Nicholson GeoSolutions, LLC
3433 East Lake Drive
Centennial, CO 80121

September 15, 2020

Mr. Don Wilbourn
Berry Petroleum Company
235 Callahan Avenue
Parachute, Colorado 81635

Subject: Long Ridge J15 Supplemental Groundwater Investigation

Dear Don:

Nicholson GeoSolutions LLC was retained by Berry Petroleum Company (Berry) to continue investigation at the site of a produced water and condensate leak near the J15 well pad on Long Ridge, Garfield County, Colorado. Excavation of impacted soils and rock, soil sampling, collection of one grab water sample from a boring, and the installation of one monitoring well on the south side of the soil impact zone were previously completed. This report provides the results of a second water sample collected from the monitoring well on August 31st, 2020 and the findings of a field reconnaissance conducted in the prominent drainage on the south side of the site and the East Fork of Parachute Creek.

Water Sampling

The total depth of well was measured at 60.40 feet from the top of the casing and the water level was 49.73 feet. Approximately 11 inches of condensate liquid was present on top of the water column. One water sample was collected from the well from below the condensate layer and analyzed for Total Petroleum Hydrocarbons (gasoline and diesel ranges), Total Dissolved Solids (TDS), chloride, sulfate, sodium, methanol, ethanol, and VOCs. Table 1 provides analytical results for the water sample. The laboratory analytical report is contained in Appendix A.

Gasoline-range TPH was reported at 55.9 mg/l, diesel-range TPH was reported at 42.6 mg/l, benzene was reported at 3.43 mg/l, and toluene was reported at 10.9 mg/l for this sample. These compounds are present in natural gas condensate liquids. Elevated levels of TDS (907 mg/l), chloride (1,270 mg/l), and dissolved sodium (655 mg/l) were also reported and are indicative of produced water.

Table 1 J15 Well Water Sample Results

Parameter	Colorado Aquatic Life Standards[3]	EPA Drinking Water Standards	J15-W-2 (Aug 31, 2020)
General Water Quality Parameters			
TDS		500[2]	**907**
Organic Constituents			
total petroleum hydrocarbons – gasoline range			55.9
total petroleum hydrocarbons – diesel range			42.6
benzene	5.3	0.005[1]	**3.43**
toluene	17.5	1.0[1]	**10.9**
ethylbenzene	32	0.7[1]	0.426
xylenes	C[3]	10[1]	9.12
methanol			<1.0
ethanol			9.86
Major Cations and Anions			
dissolved sodium (mg/l)			655
chloride (mg/l)		250[2]	**1,270**

All values in mg/l Values in bold type exceed standards
[1]Federal Drinking Water Maximum Contaminant Level (MCL)
[2]Federal Drinking Water Secondary Standard
[3]Carcinogenic compounds as classified by the EPA

Field Reconnaissance

A field reconnaissance of the prominent drainage that extends to the south from the spill site and the upper reaches of the East Fork of Parachute Creek was conducted on August 31st, 2020. The purpose of the reconnaissance was to inspect the drainage for seeps or springs that may represent discharge of the spill water at lower elevations and to collect samples of any discharge water encountered. The entire drainage was inspected down to the cliff face above the East Fork of Parachute Creek. No springs or evidence of seeps was observed. The upper East Fork and the area near Ben Goode Creek were also inspected. Ben Goode Creek and the East Fork were both dry.

Discussion

Berry Petroleum has been pumping water from the monitoring well daily and disposing of this water in the permitted 29-17 injection well in Garden Gulch. Approximately 13 gallons are pumped from the well in a few minutes and then the well goes dry. This indicates that the water is contained only in fractures within the sandstone bedrock at the site and that only the sand pack around the well is saturated with water. The water level has returned to approximately the same depth as originally measured each time the well has been pumped. Based on these observations, the two water sampling events, and the field reconnaissance, it appears that the spill water encountered in the borehole is mainly produced water and condensate with little or no natural groundwater present. In addition, the water appears to be perched on a low-conductivity layer that is preventing further vertical migration and is not discharging into the drainage to the south or Ben Goode Creek.

Nicholson GeoSolutions LLC has prepared this report using all available site data. If you have any questions please call me at 303-601-2023.

Nicholson GeoSolutions LLC

David K. Nicholson, P.G.
Principal Geologist

APPENDIX A
Laboratory Report

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

September 14, 2020

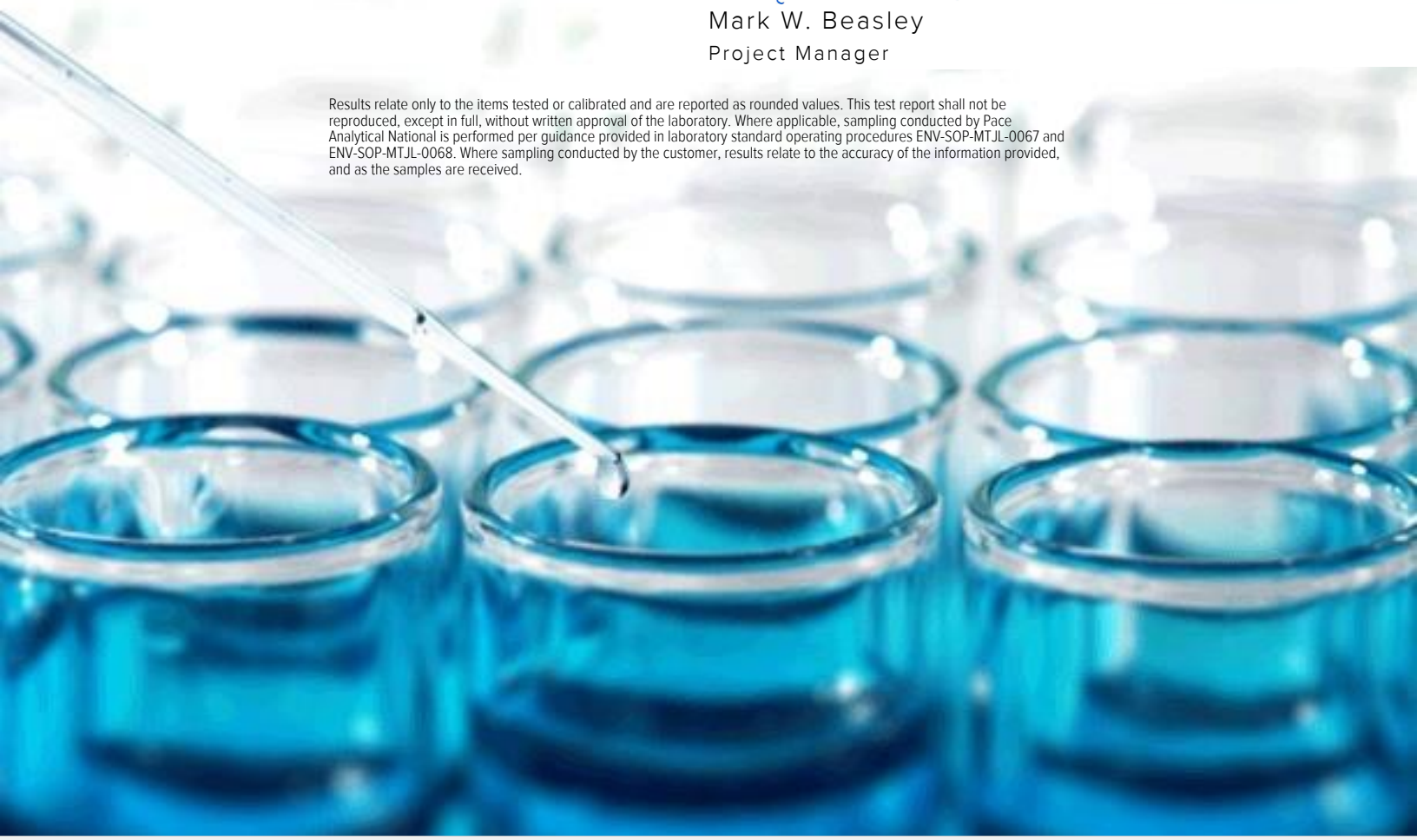
Berry Petroleum - Denver, CO

Sample Delivery Group:	L1257749
Samples Received:	09/03/2020
Project Number:	
Description:	

Report To: Dave Nicholson
3433 E. Lake Dr
Centennial, CO 80121

Entire Report Reviewed By:

Mark W. Beasley
Project Manager



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J15-W-2 L1257749-01 GW

Collected by	Collected date/time	Received date/time
	08/31/20 08:50	09/03/20 09:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Gravimetric Analysis by Method 2540 C-2011	WG1539155	1	09/07/20 06:37	09/07/20 14:27	CAT	Mt. Juliet, TN
Wet Chemistry by Method 9056A	WG1539342	20	09/07/20 23:46	09/07/20 23:46	ST	Mt. Juliet, TN
Metals (ICP) by Method 6010B	WG1538273	1	09/09/20 00:02	09/09/20 11:51	EL	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015D/GRO	WG1538383	250	09/05/20 00:48	09/05/20 00:48	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8015M	WG1538696	1	09/08/20 11:41	09/08/20 11:41	DAH	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1539145	250	09/06/20 23:34	09/06/20 23:34	ACG	Mt. Juliet, TN
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1541660	250	09/11/20 17:43	09/11/20 17:43	ACG	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method 3511/8015	WG1537650	5	09/04/20 13:14	09/06/20 11:09	JN	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.

Mark W. Beasley
Project Manager

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Dissolved Solids	907		10.0	1	09/07/2020 14:27	WG1539155

Wet Chemistry by Method 9056A

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Chloride	1270		20.0	20	09/07/2020 23:46	WG1539342
Sulfate	ND		100	20	09/07/2020 23:46	WG1539342

Metals (ICP) by Method 6010B

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Sodium,Dissolved	655		3.00	1	09/09/2020 11:51	WG1538273

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
TPH (GC/FID) Low Fraction	55.9		25.0	250	09/05/2020 00:48	WG1538383
(S) a,a,a-Trifluorotoluene(FID)	*97.2*		*78.0-120*		*09/05/2020 00:48*	WG1538383

Volatile Organic Compounds (GC) by Method 8015M

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Methanol	ND		1.00	1	09/08/2020 11:41	WG1538696
Ethanol	9.86		1.00	1	09/08/2020 11:41	WG1538696

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

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Acetone	ND		12.5	250	09/06/2020 23:34	WG1539145
Acrolein	ND		12.5	250	09/06/2020 23:34	WG1539145
Acrylonitrile	ND		2.50	250	09/06/2020 23:34	WG1539145
Benzene	3.43		0.250	250	09/06/2020 23:34	WG1539145
Bromodichloromethane	ND		0.250	250	09/06/2020 23:34	WG1539145
Bromoform	ND		0.250	250	09/06/2020 23:34	WG1539145
Bromomethane	ND		1.25	250	09/06/2020 23:34	WG1539145
Carbon disulfide	ND		0.250	250	09/06/2020 23:34	WG1539145
Carbon tetrachloride	ND		0.250	250	09/06/2020 23:34	WG1539145
Chlorobenzene	ND		0.250	250	09/06/2020 23:34	WG1539145
Chlorodibromomethane	ND		0.250	250	09/06/2020 23:34	WG1539145
Chloroethane	ND		1.25	250	09/06/2020 23:34	WG1539145
Chloroform	ND		1.25	250	09/06/2020 23:34	WG1539145
Chloromethane	ND		0.625	250	09/06/2020 23:34	WG1539145
1,2-Dibromoethane	ND		0.250	250	09/06/2020 23:34	WG1539145
1,2-Dibromo-3-Chloropropane	ND		1.25	250	09/06/2020 23:34	WG1539145
Dibromomethane	ND		0.250	250	09/06/2020 23:34	WG1539145
1,2-Dichlorobenzene	ND		0.250	250	09/06/2020 23:34	WG1539145
1,3-Dichlorobenzene	ND		0.250	250	09/06/2020 23:34	WG1539145
1,4-Dichlorobenzene	ND		0.250	250	09/06/2020 23:34	WG1539145
Dichlorodifluoromethane	ND		1.25	250	09/06/2020 23:34	WG1539145
1,1-Dichloroethane	ND		0.250	250	09/06/2020 23:34	WG1539145
1,2-Dichloroethane	ND		0.250	250	09/06/2020 23:34	WG1539145
1,1-Dichloroethene	ND		0.250	250	09/06/2020 23:34	WG1539145
cis-1,2-Dichloroethene	ND		0.250	250	09/06/2020 23:34	WG1539145

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

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
trans-1,2-Dichloroethene	ND		0.250	250	09/06/2020 23:34	WG1539145
1,2-Dichloropropane	ND		0.250	250	09/06/2020 23:34	WG1539145
cis-1,3-Dichloropropene	ND		0.250	250	09/06/2020 23:34	WG1539145
trans-1,3-Dichloropropene	ND		0.250	250	09/06/2020 23:34	WG1539145
Ethylbenzene	0.426		0.250	250	09/06/2020 23:34	WG1539145
2-Hexanone	ND		2.50	250	09/06/2020 23:34	WG1539145
Iodomethane	ND		2.50	250	09/06/2020 23:34	WG1539145
2-Butanone (MEK)	ND		2.50	250	09/06/2020 23:34	WG1539145
Methylene Chloride	ND		1.25	250	09/06/2020 23:34	WG1539145
4-Methyl-2-pentanone (MIBK)	ND		2.50	250	09/06/2020 23:34	WG1539145
Pentachloroethane	ND		1.25	250	09/11/2020 17:43	WG1541660
Styrene	ND		0.250	250	09/06/2020 23:34	WG1539145
1,1,2,2-Tetrachloroethane	ND		0.250	250	09/06/2020 23:34	WG1539145
1,1,1,2-Tetrachloroethane	ND		0.250	250	09/06/2020 23:34	WG1539145
Tetrachloroethene	ND		0.250	250	09/06/2020 23:34	WG1539145
Toluene	10.9		0.250	250	09/06/2020 23:34	WG1539145
1,1,1-Trichloroethane	ND		0.250	250	09/06/2020 23:34	WG1539145
1,1,2-Trichloroethane	ND		0.250	250	09/06/2020 23:34	WG1539145
Trichloroethene	ND		0.250	250	09/06/2020 23:34	WG1539145
Trichlorofluoromethane	ND		1.25	250	09/06/2020 23:34	WG1539145
1,2,3-Trichloropropane	ND		0.625	250	09/06/2020 23:34	WG1539145
Vinyl acetate	ND		2.50	250	09/06/2020 23:34	WG1539145
Vinyl chloride	ND		0.250	250	09/06/2020 23:34	WG1539145
Xylenes, Total	9.12		0.750	250	09/06/2020 23:34	WG1539145
Acetonitrile	ND		12.5	250	09/06/2020 23:34	WG1539145
Allyl chloride	ND		1.25	250	09/06/2020 23:34	WG1539145
Chloroprene	ND		12.5	250	09/06/2020 23:34	WG1539145
trans-1,4-Dichloro-2-butene	ND		0.625	250	09/06/2020 23:34	WG1539145
Isobutanol	ND		25.0	250	09/06/2020 23:34	WG1539145
1,4-Dioxane	ND		25.0	250	09/06/2020 23:34	WG1539145
Methacrylonitrile	ND		12.5	250	09/06/2020 23:34	WG1539145
Methyl methacrylate	ND		1.25	250	09/06/2020 23:34	WG1539145
Ethyl methacrylate	ND		1.25	250	09/06/2020 23:34	WG1539145
2-Propanol	ND		1.25	250	09/06/2020 23:34	WG1539145
Propionitrile	ND		12.5	250	09/06/2020 23:34	WG1539145
(S) Toluene-d8	*95.7*		*80.0-120*		*09/06/2020 23:34*	WG1539145
(S) Toluene-d8	*92.4*		*80.0-120*		*09/11/2020 17:43*	WG1541660
(S) 4-Bromofluorobenzene	*108*		*77.0-126*		*09/06/2020 23:34*	WG1539145
(S) 4-Bromofluorobenzene	*91.3*		*77.0-126*		*09/11/2020 17:43*	WG1541660
(S) 1,2-Dichloroethane-d4	*82.4*		*70.0-130*		*09/06/2020 23:34*	WG1539145
(S) 1,2-Dichloroethane-d4	*117*		*70.0-130*		*09/11/2020 17:43*	WG1541660

Semi-Volatile Organic Compounds (GC) by Method 3511/8015

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
TPH (GC/FID) High Fraction	42.6		0.500	5	09/06/2020 11:09	WG1537650
(S) o-Terphenyl	*123*		*31.0-160*		*09/06/2020 11:09*	WG1537650

Method Blank (MB)

(MB) R3568311-1 09/07/20 14:27

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Dissolved Solids	U		2.82	10.0

L1257158-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1257158-01 09/07/20 14:27 • (DUP) R3568311-3 09/07/20 14:27

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Dissolved Solids	162	125	1	25.8	J3	5

L1257329-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1257329-02 09/07/20 14:27 • (DUP) R3568311-4 09/07/20 14:27

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Dissolved Solids	98.0	94.0	1	4.17		5

Laboratory Control Sample (LCS)

(LCS) R3568311-2 09/07/20 14:27

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Dissolved Solids	8800	7120	80.9	77.4-123	

Method Blank (MB)

(MB) R3568306-1 09/07/20 16:44

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

L1258073-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1258073-02 09/08/20 04:42 • (DUP) R3568306-5 09/08/20 04:59

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	ND	1.04	1	13.3		15
Sulfate	18.7	19.3	1	2.81		15

L1258113-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1258113-02 09/08/20 07:19 • (DUP) R3568306-6 09/08/20 07:36

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Chloride	4.72	4.69	1	0.691		15
Sulfate	ND	ND	1	0.000		15

Laboratory Control Sample (LCS)

(LCS) R3568306-2 09/07/20 17:02

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Chloride	40.0	39.6	99.0	80.0-120	
Sulfate	40.0	40.3	101	80.0-120	

L1258073-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1258073-01 09/08/20 03:50 • (MS) R3568306-3 09/08/20 04:07 • (MSD) R3568306-4 09/08/20 04:24

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Chloride	50.0	6.05	51.9	52.0	91.7	92.0	1	80.0-120			0.316	15
Sulfate	50.0	143	182	182	78.6	78.3	1	80.0-120	E J6	E J6	0.0739	15

L1258113-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L1258113-02 09/08/20 07:19 • (MS) R3568306-7 09/08/20 07:54

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Chloride	50.0	4.72	54.7	100	1	80.0-120	
Sulfate	50.0	ND	53.3	101	1	80.0-120	

Method Blank (MB)

(MB) R3568710-1 09/09/20 11:30

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Sodium,Dissolved	U		0.504	3.00

Laboratory Control Sample (LCS)

(LCS) R3568710-2 09/09/20 11:32

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Sodium,Dissolved	10.0	10.2	102	80.0-120	

L1257760-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1257760-01 09/09/20 11:35 • (MS) R3568710-4 09/09/20 11:40 • (MSD) R3568710-5 09/09/20 11:42

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Sodium,Dissolved	10.0	74.5	82.2	82.4	76.7	78.2	1	75.0-125			0.178	20

Method Blank (MB)

(MB) R3569188-2 09/04/20 16:52

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TPH (GC/FID) Low Fraction	U		0.0314	0.100
(S) a,a,a-Trifluorotoluene(FID)	*98.4*			*78.0-120*

Laboratory Control Sample (LCS)

(LCS) R3569188-1 09/04/20 16:07

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/FID) Low Fraction	5.50	6.02	109	72.0-127	
(S) a,a,a-Trifluorotoluene(FID)			*103*	*78.0-120*	

L1257749-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1257749-01 09/05/20 00:48 • (MS) R3569188-3 09/05/20 01:10 • (MSD) R3569188-4 09/05/20 01:32

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
TPH (GC/FID) Low Fraction	1380	55.9	1740	1760	122	123	250	10.0-160			1.14	22
(S) a,a,a-Trifluorotoluene(FID)					*105*	*104*		*78.0-120*				

Method Blank (MB)

(MB) R3568015-2 09/08/20 09:27

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Methanol	U		0.495	1.00
Ethanol	U		0.476	1.00

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

(LCS) R3568015-1 09/08/20 09:21 • (LCSD) R3568015-3 09/08/20 09:33

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 %
Methanol	5.00	5.67	5.30	113	106	61.0-132			6.75	21
Ethanol	5.00	5.06	4.78	101	95.6	64.0-130			5.69	20

Method Blank (MB)

(MB) R3569066-3 09/06/20 14:57

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Acetone	U		0.0113	0.0500
Acrolein	U		0.00254	0.0500
Acrylonitrile	U		0.000671	0.0100
Benzene	U		0.0000941	0.00100
Bromodichloromethane	U		0.000136	0.00100
Bromoform	U		0.000129	0.00100
Bromomethane	U		0.000605	0.00500
Carbon disulfide	U		0.0000962	0.00100
Carbon tetrachloride	U		0.000128	0.00100
Chlorobenzene	U		0.000116	0.00100
Chlorodibromomethane	U		0.000140	0.00100
Chloroethane	U		0.000192	0.00500
Chloroform	U		0.000111	0.00500
Chloromethane	U		0.000960	0.00250
1,2-Dibromo-3-Chloropropane	U		0.000276	0.00500
1,2-Dibromoethane	U		0.000126	0.00100
Dibromomethane	U		0.000122	0.00100
1,2-Dichlorobenzene	U		0.000107	0.00100
1,3-Dichlorobenzene	U		0.000110	0.00100
1,4-Dichlorobenzene	U		0.000120	0.00100
trans-1,4-Dichloro-2-butene	U		0.000467	0.00250
Dichlorodifluoromethane	U		0.000374	0.00500
1,1-Dichloroethane	U		0.000100	0.00100
1,2-Dichloroethane	U		0.0000819	0.00100
1,1-Dichloroethene	U		0.000188	0.00100
cis-1,2-Dichloroethene	U		0.000126	0.00100
trans-1,2-Dichloroethene	U		0.000149	0.00100
1,2-Dichloropropane	U		0.000149	0.00100
cis-1,3-Dichloropropene	U		0.000111	0.00100
trans-1,3-Dichloropropene	U		0.000118	0.00100
Ethylbenzene	U		0.000137	0.00100
2-Hexanone	U		0.000787	0.0100
Iodomethane	U		0.00600	0.0100
2-Butanone (MEK)	U		0.00119	0.0100
Methylene Chloride	U		0.000430	0.00500
4-Methyl-2-pentanone (MIBK)	U		0.000478	0.0100
2-Propanol	U		0.00165	0.00500
Styrene	U		0.000118	0.00100
1,1,1,2-Tetrachloroethane	U		0.000147	0.00100
1,1,2,2-Tetrachloroethane	U		0.000133	0.00100

Method Blank (MB)

(MB) R3569066-3 09/06/20 14:57

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Tetrachloroethene	U		0.000300	0.00100
Toluene	U		0.000278	0.00100
1,1,1-Trichloroethane	U		0.000149	0.00100
1,1,2-Trichloroethane	U		0.000158	0.00100
Trichloroethene	U		0.000190	0.00100
Trichlorofluoromethane	U		0.000160	0.00500
1,2,3-Trichloropropane	U		0.000237	0.00250
Vinyl acetate	U		0.000692	0.0100
Vinyl chloride	U		0.000234	0.00100
Xylenes, Total	U		0.000174	0.00300
Allyl Chloride	U		0.000500	0.00500
Acetonitrile	U		0.0240	0.0500
Chloroprene	U		0.00145	0.0500
Ethyl methacrylate	U		0.00148	0.00500
Isobutanol	U		0.0421	0.100
Methacrylonitrile	U		0.0142	0.0500
Methyl methacrylate	U		0.00152	0.00500
Propionitrile	U		0.0162	0.0500
1,4-Dioxane	U		0.0360	0.100
(S) Toluene-d8	*94.5*			*80.0-120*
(S) 4-Bromofluorobenzene	*104*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*84.7*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3569066-1 09/06/20 13:58

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acetone	0.0250	0.0191	76.4	19.0-160	
Acrolein	0.0250	0.0147	58.8	10.0-160	
Acrylonitrile	0.0250	0.0200	80.0	55.0-149	
Benzene	0.00500	0.00494	98.8	70.0-123	
Bromodichloromethane	0.00500	0.00482	96.4	75.0-120	
Bromoform	0.00500	0.00453	90.6	68.0-132	
Bromomethane	0.00500	0.00297	59.4	10.0-160	
Carbon disulfide	0.00500	0.00481	96.2	61.0-128	
Carbon tetrachloride	0.00500	0.00496	99.2	68.0-126	
Chlorobenzene	0.00500	0.00483	96.6	80.0-121	
Chlorodibromomethane	0.00500	0.00450	90.0	77.0-125	

Laboratory Control Sample (LCS)

(LCS) R3569066-1 09/06/20 13:58

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Chloroethane	0.00500	0.00638	128	47.0-150	
Chloroform	0.00500	0.00496	99.2	73.0-120	
Chloromethane	0.00500	0.00532	106	41.0-142	
1,2-Dibromo-3-Chloropropane	0.00500	0.00370	74.0	58.0-134	
1,2-Dibromoethane	0.00500	0.00464	92.8	80.0-122	
Dibromomethane	0.00500	0.00499	99.8	80.0-120	
1,2-Dichlorobenzene	0.00500	0.00422	84.4	79.0-121	
1,3-Dichlorobenzene	0.00500	0.00431	86.2	79.0-120	
1,4-Dichlorobenzene	0.00500	0.00434	86.8	79.0-120	
trans-1,4-Dichloro-2-butene	0.00500	0.00288	57.6	33.0-144	
Dichlorodifluoromethane	0.00500	0.00565	113	51.0-149	
1,1-Dichloroethane	0.00500	0.00448	89.6	70.0-126	
1,2-Dichloroethane	0.00500	0.00419	83.8	70.0-128	
1,1-Dichloroethene	0.00500	0.00501	100	71.0-124	
cis-1,2-Dichloroethene	0.00500	0.00501	100	73.0-120	
trans-1,2-Dichloroethene	0.00500	0.00528	106	73.0-120	
1,2-Dichloropropane	0.00500	0.00450	90.0	77.0-125	
cis-1,3-Dichloropropene	0.00500	0.00467	93.4	80.0-123	
trans-1,3-Dichloropropene	0.00500	0.00424	84.8	78.0-124	
Ethylbenzene	0.00500	0.00474	94.8	79.0-123	
2-Hexanone	0.0250	0.0195	78.0	67.0-149	
Iodomethane	0.0250	0.0160	64.0	33.0-147	
2-Butanone (MEK)	0.0250	0.0184	73.6	44.0-160	
Methylene Chloride	0.00500	0.00514	103	67.0-120	
4-Methyl-2-pentanone (MIBK)	0.0250	0.0172	68.8	68.0-142	
Styrene	0.00500	0.00474	94.8	73.0-130	
1,1,1,2-Tetrachloroethane	0.00500	0.00456	91.2	75.0-125	
1,1,2,2-Tetrachloroethane	0.00500	0.00432	86.4	65.0-130	
Tetrachloroethene	0.00500	0.00504	101	72.0-132	
Toluene	0.00500	0.00442	88.4	79.0-120	
1,1,1-Trichloroethane	0.00500	0.00497	99.4	73.0-124	
1,1,2-Trichloroethane	0.00500	0.00470	94.0	80.0-120	
Trichloroethene	0.00500	0.00526	105	78.0-124	
Trichlorofluoromethane	0.00500	0.00542	108	59.0-147	
1,2,3-Trichloropropane	0.00500	0.00441	88.2	73.0-130	
Vinyl acetate	0.0250	0.0203	81.2	11.0-160	
Vinyl chloride	0.00500	0.00525	105	67.0-131	
Xylenes, Total	0.0150	0.0146	97.3	79.0-123	
Allyl chloride	0.0250	0.0253	101	72.0-128	
(S) Toluene-d8			*94.1*	*80.0-120*	

Laboratory Control Sample (LCS)

(LCS) R3569066-1 09/06/20 13:58

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
(S) 4-Bromofluorobenzene			*106*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*86.2*	*70.0-130*	

Laboratory Control Sample (LCS)

(LCS) R3569066-2 09/06/20 14:18

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Acetonitrile	0.500	0.395	79.0	40.0-160	
Chloroprene	0.0500	0.0419	83.8	60.0-143	
1,4-Dioxane	1.00	1.02	102	13.0-160	
Ethyl methacrylate	0.0500	0.0475	95.0	72.0-129	
Isobutanol	1.00	0.828	82.8	40.0-160	
Methacrylonitrile	0.500	0.524	105	61.0-145	
Methyl methacrylate	0.0500	0.0388	77.6	63.0-149	
2-Propanol	0.0500	0.0426	85.2	10.0-160	
Propionitrile	0.500	0.439	87.8	49.0-160	
(S) Toluene-d8			*93.4*	*80.0-120*	
(S) 4-Bromofluorobenzene			*107*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*83.1*	*70.0-130*	

Method Blank (MB)

(MB) R3569808-3 09/11/20 16:21

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Pentachloroethane	U		0.00230	0.00500
(S) Toluene-d8	*103*			*80.0-120*
(S) 4-Bromofluorobenzene	*94.4*			*77.0-126*
(S) 1,2-Dichloroethane-d4	*116*			*70.0-130*

Laboratory Control Sample (LCS)

(LCS) R3569808-2 09/11/20 15:41

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Pentachloroethane	0.0500	0.0713	143	10.0-160	
(S) Toluene-d8			*93.6*	*80.0-120*	
(S) 4-Bromofluorobenzene			*104*	*77.0-126*	
(S) 1,2-Dichloroethane-d4			*105*	*70.0-130*	

Method Blank (MB)

(MB) R3567683-1 09/05/20 18:46

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
TPH (GC/FID) High Fraction	U		0.0247	0.100
(S) o-Terphenyl	*89.0*			*31.0-160*

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

(LCS) R3567683-2 09/05/20 19:07 • (LCSD) R3567683-3 09/05/20 19:27

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 %
TPH (GC/FID) High Fraction	1.50	1.56	1.56	104	104	50.0-150			0.000	20
(S) o-Terphenyl				*115*	*115*	*31.0-160*				

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
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL).
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.

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	LAO00356
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

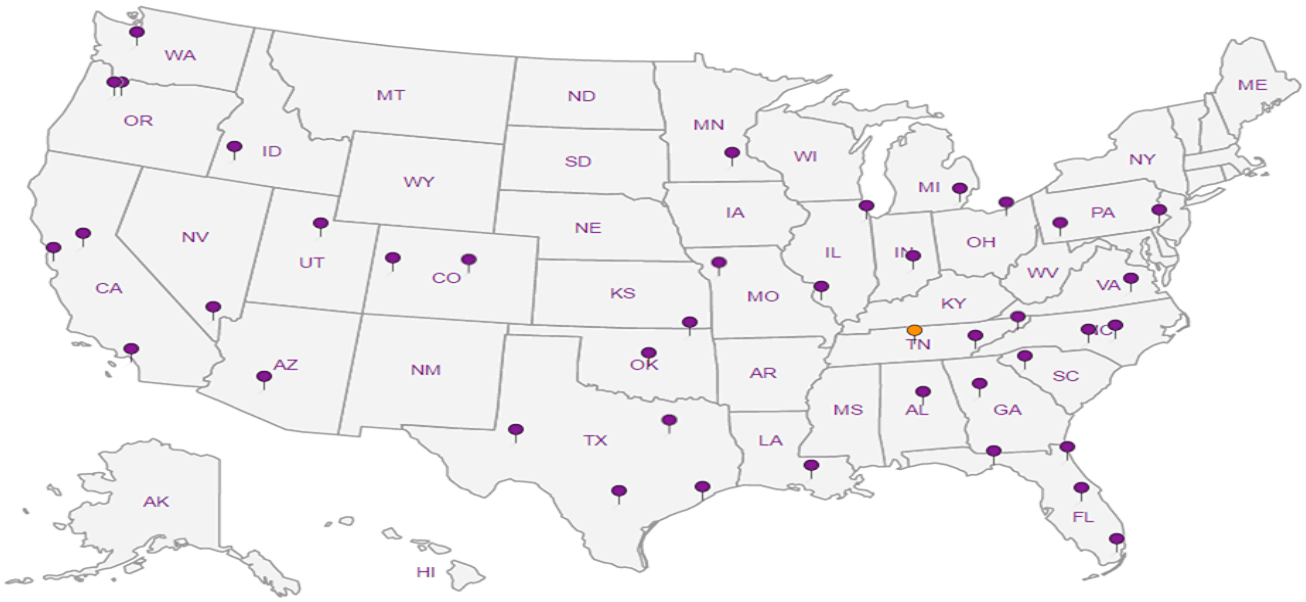
Third Party Federal Accreditations

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.



Berry Petroleum - Denver, CO

3433 E. Lake Dr
Centennial, CO 80121

Billing Information:
Don Wilbourn
235 Callahan Ave
Parachute, CO 81635

Pres Chk

Report to: **Dave Nicholson**

Email To: **dknicholson@q.com**

Project Description:

City/State Collected:

Please Circle: PT MT CT ET

Phone: **303-601-2023**
Fax: ~~303-999-4401~~

Client Project #

Lab Project # **BERPETDCO-NICHOLSON**

Collected by (print):

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N____ Y____

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

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	~~**Cl,NO2,NO3,SO4~~ 125mlHDPE-NoPres Chloride, sulfate	~~TDS~~ 250mlHDPE-NoPres	~~BTEX~~GRO 40mlAmb-HCl	DROLVI 40mlAmb-HCl-BT	Dissolved Sodium 250mlHDPE-NoPres	~~NH3, NO2NO3 250mlHDPE-H2SO4~~	~~RSK175 40mlAmb HCl~~	VOCs 8260 + AP IX	MEETAC		
J15-W-2		GW		8/31	0850	12	X	X	X	X	X			X	X		61
		GW															

Chain of Custody Page 1 of 1

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

SDG # 125779

Table # F022

Acctnum: **BERPETDCO**
Template: **T122368**
Prelogin: **P729746**
PM: **134 - Mark W. Beasley**
PB: 9-1-20

Shipped Via: **FedEX Ground**

Remarks | Sample # (lab only)

* 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 # 1790 3023 6855

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
RAD Screen <0.5 mR/hr:		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
DK Nicholson	9/2/20	1600	FedEx		
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: °C Bottles Received: 3.5+1=3.4 AT CK 12	
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature) Olivia Luna	Date: 9/3/20 Time: 945	Hold: / Condition: NCF / OK