

PDC Energy, Inc.
Fourth Quarter 2017 Groundwater Monitoring Summary

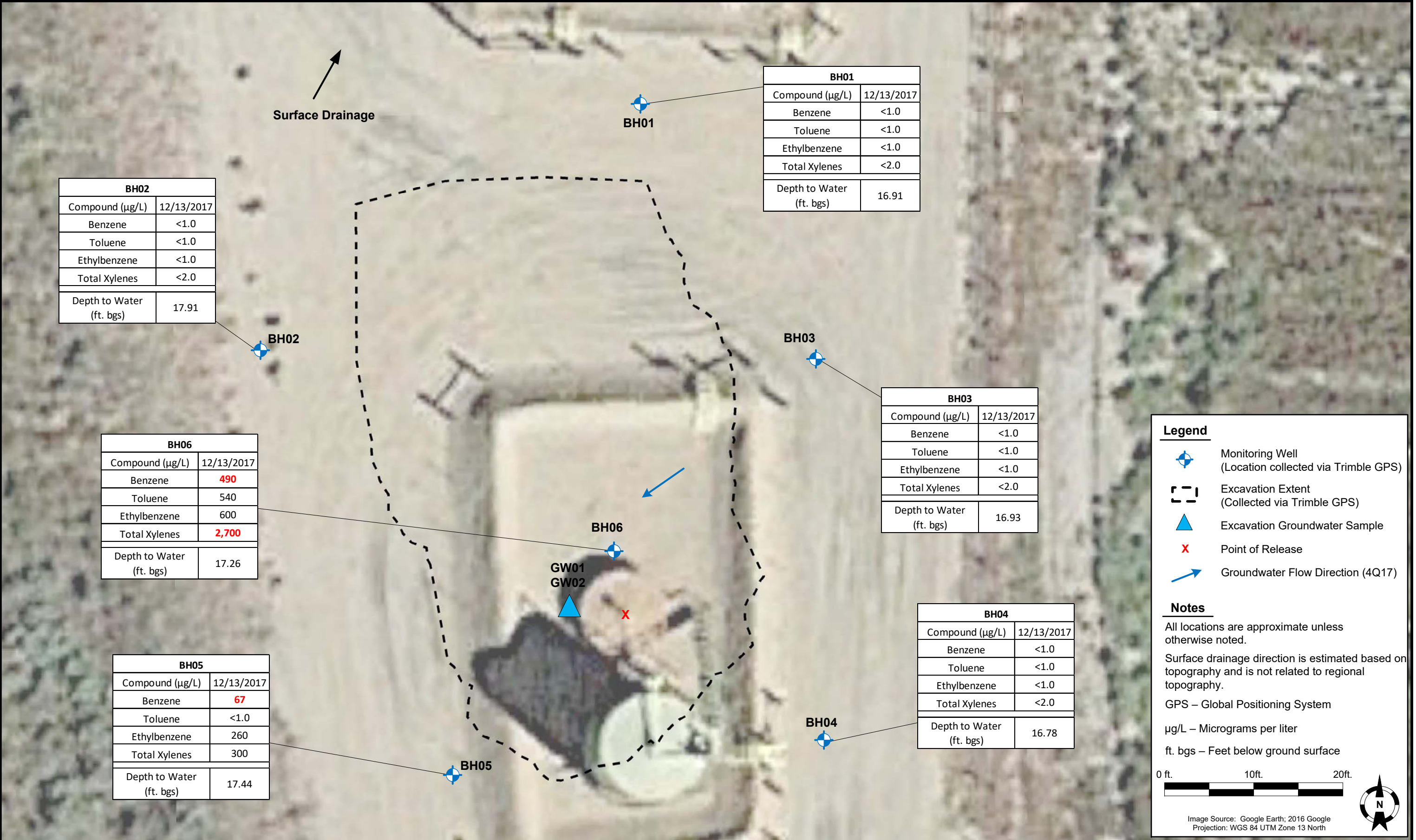
January 8, 2018

Former J&L Farms 14, 24-29 Tank Battery
SWSW Section 29 T6N R63W
Spill Point ID # 451446
Remediation # 10537

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the former J&L Farms 14, 24-29 tank battery. On December 4, 2017, six monitoring wells (BH01 – BH06) were installed to delineate the extent of dissolved phase hydrocarbons associated with the release discovered on July 19, 2017. On December 13, 2017, groundwater monitoring was conducted at all six monitoring well locations (BH01 – BH06). Six groundwater samples were submitted to Summit Scientific Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B. Analytical results are summarized in Table 1 and the laboratory report is included as Attachment A. Sample locations and corresponding analytical results are illustrated on Figure 1. Fourth quarter 2017 analytical results indicate that BTEX concentrations are above applicable COGCC Table 910-1 groundwater standards in monitoring wells BH05 and BH06. BTEX concentrations are below applicable regulatory standards in monitoring wells BH01 - BH04.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the fourth quarter 2017 and will remain as the selected remediation strategy through the first quarter 2018.

First quarter 2018 groundwater sampling will be conducted during March 2018.



DATE:	December 5, 2017
DESIGNED BY:	C. Hamlin
DRAWN BY:	B. Nelson



TASMAN
GEOSCIENCES

Tasman Geosciences, Inc.
6899 Pecos Street – Unit C
Denver, CO 80221

PDC Energy, Inc. – DJ Basin
Former J&L Farms 14, 24-29 Tank Battery
SWSW, Section 29, Township 6 North, Range 63 West
Weld County, Colorado

**GROUNDWATER
ANALYTICAL RESULTS
MAP**

**FIGURE
1**

TABLE 1
FORMER J&L FARMS 14, 24-29 TANK BATTERY
GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE

Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Depth to Water ⁽²⁾ (feet)
COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
GW01	8/31/2017	6.4	<1.0	<1.0	<2.0	~ 18
GW02	9/5/2017	60	3.4	2.2	170	~ 18
BH01	12/13/2017	<1.0	<1.0	<1.0	<2.0	16.91
BH02	12/13/2017	<1.0	<1.0	<1.0	<2.0	17.91
BH03	12/13/2017	<1.0	<1.0	<1.0	<2.0	16.93
BH04	12/13/2017	<1.0	<1.0	<1.0	<2.0	16.78
BH05	12/13/2017	67	<1.0	260	300	17.44
BH06 ⁽³⁾	12/13/2017	490	540	600	2,700	17.26

Notes:

1. Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective January 30, 2015.
2. Depth to water measurements collected prior to fourth quarter 2016 were measured from top of casing or ground surface for monitoring well samples and excavation samples respectively. Subsequent monitoring well measurements were collected from top of casing and adjusted using survey data and product thickness to reflect depth of water from ground surface.
3. Sheen observed on groundwater.

COGCC = Colorado Oil and Gas Conservation Commission

µg/L = Micrograms per liter

(<) = Analytical result is less than the indicated laboratory reporting limit.

BOLD = Analytical result is in exceedance of COGCC groundwater standards.

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

December 20, 2017

Mark Longhurst
PDC Energy
1775 Sherman St. STE. 3000
Denver, CO 80203
RE: J&L Farms 14, 24-29

Enclosed are the results of analyses for samples received by Summit Scientific on 12/13/17 16:45. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Paul Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury For Ben Shrewsbury
Laboratory Manager



PDC Energy
1775 Sherman St. STE. 3000
Denver CO, 80203

Project: J&L Farms 14, 24-29

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1712148-01	Water	12/13/17 15:03	12/13/17 16:45
BH02	1712148-02	Water	12/13/17 15:00	12/13/17 16:45
BH03	1712148-03	Water	12/13/17 14:45	12/13/17 16:45
BH04	1712148-04	Water	12/13/17 14:30	12/13/17 16:45
BH05	1712148-05	Water	12/13/17 14:35	12/13/17 16:45
BH06	1712148-06	Water	12/13/17 14:47	12/13/17 16:45

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1712148

303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Project Number:

www.s2scientific.com

Sample Receipt Checklist

1712148

S2 Work Order: _____

Client: PDC Energy

Client Project ID: J&L Farms 14, 24-29

Shipped Via: P/U
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Airbill #: _____

Matrix (check all that apply): ☐ Air ☐ Soil/Solid ☒ Water ☐ Other: _____
(Describe)

Cooler ID					
Temp (°C)	1.8				

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C ⁽¹⁾ ?				
NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	✓			
Were all samples received intact ⁽¹⁾ ?	✓			
Was adequate sample volume provided ⁽¹⁾ ?	✓			
If custody seals are present, are they intact ⁽¹⁾ ?			✓	
Are short holding time analytes or samples with HTs due within 48 hours present?			✓	
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?				
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	✓			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	✓			
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	✓			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		✓		
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ?	✓			HCl
Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect				
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ?			✓	
Record the pH in Comments.				
If dissolved metals are requested, were samples field filtered?			✓	
Additional Comments (if any):				

⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.

Nakita
Custodian Printed Name

[Signature]
Signature or Initials of Custodian

12/13/17 1725
Date/Time



PDC Energy
1775 Sherman St. STE. 3000
Denver CO, 80203

Project: J&L Farms 14, 24-29
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

BH01
1712148-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/13/17 15:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1712165	12/19/17	12/19/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/13/17 15:03**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		118 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		93.9 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	45-146		"	"	"	"	

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PDC Energy
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Denver CO, 80203

Project: J&L Farms 14, 24-29
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

BH02
1712148-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/13/17 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1712165	12/19/17	12/19/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/13/17 15:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		112 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		95.0 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.3 %	45-146		"	"	"	"	

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Denver CO, 80203

Project: J&L Farms 14, 24-29
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

BH03
1712148-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/13/17 14:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1712165	12/19/17	12/19/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/13/17 14:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		121 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		101 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		102 %	45-146		"	"	"	"	

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Denver CO, 80203

Project: J&L Farms 14, 24-29
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

BH04
1712148-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/13/17 14:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1712165	12/19/17	12/19/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **12/13/17 14:30**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		114 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		94.5 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.8 %	45-146		"	"	"	"	

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1775 Sherman St. STE. 3000
Denver CO, 80203

Project: J&L Farms 14, 24-29
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

BH05
1712148-05 (Water)

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Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/13/17 14:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	67	1.0	ug/l	1	1712165	12/19/17	12/19/17	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	260	10	"	10	"	"	"	"	
Xylenes (total)	300	20	"	"	"	"	"	"	

Date Sampled: **12/13/17 14:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		114 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.2 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	45-146		"	"	"	"	

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Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

BH06
1712148-06 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/13/17 14:47**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	490	25	ug/l	25	1712165	12/19/17	12/19/17	EPA 8260B	
Toluene	540	25	"	"	"	"	"	"	
Ethylbenzene	600	25	"	"	"	"	"	"	
Xylenes (total)	2700	2.0	"	1	"	"	"	"	

Date Sampled: **12/13/17 14:47**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<i>Surrogate: 1,2-Dichloroethane-d4</i>		146 %	37-154		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		95.7 %	45-149		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		98.3 %	45-146		"	"	"	"	

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PDC Energy
1775 Sherman St. STE. 3000
Denver CO, 80203

Project: J&L Farms 14, 24-29

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

Volatile Organic Compounds by EPA Method 8260B - Quality Control

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Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch 1712165 - EPA 5030 Water MS

Blank (1712165-BLK1)

Prepared & Analyzed: 12/18/17

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	14.1		"	13.3		105	37-154			
Surrogate: Toluene-d8	12.6		"	13.3		94.2	45-149			
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3		94.9	45-146			

LCS (1712165-BS1)

Prepared & Analyzed: 12/18/17

Benzene	30.4	1.0	ug/l	33.3		91.1	51-132			
Toluene	32.4	1.0	"	33.3		97.1	51-138			
Ethylbenzene	36.2	1.0	"	33.1		110	58-146			
m,p-Xylene	72.8	2.0	"	66.5		109	57-144			
o-Xylene	35.1	1.0	"	32.7		107	53-146			
Surrogate: 1,2-Dichloroethane-d4	14.5		"	13.3		109	37-154			
Surrogate: Toluene-d8	12.4		"	13.3		92.9	45-149			
Surrogate: 4-Bromofluorobenzene	13.1		"	13.3		98.5	45-146			

Matrix Spike (1712165-MS1)

Source: 1712128-02

Prepared & Analyzed: 12/18/17

Benzene	31.9	1.0	ug/l	33.3	ND	95.8	34-141			
Toluene	34.7	1.0	"	33.3	ND	104	27-151			
Ethylbenzene	38.3	1.0	"	33.1	ND	116	29-160			
m,p-Xylene	73.9	2.0	"	66.5	ND	111	20-166			
o-Xylene	35.1	1.0	"	32.7	ND	107	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.4		"	13.3		108	37-154			
Surrogate: Toluene-d8	13.1		"	13.3		98.4	45-149			
Surrogate: 4-Bromofluorobenzene	13.3		"	13.3		99.7	45-146			

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PDC Energy
1775 Sherman St. STE. 3000
Denver CO, 80203

Project: J&L Farms 14, 24-29
Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source		%REC		RPD	
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	Notes

Batch 1712165 - EPA 5030 Water MS

Matrix Spike Dup (1712165-MSD1)		Source: 1712128-02			Prepared & Analyzed: 12/18/17					
Benzene	32.3	1.0	ug/l	33.3	ND	96.9	34-141	1.21	32	
Toluene	34.9	1.0	"	33.3	ND	105	27-151	0.661	25	
Ethylbenzene	36.8	1.0	"	33.1	ND	111	29-160	4.02	50	
m,p-Xylene	71.6	2.0	"	66.5	ND	108	20-166	3.15	36	
o-Xylene	34.6	1.0	"	32.7	ND	106	33-159	1.26	26	
Surrogate: 1,2-Dichloroethane-d4	16.4		"	13.3		123	37-154			
Surrogate: Toluene-d8	12.9		"	13.3		96.9	45-149			
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3		94.7	45-146			

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1775 Sherman St. STE. 3000
Denver CO, 80203

Project: J&L Farms 14, 24-29

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
12/20/17 08:35

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference