

**PDC Energy, Inc.**  
First Quarter 2020 Groundwater Monitoring Summary

March 12, 2020

Former JR #1 Tank Battery  
SESW Section 13 T6N R65W  
Remediation # 12319

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the former JR #1 tank battery. On February 14, 2020, groundwater monitoring was conducted at five monitoring well locations (BH01 – BH05). Five groundwater samples were submitted to Summit Scientific Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B.

First quarter 2020 analytical results indicated that the benzene concentration was above the applicable COGCC Table 910-1 groundwater standard in monitoring well BH01. BTEX concentrations were below regulatory standards in the four remaining monitoring well locations. 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 illustrated in Figure 2.

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 2020.

Second quarter 2020 groundwater sampling will be conducted during May 2020.





DATE:	March 12, 2020
DESIGNED BY:	C. Hamlin
DRAWN BY:	M. Dahlgren



**TASMAN**  
GEOSCIENCES

**Tasman Geosciences, Inc.**  
6855 W. 119<sup>th</sup> Ave.  
Broomfield, CO 80020

**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**





DATE:	February 18, 2020
DESIGNED BY:	C. Hamlin
DRAWN BY:	L. Martin



**TASMAN**  
GEOSCIENCES

**Tasman Geosciences, Inc.**  
6855 W. 119th Ave  
Broomfield, CO 80020

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

**GROUNDWATER  
ELEVATION CONTOUR  
MAP (02/14/2020)**

**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> (ft.)	Groundwater Elevation (ft. AMSL)
COGCC Table 910-1 Groundwater Standard (µg/L) <sup>(1)</sup>		5	560	700	1,400		
GW01	1/4/2019	5.2	<1.0	1.1	11	~ 16	NM
BH01	2/22/2019	81	7.7	88	1,300	15.12	4681.14
BH01	5/30/2019	180	1.0	<1.0	2,400	15.39	4680.45
BH01	8/16/2019	42	<1.0	13	160	11.04	4684.80
BH01	11/8/2019	53	<1.0	24	120	13.11	4682.90
BH01	2/14/2020	200	<1.0	120	320	14.43	4681.58
BH02	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.29	4681.30
BH02	5/30/2019	<1.0	<1.0	<1.0	<2.0	15.71	4680.65
BH02	8/16/2019	<1.0	<1.0	<1.0	<2.0	11.33	4685.03
BH02	11/8/2019	<1.0	<1.0	<1.0	<2.0	12.58	4683.78
BH02	2/14/2020	<1.0	<1.0	<1.0	<2.0	14.66	4681.70
BH03	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.11	4681.50
BH03	5/30/2019	<1.0	<1.0	<1.0	<2.0	15.54	4680.85
BH03	8/16/2019	<1.0	<1.0	<1.0	<2.0	10.77	4685.62
BH03	11/8/2019	<1.0	<1.0	<1.0	<2.0	12.28	4684.09
BH03	2/14/2020	<1.0	<1.0	<1.0	<2.0	14.47	4681.90
BH04	2/22/2019	8.5	<1.0	<1.0	<2.0	15.12	4680.82
BH04	5/30/2019	<1.0	<1.0	<1.0	<2.0	16.67	4678.97
BH04	8/16/2019	<1.0	<1.0	<1.0	<2.0	12.60	4683.04
BH04	11/8/2019	<1.0	<1.0	<1.0	<2.0	12.47	4682.10
BH04	2/14/2020	<1.0	<1.0	<1.0	<2.0	14.47	4680.10
BH05	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.43	4680.29
BH05	5/30/2019	<1.0	<1.0	<1.0	<2.0	16.06	4679.56
BH05	8/16/2019	<1.0	<1.0	<1.0	<2.0	12.19	4683.43
BH05	11/8/2019	<1.0	<1.0	<1.0	<2.0	11.83	4683.60
BH05	2/14/2020	<1.0	<1.0	<1.0	<2.0	15.73	4679.70
BH06	2/22/2019	<1.0	<1.0	<1.0	<2.0	15.29	4680.56
BH06	5/30/2019	Destroyed					

**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> (ft.)	Groundwater Elevation (ft. AMSL)
COGCC Table 910-1 Groundwater Standard (µg/L) <sup>(1)</sup>		5	560	700	1,400		

**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. = Feet

AMSL = Above Mean Sea Level

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

## Attachment A

# Summit Scientific

---

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

February 19, 2020

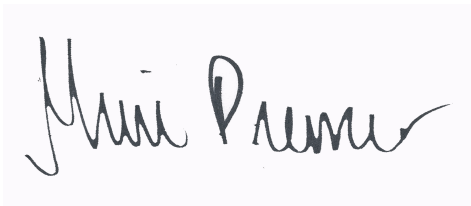
Mark Longhurst  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203

RE: JR #1

Work Order #2002139

Enclosed are the results of analyses for samples received by Summit Scientific on 02/14/20 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, reading "Muri Premer", is displayed on a light purple rectangular background.

Muri Premer For Paul Shrewsbury  
President



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

Project: JR #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
02/19/20 13:58

#### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	2002139-01	Water	02/14/20 12:53	02/14/20 17:30
BH02	2002139-02	Water	02/14/20 12:27	02/14/20 17:30
BH03	2002139-03	Water	02/14/20 12:35	02/14/20 17:30
BH04	2002139-04	Water	02/14/20 12:39	02/14/20 17:30
BH05	2002139-05	Water	02/14/20 12:45	02/14/20 17:30

Summit Scientific

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



2002139

Page 1 of 1

Project Manager: Mark Longhurst  
E-Mail: mark.longhurst@pdce.com  
Project Name: JR #1  
Project Number: \_\_\_\_\_

[www.s2scientific.com](http://www.s2scientific.com)

# Sample Receipt Checklist

S2 Work Order 2002139

Client: PDC / TASMAN

Client Project ID: JR # 1

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other Airbill #: \_\_\_\_\_

☐ ☒ ☐ ☐ ☐

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

Temp (°C)	2.8
-----------	-----

Thermometer ID: 61857155-K

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

Additional Comments (if any):

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

RZ

Custodian Printed Name or Initials

Signature of Custodian

2/14/20

Date/Time



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

Project: JR #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
02/19/20 13:58

**BH01**  
**2002139-01 (Water)**

**Summit Scientific**

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

Date Sampled: **02/14/20 12:53**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
<b>Benzene</b>	<b>200</b>	1.0		ug/l	1	2002163	02/17/20	02/18/20	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
<b>Ethylbenzene</b>	<b>120</b>	1.0		"	"	"	"	"	"	
<b>Xylenes (total)</b>	<b>320</b>	2.0		"	"	"	"	"	"	

Date Sampled: **02/14/20 12:53**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		109 %		23-173		"	"	"	"	
Surrogate: Toluene-d8		102 %		20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		108 %		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:**  
02/19/20 13:58

**BH02**  
**2002139-02 (Water)**

**Summit Scientific**

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

Date Sampled: **02/14/20 12:27**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	2002163	02/17/20	02/18/20	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **02/14/20 12:27**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		107 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.8 %	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:**  
02/19/20 13:58

**BH03**  
**2002139-03 (Water)**

**Summit Scientific**

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

Date Sampled: **02/14/20 12:35**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	2002163	02/17/20	02/18/20	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **02/14/20 12:35**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		112 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.7 %	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:**  
02/19/20 13:58

**BH04**  
**2002139-04 (Water)**

**Summit Scientific**

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

Date Sampled: **02/14/20 12:39**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	2002163	02/17/20	02/18/20	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **02/14/20 12:39**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		107 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		99.6 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.5 %	21-167		"	"	"	"	

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PDC Energy  
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Denver CO, 80203

Project: JR #1  
Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
02/19/20 13:58

**BH05**  
**2002139-05 (Water)**

**Summit Scientific**

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

Date Sampled: **02/14/20 12:45**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Benzene	ND	1.0	ug/l	1	2002163	02/17/20	02/18/20	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	2.0	"	"	"	"	"	"	

Date Sampled: **02/14/20 12:45**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: 1,2-Dichloroethane-d4		112 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		103 %	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:**  
02/19/20 13:58

## 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 2002163 - EPA 5030 Water MS

##### Blank (2002163-BLK1)

Prepared: 02/17/20 Analyzed: 02/18/20

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	2.0	"							
Surrogate: 1,2-Dichloroethane-d4	15.0		"	13.3	113	23-173				
Surrogate: Toluene-d8	14.0		"	13.3	105	20-170				
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3	94.8	21-167				

##### LCS (2002163-BS1)

Prepared: 02/17/20 Analyzed: 02/18/20

Benzene	29.6	1.0	ug/l	33.3	88.9	51-132				
Toluene	21.9	1.0	"	33.3	65.8	51-138				
Ethylbenzene	27.2	1.0	"	33.3	81.6	58-146				
m,p-Xylene	54.1	2.0	"	66.7	81.1	57-144				
o-Xylene	27.6	1.0	"	33.3	82.9	53-146				
Surrogate: 1,2-Dichloroethane-d4	14.3		"	13.3	107	23-173				
Surrogate: Toluene-d8	13.4		"	13.3	100	20-170				
Surrogate: 4-Bromofluorobenzene	13.7		"	13.3	103	21-167				

##### Matrix Spike (2002163-MS1)

Source: 2002120-01

Prepared: 02/17/20 Analyzed: 02/18/20

Benzene	207	1.0	ug/l	33.3	323	NR	34-141			QM-07
Toluene	22.2	1.0	"	33.3	ND	66.8	27-151			
Ethylbenzene	28.1	1.0	"	33.3	ND	84.2	29-160			
m,p-Xylene	58.1	2.0	"	66.7	4.81	80.0	20-166			
o-Xylene	30.5	1.0	"	33.3	4.99	76.6	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.9		"	13.3	112	23-173				
Surrogate: Toluene-d8	13.5		"	13.3	101	20-170				
Surrogate: 4-Bromofluorobenzene	13.2		"	13.3	98.9	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:**  
02/19/20 13:58

**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 2002163 - EPA 5030 Water MS**

Matrix Spike Dup (2002163-MSD1)		Source: 2002120-01			Prepared: 02/17/20 Analyzed: 02/18/20					
Benzene	231	1.0	ug/l	33.3	323	NR	34-141	10.9	30	QM-07
Toluene	23.0	1.0	"	33.3	ND	68.9	27-151	3.14	30	
Ethylbenzene	29.2	1.0	"	33.3	ND	87.7	29-160	4.01	30	
m,p-Xylene	60.3	2.0	"	66.7	4.81	83.2	20-166	3.66	30	
o-Xylene	32.0	1.0	"	33.3	4.99	81.1	33-159	4.80	30	
Surrogate: 1,2-Dichloroethane-d4	15.0		"	13.3		112	23-173			
Surrogate: Toluene-d8	13.6		"	13.3		102	20-170			
Surrogate: 4-Bromofluorobenzene	13.3		"	13.3		99.6	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:**  
02/19/20 13:58

### Notes and Definitions

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
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