

**PDC Energy, Inc.**  
First Quarter 2019 Groundwater Monitoring Summary

March 18, 2019

Former JR #1 Tank Battery  
SESW Section 13 T6N R65W  
Spill Point ID # 460044  
Remediation # 12319

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the former JR #1 tank battery. On February 5, 2019, six monitoring wells (BH01 – BH06) were installed to delineate the extent of dissolved phase hydrocarbons associated with the release discovered on December 17, 2018. On February 22, 2019, 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.

First quarter 2019 analytical results indicate that benzene concentrations were above the applicable COGCC Table 910-1 groundwater standards in monitoring wells BH01 and BH04. BTEX concentrations were below regulatory standards in four monitoring well locations.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the first quarter 2019 and will remain the selected remediation strategy for the second quarter 2019.

Second quarter 2019 groundwater sampling will be conducted during May 2019. 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. Groundwater elevation data is summarized in Figure 2.



DATE: March 18, 2019

DESIGNED BY: C. Hamlin

DRAWN BY: B. Nelson



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

**PDC Energy, Inc. – DJ Basin**  
**Former JR #1 Tank Battery**  
SESW, Section 13, Township 6 North, Range 65 West  
Weld County, Colorado

**GROUNDWATER**  
**ANALYTICAL RESULTS**  
**MAP**

**FIGURE**  
**1**



**Legend**

- X Point of Release
- Monitoring Well (Location collected via Trimble GPS)
- Excavation Extent (Collected via Trimble GPS)
- Excavation Groundwater Sample
- Groundwater Elevation Contour (Dashed where inferred)

**4681.14** Groundwater Elevation (ft. AMSL)

Groundwater Flow Direction (1Q19)

**Notes**

All locations are approximate unless otherwise noted.

Surface drainage direction is estimated based on site topography and is not related to regional topography.

GPS – Global Positioning System

Ft. AMSL – Above Mean Sea Level

0 ft. 15 ft. 40 ft.

Image Source: Google Earth; 2016 Google  
Projection: WGS 84 UTM Zone 13 North

DATE:	February 25, 2019
DESIGNED BY:	C. Hamlin
DRAWN BY:	D. Cavinder



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6899 Pecos Street – Unit C  
Denver, CO 80221

**PDC Energy, Inc. – DJ Basin**  
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SESW, Section 13, Township 6 North, Range 65 West  
Weld County, Colorado

**GROUNDWATER ELEVATION CONTOUR MAP (02/22/2019)**

**FIGURE 2**

**TABLE 1**  
**FORMER JR #1 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 <sup>(2)</sup> (feet)	Groundwater Elevation (ft AMSL)
COGCC Table 910-1 Groundwater Standard (µg/L) <sup>(1)</sup>		5	560	700	1,400		
GW01	1/4/2019	<b>5.2</b>	<1.0	1.1	11	~ 16	NM
BH01	2/22/2019	<b>81</b>	7.7	88	1,300	15.12	4681.14
BH02	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.29	4681.30
BH03	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.11	4681.50
BH04	2/22/2019	<b>8.5</b>	<1.0	<1.0	<2.0	15.12	4680.82
BH05	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.43	4680.29
BH06	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.29	4680.56

**Notes:**

1. Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective May 1, 2018.
2. Depth to water measurements were measured from ground surface for excavation samples. Monitoring well measurements were collected from top of casing and adjusted using survey data to reflect depth of water from ground surface.

COGCC = Colorado Oil and Gas Conservation Commission

µg/L = Micrograms per liter

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

ft AMSL = Feet Above Mean Sea Level

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

## **ATTACHMENT A**

# Summit Scientific

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4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

March 01, 2019

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: JR #1

Enclosed are the results of analyses for samples received by Summit Scientific on 02/22/19 18:20. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', written in a cursive style.

Paul Shrewsbury

President



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

Project: JR #1

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
03/01/19 16:20

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1902226-01	Water	02/22/19 11:44	02/22/19 18:20
BH02	1902226-02	Water	02/22/19 11:10	02/22/19 18:20
BH03	1902226-03	Water	02/22/19 11:35	02/22/19 18:20
BH04	1902226-04	Water	02/22/19 11:50	02/22/19 18:20
BH05	1902226-05	Water	02/22/19 11:25	02/22/19 18:20
BH06	1902226-06	Water	02/22/19 11:40	02/22/19 18:20

Summit Scientific

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1902226

# Summit Scientific

S<sub>2</sub>

4653 Table Mountain Drive ♦ Golden, Colorado 80403  
303-277-9310

Page | of |

Client: PDC / Tasman Project Manager: Mark Longhurst  
 Address: 6899 Pecos Street E-Mail: mark.longhurst@PDCE.com  
 City/State/Zip: Denver / CO/ 80221  
 Phone: 303-487-1228 Project Name: JR #1  
 Sampler Name: Brian Gabel, Derek Cavender Project Number:

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix			Analysis Requested				Special Instructions	
					HCl	HNO3	None	Other	Water	Soil	Air-Canister #	Other	8260 BTEX	8260B GBTEXN	8015 DRO		pH, EC, SAR
1	BH01	2/22/19	1144	3	X				X				X				
2	BH02	↓	1110	↓	↓				↓				↓				
3	BH03	↓	1135	↓	↓				↓				↓				
4	BH04	↓	1150	↓	↓				↓				↓				
5	BH05	↓	1125	↓	↓				↓				↓				
6	BH06	↓	1140	↓	↓				↓				↓				
7																	
8																	
9																	
10																	

Relinquished by: <i>B. Gabel</i> Date/Time: 2/22/19 1500	Received by: Tasman's Lock Box Date/Time: 2/22/19 1500	Turn Around Time (Check) Same Day — 72 hours 24 hours — Standard <input checked="" type="checkbox"/> 48 hours —	Notes:
Relinquished by: Tasman's Lock Box Date/Time: 2.22.19 1620	Received by: <i>[Signature]</i> Date/Time: 2.22.19 1620	Sample Integrity: Temperature Upon Receipt: 7.5 Samples Intact: <input checked="" type="checkbox"/> Yes No	
Relinquished by:	Received by:		





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

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**BH01**  
**1902226-01 (Water)**

**Summit Scientific**

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **02/22/19 11:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>Benzene</b>	<b>81</b>	1.0	ug/l	1	1902294	02/25/19	02/25/19	EPA 8260B	
<b>Toluene</b>	<b>7.7</b>	1.0	"	"	"	"	"	"	
<b>Ethylbenzene</b>	<b>88</b>	1.0	"	"	"	"	"	"	
<b>Xylenes (total)</b>	<b>1300</b>	200	"	100	"	"	02/25/19	"	

Date Sampled: **02/22/19 11:44**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		101 %	23-173		"	"	02/25/19	"	
Surrogate: Toluene-d8		91.4 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		131 %	21-167		"	"	"	"	

Summit Scientific

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

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**BH02**  
**1902226-02 (Water)**

**Summit Scientific**

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **02/22/19 11:10**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1902294	02/25/19	02/25/19	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	

Date Sampled: **02/22/19 11:10**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		93.8 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		99.7 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		104 %		21-167		"	"	"	"	

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

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**BH03**  
**1902226-03 (Water)**

**Summit Scientific**

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **02/22/19 11:35**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1902294	02/25/19	02/25/19	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	

Date Sampled: **02/22/19 11:35**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		91.7 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		99.5 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		104 %		21-167		"	"	"	"	

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 Denver CO, 80203

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**BH04**  
**1902226-04 (Water)**

**Summit Scientific**

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **02/22/19 11:50**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
<b>Benzene</b>	<b>8.5</b>	1.0		ug/l	1	1902294	02/25/19	02/25/19	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	

Date Sampled: **02/22/19 11:50**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
<i>Surrogate: 1,2-Dichloroethane-d4</i>		84.7 %		23-173		"	"	"	"	
<i>Surrogate: Toluene-d8</i>		91.4 %		20-170		"	"	"	"	
<i>Surrogate: 4-Bromofluorobenzene</i>		118 %		21-167		"	"	"	"	

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 Denver CO, 80203

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**BH05**  
**1902226-05 (Water)**

**Summit Scientific**

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **02/22/19 11:25**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1902294	02/25/19	02/25/19	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	

Date Sampled: **02/22/19 11:25**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		89.6 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		99.5 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %		21-167		"	"	"	"	

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

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**BH06**  
**1902226-06 (Water)**

**Summit Scientific**

**Volatile Organic Compounds by EPA Method 8260B**

Date Sampled: **02/22/19 11:40**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1902294	02/25/19	02/25/19	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	2.0		"	"	"	"	"	"	

Date Sampled: **02/22/19 11:40**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		90.8 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		97.6 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		100 %		21-167		"	"	"	"	

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

Project: JR #1

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
03/01/19 16:20

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**

**Summit Scientific**

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

**Batch 1902294 - EPA 5030 Water MS**

**Blank (1902294-BLK1)**

Prepared: 02/25/19 Analyzed: 02/26/19

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	11.4		"	13.3		85.3	23-173			
Surrogate: Toluene-d8	12.8		"	13.3		95.9	20-170			
Surrogate: 4-Bromofluorobenzene	12.7		"	13.3		95.3	21-167			

**LCS (1902294-BS1)**

Prepared: 02/25/19 Analyzed: 02/26/19

Benzene	34.2	1.0	ug/l	33.3		103	70-130			
Toluene	34.9	1.0	"	33.3		105	70-130			
Ethylbenzene	37.4	1.0	"	33.3		112	70-130			
m,p-Xylene	76.2	2.0	"	66.7		114	70-130			
o-Xylene	34.5	1.0	"	33.3		103	70-130			
Surrogate: 1,2-Dichloroethane-d4	12.9		"	13.3		96.5	23-173			
Surrogate: Toluene-d8	12.9		"	13.3		96.9	20-170			
Surrogate: 4-Bromofluorobenzene	12.8		"	13.3		96.1	21-167			

**Matrix Spike (1902294-MS1)**

Source: 1902225-01

Prepared: 02/25/19 Analyzed: 02/26/19

Benzene	35.0	1.0	ug/l	33.3	ND	105	70-130			
Toluene	36.1	1.0	"	33.3	ND	108	70-130			
Ethylbenzene	37.5	1.0	"	33.3	ND	112	70-130			
m,p-Xylene	77.0	2.0	"	66.7	ND	115	70-130			
o-Xylene	34.9	1.0	"	33.3	ND	105	70-130			
Surrogate: 1,2-Dichloroethane-d4	13.3		"	13.3		99.7	23-173			
Surrogate: Toluene-d8	13.1		"	13.3		98.3	20-170			
Surrogate: 4-Bromofluorobenzene	12.9		"	13.3		97.0	21-167			

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

Project: JR #1

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 03/01/19 16:20

**Volatile Organic Compounds by EPA Method 8260B - Quality Control**

**Summit Scientific**

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

**Batch 1902294 - EPA 5030 Water MS**

**Matrix Spike Dup (1902294-MSD1)**

Source: 1902225-01

Prepared: 02/25/19 Analyzed: 02/26/19

Benzene	34.8	1.0	ug/l	33.3	ND	104	70-130	0.602	30	
Toluene	35.5	1.0	"	33.3	ND	106	70-130	1.73	30	
Ethylbenzene	37.7	1.0	"	33.3	ND	113	70-130	0.611	30	
m,p-Xylene	77.2	2.0	"	66.7	ND	116	70-130	0.259	30	
o-Xylene	35.0	1.0	"	33.3	ND	105	70-130	0.172	30	
Surrogate: 1,2-Dichloroethane-d4	13.4		"	13.3		101	23-173			
Surrogate: Toluene-d8	12.8		"	13.3		96.2	20-170			
Surrogate: 4-Bromofluorobenzene	13.4		"	13.3		100	21-167			

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

Project: JR #1

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
03/01/19 16:20

### 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