

Caerus Oil and Gas

Sample Delivery Group: L1756011
Samples Received: 07/12/2024
Project Number:
Description: Love Ranch 8 Remediation
Site: LOVE RANCH 8
Report To: Jake J. / Brett M. / Blair R. / Andy V.
143 Diamond Avenue
Parachute, CO 81635

Entire Report Reviewed By:



Chris Ward
Project Manager

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

Pace Analytical National

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TABLE OF CONTENTS

Cp: Cover Page	1
Tc: Table of Contents	2
Ss: Sample Summary	3
Cn: Case Narrative	4
Sr: Sample Results	5
20240711-XTWP-(LR8-PZ04) L1756011-01	5
20240711-XTWP-(LR8-MW03) L1756011-02	6
Qc: Quality Control Summary	7
Gravimetric Analysis by Method 2540 C-2011	7
Wet Chemistry by Method 9056A	8
Volatile Organic Compounds (GC/MS) by Method 8260B	10
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	11
Gl: Glossary of Terms	12
Al: Accreditations & Locations	13
Sc: Sample Chain of Custody	14

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

SAMPLE SUMMARY

20240711-XTWP-(LR8-PZ04) L1756011-01 GW

Collected by
M. Schlageter

Collected date/time
07/11/24 11:55

Received date/time
07/12/24 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG2321817	1	07/12/24 17:46	07/14/24 23:12	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG2322983	10	07/19/24 23:05	07/19/24 23:05	JDG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2322826	1	07/15/24 01:46	07/15/24 01:46	DYW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG2324443	1	07/18/24 22:28	07/19/24 03:04	DSH	Mt. Juliet, TN

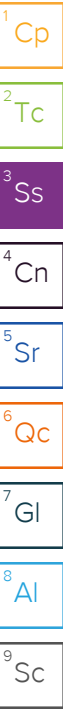
20240711-XTWP-(LR8-MW03) L1756011-02 GW

Collected by
M. Schlageter

Collected date/time
07/11/24 12:05

Received date/time
07/12/24 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG2321817	1	07/12/24 17:46	07/14/24 23:12	MMF	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG2322983	10	07/19/24 23:32	07/19/24 23:32	JDG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG2322826	1	07/15/24 02:08	07/15/24 02:08	DYW	Mt. Juliet, TN
Semi Volatile Organic Compounds (GC/MS) by Method 8270C-SIM	WG2324443	1	07/18/24 22:28	07/19/24 03:21	DSH	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



Gravimetric Analysis by Method 2540 C-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Dissolved Solids	1910		50.0	1	07/14/2024 23:12	WG2321817

Wet Chemistry by Method 9056A

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Chloride	179		3.79	10.0	10	07/19/2024 23:05	WG2322983
Sulfate	512		5.94	50.0	10	07/19/2024 23:05	WG2322983

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

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.108		0.0000941	0.00100	1	07/15/2024 01:46	WG2322826
Toluene	U		0.000278	0.00100	1	07/15/2024 01:46	WG2322826
Ethylbenzene	U		0.000137	0.00100	1	07/15/2024 01:46	WG2322826
Xylenes, Total	U		0.000174	0.00300	1	07/15/2024 01:46	WG2322826
Naphthalene	U		0.00100	0.00500	1	07/15/2024 01:46	WG2322826
1,2,4-Trimethylbenzene	U		0.000322	0.00100	1	07/15/2024 01:46	WG2322826
1,3,5-Trimethylbenzene	U		0.000104	0.00100	1	07/15/2024 01:46	WG2322826
(S) Toluene-d8	110			80.0-120		07/15/2024 01:46	WG2322826
(S) 4-Bromofluorobenzene	115			77.0-126		07/15/2024 01:46	WG2322826
(S) 1,2-Dichloroethane-d4	116			70.0-130		07/15/2024 01:46	WG2322826

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

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
1-Methylnaphthalene	U		0.0000687	0.000250	1	07/19/2024 03:04	WG2324443
2-Methylnaphthalene	U		0.0000674	0.000250	1	07/19/2024 03:04	WG2324443
(S) Nitrobenzene-d5	87.9			31.0-160		07/19/2024 03:04	WG2324443
(S) 2-Fluorobiphenyl	87.4			48.0-148		07/19/2024 03:04	WG2324443
(S) p-Terphenyl-d14	81.6			37.0-146		07/19/2024 03:04	WG2324443

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	1750		50.0	1	07/14/2024 23:12	WG2321817

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l		date / time	
Chloride	84.2		3.79	10.0	10	07/19/2024 23:32	WG2322983
Sulfate	679		5.94	50.0	10	07/19/2024 23:32	WG2322983

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

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l		date / time	
Benzene	U		0.0000941	0.00100	1	07/15/2024 02:08	WG2322826
Toluene	U		0.000278	0.00100	1	07/15/2024 02:08	WG2322826
Ethylbenzene	U		0.000137	0.00100	1	07/15/2024 02:08	WG2322826
Xylenes, Total	U		0.000174	0.00300	1	07/15/2024 02:08	WG2322826
Naphthalene	U		0.00100	0.00500	1	07/15/2024 02:08	WG2322826
1,2,4-Trimethylbenzene	U		0.000322	0.00100	1	07/15/2024 02:08	WG2322826
1,3,5-Trimethylbenzene	U		0.000104	0.00100	1	07/15/2024 02:08	WG2322826
(S) Toluene-d8	111			80.0-120		07/15/2024 02:08	WG2322826
(S) 4-Bromofluorobenzene	113			77.0-126		07/15/2024 02:08	WG2322826
(S) 1,2-Dichloroethane-d4	120			70.0-130		07/15/2024 02:08	WG2322826

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

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis	Batch
	mg/l		mg/l	mg/l		date / time	
1-Methylnaphthalene	U		0.0000687	0.000250	1	07/19/2024 03:21	WG2324443
2-Methylnaphthalene	U		0.0000674	0.000250	1	07/19/2024 03:21	WG2324443
(S) Nitrobenzene-d5	86.3			31.0-160		07/19/2024 03:21	WG2324443
(S) 2-Fluorobiphenyl	84.2			48.0-148		07/19/2024 03:21	WG2324443
(S) p-Terphenyl-d14	79.5			37.0-146		07/19/2024 03:21	WG2324443

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R4094569-1 07/14/24 23:12

	MB Result	<u>MB Qualifier</u>	MB MDL	MB RDL
Analyte	mg/l		mg/l	mg/l
Dissolved Solids	U		10.0	10.0

L1755004-17 Original Sample (OS) • Duplicate (DUP)

(OS) L1755004-17 07/14/24 23:12 • (DUP) R4094569-3 07/15/24 19:09

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	mg/l	mg/l		%		%
Dissolved Solids	828	840	1	1.44		10

L1755721-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1755721-01 07/14/24 23:12 • (DUP) R4094569-4 07/15/24 19:09

	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u>	DUP RPD Limits
Analyte	mg/l	mg/l		%		%
Dissolved Solids	201	204	1	1.48		10

Laboratory Control Sample (LCS)

(LCS) R4094569-2 07/14/24 23:12

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	<u>LCS Qualifier</u>
Analyte	mg/l	mg/l	%	%	
Dissolved Solids	8800	8760	99.5	85.0-115	

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Method Blank (MB)

(MB) R4094202-1 07/15/24 18:41

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	mg/l		mg/l	mg/l
Chloride	U		0.379	1.00
Sulfate	U		0.594	5.00

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

L1750875-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1750875-01 07/15/24 19:08 • (DUP) R4094202-3 07/15/24 19:22

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/l	mg/l		%		%
Chloride	32.3	39.3	1	19.5	J3	15
Sulfate	1.04	1.30	1	22.6	J P1	15

Sample Narrative:

OS: duplicate failure due to sample matrix

L1756003-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1756003-04 07/19/24 20:23 • (DUP) R4096355-1 07/19/24 20:36

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/l	mg/l		%		%
Chloride	23.8	23.4	1	1.58		15

L1756003-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1756003-04 07/19/24 21:03 • (DUP) R4096355-3 07/19/24 21:17

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	mg/l	mg/l		%		%
Sulfate	460	449	10	2.25		15

Laboratory Control Sample (LCS)

(LCS) R4094202-2 07/15/24 18:55

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	mg/l	mg/l	%	%	
Chloride	40.0	39.5	98.7	80.0-120	
Sulfate	40.0	40.2	100	80.0-120	

L1750875-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1750875-01 07/15/24 19:08 • (MS) R4094202-4 07/15/24 19:35 • (MSD) R4094202-5 07/15/24 19:49

	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Analyte	mg/l	mg/l	mg/l	mg/l	%	%		%			%	%
Chloride	40.0	32.3	62.6	71.5	75.7	97.9	1	80.0-120	J6		13.2	15
Sulfate	40.0	1.04	36.2	41.2	87.8	100	1	80.0-120			13.1	15

Sample Narrative:

OS: duplicate failure due to sample matrix

L1756003-04 Original Sample (OS) • Matrix Spike (MS)

(OS) L1756003-04 07/19/24 20:23 • (MS) R4096355-2 07/19/24 20:50

	Spike Amount	Original Result	MS Result	MS Rec.	Dilution	Rec. Limits	MS Qualifier
Analyte	mg/l	mg/l	mg/l	%		%	
Chloride	40.0	23.8	59.5	89.2	1	80.0-120	

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Method Blank (MB)

(MB) R4095442-3 07/14/24 19:02

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Benzene	U		0.0000941	0.00100
Toluene	U		0.000278	0.00100
Ethylbenzene	U		0.000137	0.00100
Xylenes, Total	U		0.000174	0.00300
Naphthalene	U		0.00100	0.00500
1,2,4-Trimethylbenzene	U		0.000322	0.00100
1,3,5-Trimethylbenzene	U		0.000104	0.00100
(S) Toluene-d8	112			80.0-120
(S) 4-Bromofluorobenzene	114			77.0-126
(S) 1,2-Dichloroethane-d4	118			70.0-130

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

(LCS) R4095442-1 07/14/24 17:57 • (LCSD) R4095442-2 07/14/24 18:19

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Benzene	0.00500	0.00482	0.00466	96.4	93.2	70.0-123			3.38	20
Toluene	0.00500	0.00442	0.00425	88.4	85.0	79.0-120			3.92	20
Ethylbenzene	0.00500	0.00436	0.00419	87.2	83.8	79.0-123			3.98	20
Xylenes, Total	0.0150	0.0132	0.0128	88.0	85.3	79.0-123			3.08	20
Naphthalene	0.00500	0.00420	0.00442	84.0	88.4	54.0-135	J	J	5.10	20
1,2,4-Trimethylbenzene	0.00500	0.00406	0.00404	81.2	80.8	76.0-121			0.494	20
1,3,5-Trimethylbenzene	0.00500	0.00426	0.00419	85.2	83.8	76.0-122			1.66	20
(S) Toluene-d8				107	105	80.0-120				
(S) 4-Bromofluorobenzene				111	109	77.0-126				
(S) 1,2-Dichloroethane-d4				118	119	70.0-130				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R4095835-3 07/19/24 02:11

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
1-Methylnaphthalene	U		0.0000687	0.000250
2-Methylnaphthalene	U		0.0000674	0.000250
(S) Nitrobenzene-d5	101			31.0-160
(S) 2-Fluorobiphenyl	98.5			48.0-148
(S) p-Terphenyl-d14	80.0			37.0-146

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

(LCS) R4095835-1 07/19/24 01:35 • (LCSD) R4095835-2 07/19/24 01:53

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
1-Methylnaphthalene	0.00200	0.00203	0.00224	102	112	66.0-142			9.84	20
2-Methylnaphthalene	0.00200	0.00195	0.00215	97.5	107	62.0-136			9.76	20
(S) Nitrobenzene-d5				101	103	31.0-160				
(S) 2-Fluorobiphenyl				91.0	99.0	48.0-148				
(S) p-Terphenyl-d14				68.5	68.5	37.0-146				

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

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

Qualifier Description

J	The identification of the analyte is acceptable; the reported value is an estimate.
J3	The associated batch QC was outside the established quality control range for precision.
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.

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

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.



[illegible]