 | 38 |
| *(S) Toluene-d8* | | | | | *109* | *110* | | *75.0-131* | | | | |
| *(S) 4-Bromofluorobenzene* | | | | | *98.0* | *97.2* | | *67.0-138* | | | | |
| *(S) 1,2-Dichloroethane-d4* | | | | | *88.3* | *91.2* | | *70.0-130* | | | | |

## Method Blank (MB)

(MB) R3755854-1 01/16/22 22:55

| Analyte | MB Result mg/kg | MB Qualifier | MB MDL mg/kg | MB RDL mg/kg |
|---|---|---|---|---|
| C10-C28 Diesel Range | U | | 1.61 | 4.00 |
| C28-C36 Motor Oil Range | U | | 0.274 | 4.00 |
| *(S) o-Terphenyl* | *79.0* | | | *18.0-148* |

## Laboratory Control Sample (LCS)

(LCS) R3755854-2 01/16/22 23:08

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| C10-C28 Diesel Range | 50.0 | 41.4 | 82.8 | 50.0-150 | |
| *(S) o-Terphenyl* | | | *101* | *18.0-148* | |

## Method Blank (MB)

(MB) R3751495-2 01/19/22 15:16

| Analyte | MB Result mg/kg | MB Qualifier | MB MDL mg/kg | MB RDL mg/kg |
|---|---|---|---|---|
| Naphthalene | U | | 0.00408 | 0.0200 |
| 1-Methylnaphthalene | U | | 0.00449 | 0.0200 |
| 2-Methylnaphthalene | U | | 0.00427 | 0.0200 |
| *(S) Nitrobenzene-d5* | *86.1* | | | *14.0-149* |
| *(S) 2-Fluorobiphenyl* | *89.3* | | | *34.0-125* |
| *(S) p-Terphenyl-d14* | *99.8* | | | *23.0-120* |

## Laboratory Control Sample (LCS)

(LCS) R3751495-1 01/19/22 14:58

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Naphthalene | 0.0800 | 0.0687 | 85.9 | 50.0-120 | |
| 1-Methylnaphthalene | 0.0800 | 0.0711 | 88.9 | 51.0-121 | |
| 2-Methylnaphthalene | 0.0800 | 0.0757 | 94.6 | 50.0-120 | |
| *(S) Nitrobenzene-d5* | | | *102* | *14.0-149* | |
| *(S) 2-Fluorobiphenyl* | | | *98.8* | *34.0-125* | |
| *(S) p-Terphenyl-d14* | | | *107* | *23.0-120* | |

## L1451955-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1451955-01 01/19/22 19:02 • (MS) R3751495-3 01/19/22 19:19 • (MSD) R3751495-4 01/19/22 19:37

| 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 % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Naphthalene | 0.0796 | 0.0690 | 0.115 | 0.143 | 57.8 | 94.9 | 1 | 10.0-135 | | | 21.7 | 27 |
| 1-Methylnaphthalene | 0.0796 | 0.114 | 0.161 | 0.198 | 59.0 | 108 | 1 | 10.0-142 | | | 20.6 | 28 |
| 2-Methylnaphthalene | 0.0796 | 0.166 | 0.219 | 0.267 | 66.6 | 129 | 1 | 10.0-137 | | | 19.8 | 28 |
| *(S) Nitrobenzene-d5* | | | | | *146* | *160* | | *14.0-149* | | J1 | | |
| *(S) 2-Fluorobiphenyl* | | | | | *88.9* | *86.8* | | *34.0-125* | | | | |
| *(S) p-Terphenyl-d14* | | | | | *103* | *102* | | *23.0-120* | | | | |

# GLOSSARY OF TERMS

## Guide to Reading and Understanding Your Laboratory Report

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

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

## Abbreviations and Definitions

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

| Qualifier | Description |
|---|---|
| J | The identification of the analyte is acceptable; the reported value is an estimate. |
| J1 | Surrogate recovery limits have been exceeded; values are outside upper control limits. |
| J3 | The associated batch QC was outside the established quality control range for precision. |
| J4 | The associated batch QC was outside the established quality control range for accuracy. |
| J5 | The sample matrix interfered with the ability to make any accurate determination; spike value is high. |
| J6 | The sample matrix interfered with the ability to make any accurate determination; spike value is low. |
| P1 | RPD value not applicable for sample concentrations less than 5 times the reporting limit. |
| T8 | Sample(s) received past/too close to holding time expiration. |

# ACCREDITATIONS & LOCATIONS

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

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

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

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

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

**Caerus Oil & Gas LLC**
**143 Diamond Avenue**
**Parachute, CO 81635**
**970-285-9606**

Billing Information: **Same as above**

Pres Chk

Report to: **bmiddleton@caerusoilandgas.com**

Email To: **bmiddleton@caerusoilandgas.com**

Project Description: **H7-Dumpline**

City/State Collected: **Mamm Creek, CO**

Phone: (949) 374-2506
Fax:

Client Project # **H7**

Lab Project # **H7**

Collected by (print): **K. MORELAND**

Site/Facility ID # **H7**

P.O. # **H7**

Collected by (signature): K. Moreland

Immediately Packed on Ice N ____ Y X

***Rush?*** (Lab MUST Be Notified)
____ Same Day ____ Five Day
____ Next Day ____ 5 Day (Rad Only)
____ Two Day ____ 10 Day (Rad Only)
____ Three Day

Quote #

Date Results Needed: **Standard TAT**

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace Analytical® National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
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Phone: 800-767-5859
Fax: 615-758-5859

L # L145511

C059

Acctnum:
Template:
Prelogin:
TSR:
PB:
Shipped Via:

| Sample ID | Comp/Grab | Matrix * | Depth | Date | Time | No. of Cntrs | TPH-GRO,DRO,ORO | BTEX | naphthalene | SAR, pH | barium, Chromium (VI) | 1,2,4-trimethylbenzene | 1,3,5-trimethylbenzene | 1-mthylnapthalene | 2-mthylnapthalene | Remarks | Sample # (lab only) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20220106-H7(PH01)@11.5-13.5 | GRAB | SS | 11.5-13.5 | 1/6/22 | 0950 | 2 | X | X | X | X | X | X | X | X | X | | 01 |
| 20220106-H7(PH01)@16.0-16.5 | ↓ | ↓ | 16.0-16.5 | ↓ | 1055 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | | 02 |

* Matrix:
**SS** - Soil **AIR** - Air **F** - Filter
**GW** - Groundwater **B** - Bioassay
**WW** - WasteWater
**DW** - Drinking Water
**OT** - Other_____

**Remarks:**

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier __ _____

Tracking # 5016 7232 0592

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

| Relinquished by : (Signature) | Date: | Time: | Received by: (Signature) | Trip Blank Received: Yes / No HCL / MeoH TBR |
|---|---|---|---|---|
| K. Moreland | 1/12/22 | 1300 | | |
| Relinquished by : (Signature) | Date: | Time: | Received by: (Signature) | Temp: 3.9+0.3=4.2 °C Bottles Received: 4 |
| | 1/12/22 | 1500 | | |
| Relinquished by : (Signature) | Date: | Time: | Received for lab by: (Signature) | Date: 1/14/22 Time: 915 |
| | | | K. Dolan | |

If preservation required by Login: Date/Time

Hold: Condition: NCF / OK

# ANALYTICAL REPORT

February 10, 2022



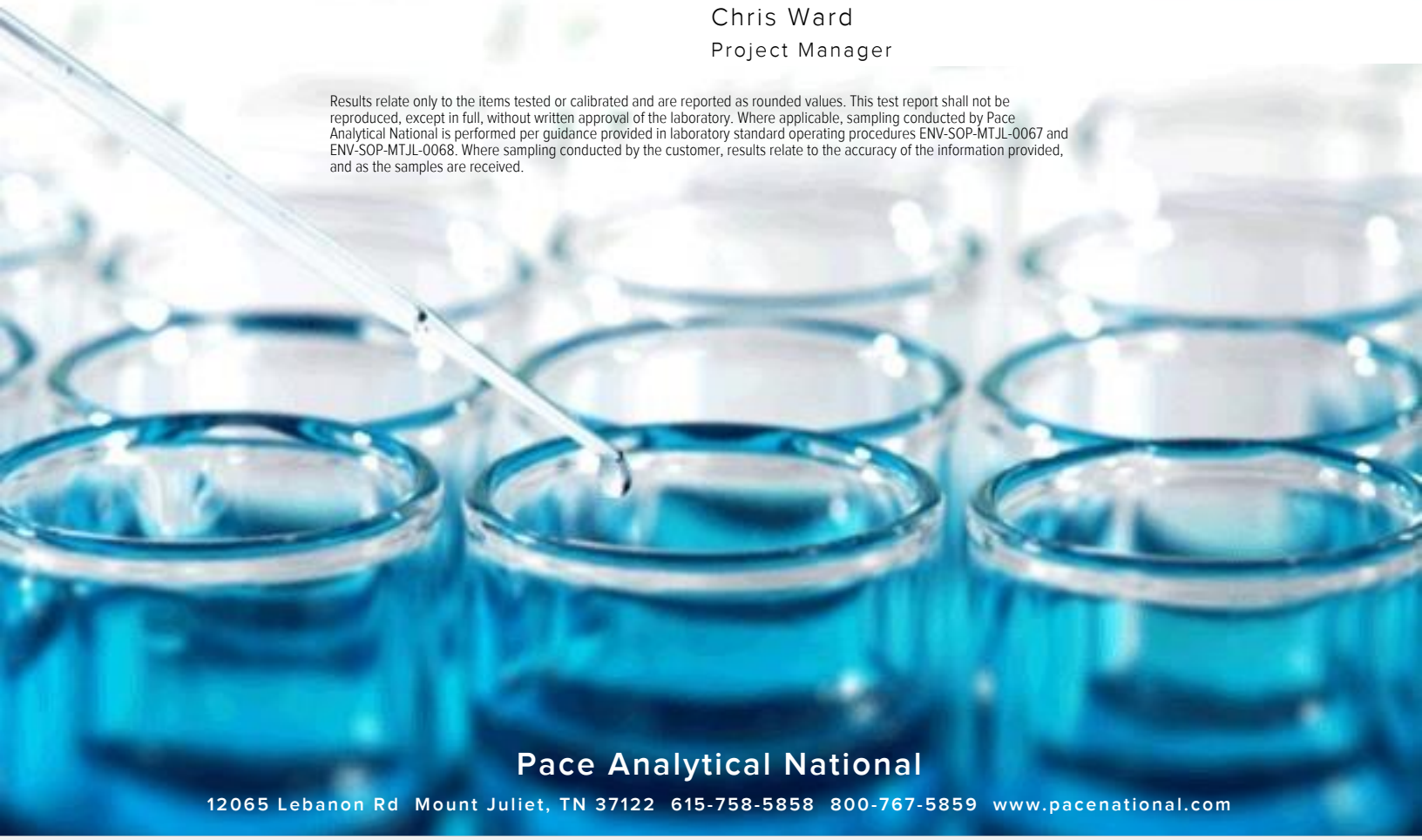
## Caerus Oil and Gas

| | |
|---|---|
| Sample Delivery Group: | L1457647 |
| Samples Received: | 01/14/2022 |
| Project Number: | H7 |
| Description: | H7 |
| Site: | H7 |
| Report To: | Brett Middleton<br>143 Diamond Avenue<br>Parachute, CO 81635 |

Entire Report Reviewed By:

Chris Ward
Project Manager





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

# TABLE OF CONTENTS

# SAMPLE SUMMARY

## 20220106-H7(PH01) @ 16'-16.5' L1457647-01 Solid

Collected by: K. Moreland
Collected date/time: 01/06/22 09:50
Received date/time: 01/14/22 09:15

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Wet Chemistry by Method 7199 | WG1813117 | 1 | 02/08/22 12:48 | 02/08/22 14:28 | JER | Mt. Juliet, TN |

# CASE NARRATIVE

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

Chris Ward
Project Manager

## Wet Chemistry by Method 7199

| Analyte | Result mg/kg | Qualifier | RDL mg/kg | Dilution | Analysis date / time | Batch |
|---|---|---|---|---|---|---|
| Hexavalent Chromium | ND | J3 J6 | 1.00 | 1 | 02/08/2022 14:28 | WG1813117 |

**Sample Narrative:**

L1457647-01 WG1813117: Sample is a reducer.

# QUALITY CONTROL SUMMARY

L1457647-01

## Method Blank (MB)

(MB) R3758140-1 02/08/22 13:49

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

## L1457621-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1457621-01 02/08/22 14:02 • (DUP) R3758140-3 02/08/22 14:07

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

## L1457650-11 Original Sample (OS) • Duplicate (DUP)

(OS) L1457650-11 02/08/22 15:35 • (DUP) R3758140-8 02/08/22 15:40

| Analyte | Original Result mg/kg | DUP Result mg/kg | Dilution | DUP RPD % | DUP Qualifier | DUP RPD Limits % |
|---|---|---|---|---|---|---|
| Hexavalent Chromium | 1.01 | ND | 1 | 200 | P1 | 20 |

## Laboratory Control Sample (LCS)

(LCS) R3758140-2 02/08/22 13:56

| Analyte | Spike Amount mg/kg | LCS Result mg/kg | LCS Rec. % | Rec. Limits % | LCS Qualifier |
|---|---|---|---|---|---|
| Hexavalent Chromium | 10.0 | 9.40 | 94.0 | 80.0-120 | |

## L1457647-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1457647-01 02/08/22 14:28 • (MS) R3758140-4 02/08/22 14:33 • (MSD) R3758140-5 02/08/22 14:38

| Analyte | Spike Amount mg/kg | Original Result mg/kg | MS Result mg/kg | MSD Result mg/kg | MS Rec. % | MSD Rec. % | Dilution | Rec. Limits % | MS Qualifier | MSD Qualifier | RPD % | RPD Limits % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hexavalent Chromium | 20.0 | ND | 5.31 | 4.00 | 26.6 | 20.0 | 1 | 75.0-125 | J6 | J3 J6 | 28.1 | 20 |

**Sample Narrative:**

OS: Sample is a reducer.

## L1457647-01 Original Sample (OS) • Matrix Spike (MS)

(OS) L1457647-01 02/08/22 14:28 • (MS) R3758140-6 02/08/22 14:54

| Analyte | Spike Amount mg/kg | Original Result mg/kg | MS Result mg/kg | MS Rec. % | Dilution | Rec. Limits % | MS Qualifier |
|---|---|---|---|---|---|---|---|
| Hexavalent Chromium | 633 | ND | 736 | 116 | 50 | 75.0-125 | |

**Sample Narrative:**

OS: Sample is a reducer.

# GLOSSARY OF TERMS

## Guide to Reading and Understanding Your Laboratory Report

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

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

## Abbreviations and Definitions

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

| Qualifier | Description |
|---|---|
| J3 | The associated batch QC was outside the established quality control range for precision. |
| J6 | The sample matrix interfered with the ability to make any accurate determination; spike value is low. |
| P1 | RPD value not applicable for sample concentrations less than 5 times the reporting limit. |

# ACCREDITATIONS & LOCATIONS

## Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

| | | | |
|---|---|---|---|
| Alabama | 40660 | Nebraska | NE-OS-15-05 |
| Alaska | 17-026 | Nevada | TN000032021-1 |
| Arizona | AZ0612 | New Hampshire | 2975 |
| Arkansas | 88-0469 | New Jersey–NELAP | TN002 |
| California | 2932 | New Mexico [1] | TN00003 |
| Colorado | TN00003 | New York | 11742 |
| Connecticut | PH-0197 | North Carolina | Env375 |
| Florida | E87487 | North Carolina [1] | DW21704 |
| Georgia | NELAP | North Carolina [3] | 41 |
| Georgia [1] | 923 | North Dakota | R-140 |
| Idaho | TN00003 | Ohio–VAP | CL0069 |
| Illinois | 200008 | Oklahoma | 9915 |
| Indiana | C-TN-01 | Oregon | TN200002 |
| Iowa | 364 | Pennsylvania | 68-02979 |
| Kansas | E-10277 | Rhode Island | LAO000356 |
| Kentucky [1 6] | KY90010 | South Carolina | 84004002 |
| Kentucky [2] | 16 | South Dakota | n/a |
| Louisiana | AI30792 | Tennessee [1 4] | 2006 |
| Louisiana | LA018 | Texas | T104704245-20-18 |
| Maine | TN00003 | Texas [5] | LAB0152 |
| Maryland | 324 | Utah | TN000032021-11 |
| Massachusetts | M-TN003 | Vermont | VT2006 |
| Michigan | 9958 | Virginia | 110033 |
| Minnesota | 047-999-395 | Washington | C847 |
| Mississippi | TN00003 | West Virginia | 233 |
| Missouri | 340 | Wisconsin | 998093910 |
| Montana | CERT0086 | Wyoming | A2LA |
| A2LA – ISO 17025 | 1461.01 | AIHA-LAP,LLC EMLAP | 100789 |
| A2LA – ISO 17025 [5] | 1461.02 | DOD | 1461.01 |
| Canada | 1461.01 | USDA | P330-15-00234 |
| EPA–Crypto | TN00003 | | |

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

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

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

Caerus Oil & Gas LLC
143 Diamond Avenue
Parachute, CO 81635
970-285-9606

Billing Information:
Same as above

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page ___ of ___

Pace Analytical®
National Center for Testing & Innovation

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

Report to: bmiddleton@caerusoilandgas.com

Email To: bmiddleton@caerusoilandgas.com

Project Description: H7-Dumpline

City/State Collected: Mamm Creek, CO

Phone: (949) 374-2506
Fax:

Client Project # H7

Lab Project # H7

L# L145164

C059
L1457647

Collected by (print): K. MORELAND

Site/Facility ID # H7

P.O. # H7

Acctnum:

Collected by (signature): K. Moreland

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed: Standard TAT

Template:

Prelogin:

TSR:

PB:

Shipped Via:

Immediately Packed on Ice N ___ Y X

| Sample ID | Comp/Grab | Matrix * | Depth | Date | Time | No. of Cntrs | TPH- GRO,DRO,ORO | BTEX | naphthalene | SAR, pH | barium, Chromium (VI) | 1,2,4-trimethylbenzene | 1,3,5-trimethylbenzene | 1-mthylnapthalene | 2-mthylnapthalene | Remarks | Sample # (lab only) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20220106-H7(PH01)@11.5-13.5 | GRAB | SS | 11.5-13.5 | 1/6/22 | 0950 | 2 | X | X | X | X | X | X | X | X | X | | -01 |
| 20220106-H7(PH01)@16.0-16.5 | ↓ | ↓ | 16.0-16.5 | ↓ | 1055 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | | -02 |

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____

Flow _____ Other _____

Samples returned via:
__ UPS __ FedEx __ Courier _____

Tracking # 5016 1232 0592

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

| Relinquished by: (Signature) | Date: | Time: | Received by: (Signature) | Trip Blank Received: Yes / No HCL / MeoH TBR | If preservation required by Login: Date/Time |
|---|---|---|---|---|---|
| K. Moreland | 1/12/22 | 1200 | | | |
| Relinquished by: (Signature) | Date: | Time: | Received by: (Signature) | Temp: 39+0.3=39 °C | Bottles Received: 4 |
| | 1/12/22 | 1500 | | | |
| Relinquished by: (Signature) | Date: | Time: | Received for lab by: (Signature) | Date: 1/14/22 | Time: 915 |
| | | | K. Dalen | | |

Hold: Condition: NCF / OK

## L1451511 *CAERUSPCO* EX

R3/R4/RX/EX

Please relog -02 to a new SDG for CR6IC

*_ _*

***Please note that email addresses for staff at the Pace Analytical National Center for Testing & Innovation have changed*.**

_My new email address is <u>Chris.Ward@pacelabs.com</u>. Please update your records accordingly.

_

* *

**Thanks,***

** *Chris
Ward

*Project Manager2_*

_***Pace Analytical National**
*

12065 Lebanon Road | Mt. Juliet, TN 37122**

Chris.ward@pacelabs.com
| www.pacenational.com

<u>615.773.9712</u>

***MAKE YOUR PAYMENTS ONLINE****



**Time estimate:** oh **Time spent:** oh

**Members**

Chris Ward (responsible)