

**PDC Energy, Inc.**  
**Third Quarter 2018 Groundwater Monitoring Summary**

October 10, 2018

Barrell 41-4 Tank Battery  
NENE Section 4 T6N R64W  
Form 19 Document #: 2213128  
Remediation # 7846

This groundwater monitoring summary has been prepared by Tasman Geosciences, Inc. for the Barrell 41-4 tank battery. On August 9, 2018, groundwater monitoring was conducted at all eight monitoring well locations (BH03 – BH09, SS02A-R2). Eight 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. Third quarter 2018 analytical results indicate that the benzene concentration is above the applicable COGCC Table 910-1 groundwater standard in monitoring wells BH05, BH09, and SS02A-R2. BTEX concentrations are below applicable regulatory standards in five sample locations.

A solar SVE system was installed at the site during first quarter 2013. The SVE system was operational for six months before being decommissioned during the third quarter 2013. During the solar SVE period of operation, approximately 1.82 pounds of hydrocarbon mass was removed from the subsurface. Enhanced fluid recovery (EFR) which extracted soil vapor only was conducted between May 2014 and March 2015.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the fourth quarter 2017 and remained the selected remediation strategy through the fourth quarter 2018. Source mass removal activities are scheduled for fourth quarter 2018.

Fourth quarter 2018 groundwater sampling will be conducted during November 2018. Per the Condition of Approval (COA) issued by the COGCC on February 8, 2018, replacement and supplementary monitoring wells will be installed upon the completion of source mass removal activities to establish down-gradient point of compliance (POC). Source mass removal activities are scheduled for December 2018 and will be summarized in the 4<sup>th</sup> Quarter 2018 Groundwater Monitoring Report and Supplemental Form 27.

| BH03                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | <1.0      | <1.0     |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 36.47     | 36.21    |

| BH06                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | <1.0      | <1.0     |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 37.12     | 36.62    |

| BH08                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | <1.0      | <1.0     |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 36.78     | 36.27    |

| BH07                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | <1.0      | <1.0     |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 36.63     | 36.20    |

| BH04                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | <1.0      | <1.0     |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 37.08     | 36.67    |

| BH05                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | 51        | 150      |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 36.90     | 36.56    |

| BH09                     |           |          |
|--------------------------|-----------|----------|
| Compound (µg/L)          | 5/17/2018 | 8/9/2018 |
| Benzene                  | 11        | 150      |
| Toluene                  | <1.0      | <1.0     |
| Ethylbenzene             | <1.0      | <1.0     |
| Total Xylenes            | <2.0      | <2.0     |
| Depth to Water (ft. bgs) | 36.58     | 36.25    |

| SS02A-R2                                |           |          |
|---|-----------|----------|
| Compound (µg/L)                         | 5/17/2018 | 8/9/2018 |
| Benzene                                 | 6.6       | 5.7      |
| Toluene                                 | <1.0      | <1.0     |
| Ethylbenzene                            | <1.0      | 2.1      |
| Total Xylenes                           | 7.4       | 3.3      |
| Depth to Water (ft. bgs) <sup>(1)</sup> | 40.03     | 39.54    |

Surface Drainage

### Legend

- Excavation Extent – LTE (2011)
- Point of Release
- Remediation Well Location – Angled (Trimble GPS)
- Monitoring / Remediation Well (Trimble GPS)
- Monitoring / Remediation Well – Angled (Trimble GPS)
- Groundwater Flow Direction (3Q18)

### Notes

All locations are approximate unless otherwise noted.

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

Monitoring well SS02A-R2 is an angled monitoring well with the terminus located southwest of the well monument, beneath the above ground storage tank.

Red text denotes an exceedance of COGCC standards

COGCC – Colorado Oil and Gas Conservation Commission

ft. bgs – Feet below ground surface

(1) – ft. along angled well casing

µg/L – Micrograms per liter

GPS – Global Positioning System

0 ft. 15 ft. 30 ft.

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

DATE: August 21, 2018

DESIGNED BY: C. Hamlin

DRAWN BY: C. Armbruster



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

**PDC Energy, Inc. – DJ Basin**  
**Barrell 41-4 Tank Battery**  
NENE, Section 4, Township 6 North, Range 64 West  
Weld County, Colorado

**GROUNDWATER  
ANALYTICAL RESULTS  
MAP**

**FIGURE  
1**

**TABLE 1**  
**BARRELL 41-4 TANK BATTERY**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**

| Sample ID   | Date Sampled | Benzene<br>(µg/L) | Toluene<br>(µg/L) | Ethylbenzene<br>(µg/L) | Total<br>Xylenes<br>(µg/L) | Depth to<br>Water <sup>(2)</sup><br>(feet) |
|---|--------------|-------------------|-------------------|------------------------|----------------------------|--|
| <b>COGCC Table 910-1 Groundwater<br/>Standard (µg/L) <sup>(1)</sup></b> |              | <b>5</b>          | <b>560</b>        | <b>700</b>             | <b>1,400</b>               |  |
| SS02A-R2 <sup>(3)</sup>   | 9/22/2017    | 120               | 150               | 120                    | 1,200                      | 39.08                                      |
| SS02A-R2 <sup>(3)</sup>   | 11/16/2017   | 74                | 8.1               | 19                     | 76                         | 38.92                                      |
| SS02A-R2 <sup>(3)</sup>   | 2/7/2018     | 9.0               | <1.0              | 9.1                    | 3.7                        | 39.67                                      |
| SS02A-R2 <sup>(3)</sup>   | 5/17/2018    | 6.6               | <1.0              | <1.0                   | 7.4                        | 40.03                                      |
| SS02A-R2 <sup>(3)</sup>   | 8/9/2018     | 5.7               | <1.0              | 2.1                    | 3.3                        | 39.54                                      |
|   |              |                   |                   |                        |                            |  |
| BH03  | 10/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 35.74                                      |
| BH03  | 11/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 35.68                                      |
| BH03  | 2/7/2018     | <1.0              | <1.0              | <1.0                   | 12                         | 36.47                                      |
| BH03  | 5/17/2018    | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.77                                      |
| BH03  | 8/9/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.21                                      |
|   |              |                   |                   |                        |                            |  |
| BH04  | 10/16/2017   | <1.0              | 1.7               | <1.0                   | <2.0                       | 36.21                                      |
| BH04  | 11/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.10                                      |
| BH04  | 2/7/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 35.76                                      |
| BH04  | 5/17/2018    | <1.0              | <1.0              | <1.0                   | <2.0                       | 37.08                                      |
| BH04  | 8/9/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.67                                      |
|   |              |                   |                   |                        |                            |  |
| BH05  | 10/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.07                                      |
| BH05  | 11/16/2017   | 17                | <1.0              | <1.0                   | <2.0                       | 35.94                                      |
| BH05  | 2/7/2018     | 130               | <1.0              | <1.0                   | <2.0                       | 36.56                                      |
| BH05  | 5/17/2018    | 51                | <1.0              | <1.0                   | <2.0                       | 36.90                                      |
| BH05  | 8/9/2018     | 150               | <1.0              | <1.0                   | <2.0                       | 36.56                                      |
|   |              |                   |                   |                        |                            |  |
| BH06  | 10/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.14                                      |
| BH06  | 11/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.04                                      |
| BH06  | 2/7/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.76                                      |
| BH06  | 5/17/2018    | <1.0              | <1.0              | <1.0                   | <2.0                       | 37.12                                      |
| BH06  | 8/9/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.62                                      |
|   |              |                   |                   |                        |                            |  |
| BH07  | 11/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 32.63                                      |
| BH07  | 2/7/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.31                                      |
| BH07  | 5/17/2018    | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.63                                      |
| BH07  | 8/9/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.20                                      |
|   |              |                   |                   |                        |                            |  |
| BH08  | 11/16/2017   | <1.0              | <1.0              | <1.0                   | <2.0                       | 35.71                                      |
| BH08  | 2/7/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.45                                      |
| BH08  | 5/17/2018    | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.78                                      |

**TABLE 1**  
**BARRELL 41-4 TANK BATTERY**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**

| Sample ID   | Date Sampled | Benzene<br>(µg/L) | Toluene<br>(µg/L) | Ethylbenzene<br>(µg/L) | Total<br>Xylenes<br>(µg/L) | Depth to<br>Water <sup>(2)</sup><br>(feet) |
|---|--------------|-------------------|-------------------|------------------------|----------------------------|--|
| <b>COGCC Table 910-1 Groundwater<br/>Standard (µg/L) <sup>(1)</sup></b> |              | <b>5</b>          | <b>560</b>        | <b>700</b>             | <b>1,400</b>               |  |
| BH08  | 8/9/2018     | <1.0              | <1.0              | <1.0                   | <2.0                       | 36.27                                      |
| BH09  | 11/16/2017   | <b>470</b>        | <1.0              | 6.0                    | 8.0                        | 35.65                                      |
| BH09  | 2/7/2018     | <b>240</b>        | <1.0              | <1.0                   | <2.0                       | 36.29                                      |
| BH09  | 5/17/2018    | <b>11</b>         | <1.0              | <1.0                   | <2.0                       | 36.58                                      |
| BH09  | 8/9/2018     | <b>150</b>        | <1.0              | <1.0                   | <2.0                       | 36.25                                      |

**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 and product thickness to reflect depth of water from ground surface.
3. Monitoring well SS02A-R2 was drilled as an angled remediation well. Depth to water does not represent true depth to water.

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

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

August 16, 2018

Mark Longhurst

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: Barrell 41-4

Enclosed are the results of analyses for samples received by Summit Scientific on 08/09/18 18:30. 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', with a stylized, cursive script.

Paul Shrewsbury For Ben Shrewsbury

Laboratory Manager





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

Project: Barrell 41-4

Project Number: [none]

Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

### ANALYTICAL REPORT FOR SAMPLES

| Sample ID | Laboratory ID | Matrix | Date Sampled   | Date Received  |
|-----------|---------------|--------|----------------|----------------|
| BH03      | 1808139-01    | Water  | 08/09/18 10:42 | 08/09/18 18:30 |
| BH04      | 1808139-02    | Water  | 08/09/18 10:56 | 08/09/18 18:30 |
| BH05      | 1808139-03    | Water  | 08/09/18 11:15 | 08/09/18 18:30 |
| BH06      | 1808139-04    | Water  | 08/09/18 10:26 | 08/09/18 18:30 |
| BH07      | 1808139-05    | Water  | 08/09/18 10:40 | 08/09/18 18:30 |
| BH08      | 1808139-06    | Water  | 08/09/18 10:25 | 08/09/18 18:30 |
| BH09      | 1808139-07    | Water  | 08/09/18 11:05 | 08/09/18 18:30 |
| SS02A-R2  | 1808139-08    | Water  | 08/09/18 10:50 | 08/09/18 18:30 |

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.*

# Summit Scientific

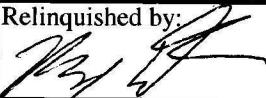
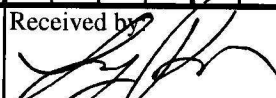
1808139

741 Corporate Circle Suite I ♦ Golden, Colorado 80401  
303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Client: PDC / Tasman  
Address: 6899 N Pecos  
City/State/Zip: Denver/CO/80221  
Phone: ~~970486909~~ - Max Dahlgren Fax:  
Sampler Name: Max Dahlgren

Project Manager: Mark Longhurst  
E-Mail: mark.longhurst@pdce.com  
Project Name: Barnell 41-4  
Project Number: -

| Sample Description   | Date Sampled | Time Sampled | Number of Containers | Preservative           |                  |      |                 | Matrix  |      |                         | Analyze For:    |                        |  |  |  |  |  |  |  |  |  |  | Special Instructions |  |  |  |  |        |  |
|--|--------------|--------------|----------------------|------------------------|------------------|------|-----------------|---|------|-------------------------|-----------------|------------------------|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--------|--|
|  |              |              |                      | HCl                    | HNO <sub>3</sub> | None | Other (Specify) | Groundwater   | Soil | Air - Canister Serial # | Other (Specify) |                        |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH03   | 8/9/18       | 1042         | 3                    | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH04   |              | 1086         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH05   |              | 1115         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH06   |              | 1026         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH07   |              | 1040         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH08   |              | 1025         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| BH09   |              | 1105         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| SS02A-P2   |              | 1050         |                      | X                      |                  |      |                 | X   |      |                         |                 | X BTX                  |  |  |  |  |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| Relinquished by:  |              |              |                      | Date/Time: 8/9/18 1830 |                  |      |                 | Received by:  |      |                         |                 | Date/Time: 8.9.18 1830 |  |  |  | Turn Around Time (Check)   |  |  |  |  |  |  |                      |  |  |  |  | Notes: |  |
| Relinquished by:   |              |              |                      | Date/Time:             |                  |      |                 | Received by:  |      |                         |                 | Date/Time:             |  |  |  | Same Day <input type="checkbox"/> 72 Hours <input type="checkbox"/><br>24 Hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/><br>48 Hours <input type="checkbox"/> |  |  |  |  |  |  |                      |  |  |  |  |        |  |
| Relinquished by:   |              |              |                      | Date/Time:             |                  |      |                 | Received in Lab by:   |      |                         |                 | Date/Time:             |  |  |  | Sample Integrity:<br>Temperature Upon Receipt: <u>8.4</u><br>Intact: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>   |  |  |  |  |  |  |                      |  |  |  |  |        |  |



# Sample Receipt Checklist

1808139

S2 Work Order \_\_\_\_\_

Client: PDC/Tasman

Client Project ID: Barrell 41-4

Shipped Via: Pickup

Airbill #: \_\_\_\_\_

(UPS, FedEx, Hand Delivered, Pick-up, etc.)

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

(Describe)

|           |     |
|-----------|-----|
| Temp (°C) | 8.4 |
|-----------|-----|

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. | ✓   |    |     |                   |
| Were all samples received intact <sup>(1)</sup> ?  | ✓   |    |     |                   |
| Was adequate sample volume provided <sup>(1)</sup> ?   | ✓   |    |     |                   |
| If custody seals are present, are they intact <sup>(1)</sup> ?   |     |    | ✓   |                   |
| Are samples with holding times due within 48 hours sample due within 48 hours present?   |     |    | ✓   |                   |
| Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?  | ✓   |    |     |                   |
| Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?  | ✓   |    |     |                   |
| Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?  | ✓   |    |     |                   |
| Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?  | ✓   |    |     |                   |
| For volatiles in water – is there headspace present? If yes, contact client and note in narrative.                                       |     | ✓  |     |                   |
| Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?   | ✓   |    |     | 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 <sup>(1)</sup> ?   |     |    | ✓   |                   |
| Record the pH in Comments.   |     |    |     |                   |
| If dissolved metals are requested, were samples field filtered?  |     |    | ✓   |                   |

Additional Comments (if any):

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

UP  
Custodian Printed Name or Initials

[Signature]  
Signature of Custodian

8.9.18 1635  
Date/Time



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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH03**  
**1808139-01 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 10:42**

| Analyte         | Result | Reporting |  | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|--------|-----------|--|-------|----------|---------|----------|----------|-----------|-------|
|                 |        | Limit     |  |       |          |         |          |          |           |       |
| Benzene         | ND     | 1.0       |  | ug/l  | 1        | 1808142 | 08/10/18 | 08/11/18 | EPA 8260B |       |
| Toluene         | ND     | 1.0       |  | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND     | 1.0       |  | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND     | 2.0       |  | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 10:42**

| Analyte                          | Result | Reporting |  | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |  |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 97.6 %    |  | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 97.7 %    |  | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 93.2 %    |  | 21-167 |          | "     | "        | "        | "      |       |

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.



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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH04**  
**1808139-02 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 10:56**

| Analyte         | Result | Reporting | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|--------|-----------|-------|----------|---------|----------|----------|-----------|-------|
|                 |        | Limit     |       |          |         |          |          |           |       |
| Benzene         | ND     | 1.0       | ug/l  | 1        | 1808142 | 08/10/18 | 08/11/18 | EPA 8260B |       |
| Toluene         | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND     | 2.0       | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 10:56**

| Analyte                          | Result | Reporting | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 95.5 %    | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 96.2 %    | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 95.1 %    | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]

Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH05**  
**1808139-03 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 11:15**

| Analyte         | Result     | Reporting |  | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|------------|-----------|--|-------|----------|---------|----------|----------|-----------|-------|
|                 |            | Limit     |  |       |          |         |          |          |           |       |
| <b>Benzene</b>  | <b>150</b> | 1.0       |  | ug/l  | 1        | 1808142 | 08/10/18 | 08/11/18 | EPA 8260B |       |
| Toluene         | ND         | 1.0       |  | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND         | 1.0       |  | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND         | 2.0       |  | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 11:15**

| Analyte                          | Result | Reporting |  | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |  |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 91.2 %    |  | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 98.1 %    |  | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 93.2 %    |  | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH06**  
**1808139-04 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 10:26**

| Analyte         | Result | Reporting | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|--------|-----------|-------|----------|---------|----------|----------|-----------|-------|
|                 |        | Limit     |       |          |         |          |          |           |       |
| Benzene         | ND     | 1.0       | ug/l  | 1        | 1808142 | 08/10/18 | 08/12/18 | EPA 8260B |       |
| Toluene         | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND     | 2.0       | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 10:26**

| Analyte                          | Result | Reporting | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 95.2 %    | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 95.9 %    | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 93.6 %    | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH07**  
**1808139-05 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 10:40**

| Analyte         | Result | Reporting | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|--------|-----------|-------|----------|---------|----------|----------|-----------|-------|
|                 |        | Limit     |       |          |         |          |          |           |       |
| Benzene         | ND     | 1.0       | ug/l  | 1        | 1808142 | 08/10/18 | 08/12/18 | EPA 8260B |       |
| Toluene         | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND     | 2.0       | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 10:40**

| Analyte                          | Result | Reporting | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 98.1 %    | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 97.4 %    | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 92.2 %    | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH08**  
**1808139-06 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 10:25**

| Analyte         | Result | Reporting | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|--------|-----------|-------|----------|---------|----------|----------|-----------|-------|
|                 |        | Limit     |       |          |         |          |          |           |       |
| Benzene         | ND     | 1.0       | ug/l  | 1        | 1808142 | 08/10/18 | 08/12/18 | EPA 8260B |       |
| Toluene         | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND     | 1.0       | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND     | 2.0       | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 10:25**

| Analyte                          | Result | Reporting | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 95.7 %    | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 97.7 %    | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 92.6 %    | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**BH09**  
**1808139-07 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 11:05**

| Analyte         | Result     | Reporting |  | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|-----------------|------------|-----------|--|-------|----------|---------|----------|----------|-----------|-------|
|                 |            | Limit     |  |       |          |         |          |          |           |       |
| <b>Benzene</b>  | <b>150</b> | 1.0       |  | ug/l  | 1        | 1808142 | 08/10/18 | 08/12/18 | EPA 8260B |       |
| Toluene         | ND         | 1.0       |  | "     | "        | "       | "        | "        | "         |       |
| Ethylbenzene    | ND         | 1.0       |  | "     | "        | "       | "        | "        | "         |       |
| Xylenes (total) | ND         | 2.0       |  | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 11:05**

| Analyte                          | Result | Reporting |  | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |  |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 86.0 %    |  | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 97.6 %    |  | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 93.4 %    |  | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**SS02A-R2**  
**1808139-08 (Water)**

**Summit Scientific**

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

Date Sampled: **08/09/18 10:50**

| Analyte                | Result     | Reporting | Units | Dilution | Batch   | Prepared | Analyzed | Method    | Notes |
|------------------------|------------|-----------|-------|----------|---------|----------|----------|-----------|-------|
|                        |            | Limit     |       |          |         |          |          |           |       |
| <b>Benzene</b>         | <b>5.7</b> | 1.0       | ug/l  | 1        | 1808142 | 08/10/18 | 08/12/18 | EPA 8260B |       |
| Toluene                | ND         | 1.0       | "     | "        | "       | "        | "        | "         |       |
| <b>Ethylbenzene</b>    | <b>2.1</b> | 1.0       | "     | "        | "       | "        | "        | "         |       |
| <b>Xylenes (total)</b> | <b>3.3</b> | 2.0       | "     | "        | "       | "        | "        | "         |       |

Date Sampled: **08/09/18 10:50**

| Analyte                          | Result | Reporting | Units  | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|----------------------------------|--------|-----------|--------|----------|-------|----------|----------|--------|-------|
|                                  |        | Limit     |        |          |       |          |          |        |       |
| Surrogate: 1,2-Dichloroethane-d4 |        | 94.9 %    | 23-173 |          | "     | "        | "        | "      |       |
| Surrogate: Toluene-d8            |        | 98.6 %    | 20-170 |          | "     | "        | "        | "      |       |
| Surrogate: 4-Bromofluorobenzene  |        | 93.4 %    | 21-167 |          | "     | "        | "        | "      |       |

Summit Scientific

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

## 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 1808142 - EPA 5030 Water MS

##### Blank (1808142-BLK1)

Prepared: 08/10/18 Analyzed: 08/11/18

|                                  |      |     |      |      |  |      |        |  |  |  |
|----------------------------------|------|-----|------|------|--|------|--------|--|--|--|
| Benzene                          | ND   | 1.0 | ug/l |      |  |      |        |  |  |  |
| Toluene                          | ND   | 1.0 | "    |      |  |      |        |  |  |  |
| Ethylbenzene                     | ND   | 1.0 | "    |      |  |      |        |  |  |  |
| Xylenes (total)                  | ND   | 2.0 | "    |      |  |      |        |  |  |  |
| Surrogate: 1,2-Dichloroethane-d4 | 12.3 |     | "    | 13.2 |  | 93.3 | 23-173 |  |  |  |
| Surrogate: Toluene-d8            | 12.8 |     | "    | 13.3 |  | 95.9 | 20-170 |  |  |  |
| Surrogate: 4-Bromofluorobenzene  | 12.8 |     | "    | 13.3 |  | 95.6 | 21-167 |  |  |  |

##### LCS (1808142-BS1)

Prepared: 08/10/18 Analyzed: 08/11/18

|                                  |      |     |      |      |  |      |        |  |  |  |
|----------------------------------|------|-----|------|------|--|------|--------|--|--|--|
| Benzene                          | 27.6 | 1.0 | ug/l | 33.3 |  | 82.8 | 70-130 |  |  |  |
| Toluene                          | 30.7 | 1.0 | "    | 33.3 |  | 92.0 | 70-130 |  |  |  |
| Ethylbenzene                     | 34.2 | 1.0 | "    | 33.3 |  | 102  | 70-130 |  |  |  |
| m,p-Xylene                       | 52.0 | 2.0 | "    | 66.7 |  | 78.1 | 70-130 |  |  |  |
| o-Xylene                         | 32.0 | 1.0 | "    | 33.3 |  | 95.9 | 70-130 |  |  |  |
| Surrogate: 1,2-Dichloroethane-d4 | 12.6 |     | "    | 13.2 |  | 95.5 | 23-173 |  |  |  |
| Surrogate: Toluene-d8            | 13.2 |     | "    | 13.3 |  | 99.2 | 20-170 |  |  |  |
| Surrogate: 4-Bromofluorobenzene  | 12.7 |     | "    | 13.3 |  | 95.3 | 21-167 |  |  |  |

##### Matrix Spike (1808142-MS1)

Source: 1808143-02

Prepared: 08/10/18 Analyzed: 08/11/18

|                                  |      |     |      |      |    |      |        |  |  |  |
|----------------------------------|------|-----|------|------|----|------|--------|--|--|--|
| Benzene                          | 28.0 | 1.0 | ug/l | 33.3 | ND | 84.1 | 70-130 |  |  |  |
| Toluene                          | 31.9 | 1.0 | "    | 33.3 | ND | 95.6 | 70-130 |  |  |  |
| Ethylbenzene                     | 33.9 | 1.0 | "    | 33.3 | ND | 102  | 70-130 |  |  |  |
| m,p-Xylene                       | 52.2 | 2.0 | "    | 66.7 | ND | 78.3 | 70-130 |  |  |  |
| o-Xylene                         | 31.9 | 1.0 | "    | 33.3 | ND | 95.6 | 70-130 |  |  |  |
| Surrogate: 1,2-Dichloroethane-d4 | 12.7 |     | "    | 13.2 |    | 96.1 | 23-173 |  |  |  |
| Surrogate: Toluene-d8            | 13.1 |     | "    | 13.3 |    | 98.4 | 20-170 |  |  |  |
| Surrogate: 4-Bromofluorobenzene  | 12.4 |     | "    | 13.3 |    | 92.8 | 21-167 |  |  |  |

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

Project: Barrell 41-4

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
08/16/18 15:56

**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 1808142 - EPA 5030 Water MS**

| Matrix Spike Dup (1808142-MSD1)  | Source: 1808143-02 |     |      | Prepared: 08/10/18 Analyzed: 08/11/18 |    |      |        |       |    |  |
|----------------------------------|--------------------|-----|------|---------------------------------------|----|------|--------|-------|----|--|
| Benzene                          | 28.4               | 1.0 | ug/l | 33.3                                  | ND | 85.3 | 70-130 | 1.42  | 30 |  |
| Toluene                          | 31.2               | 1.0 | "    | 33.3                                  | ND | 93.7 | 70-130 | 2.03  | 30 |  |
| Ethylbenzene                     | 34.0               | 1.0 | "    | 33.3                                  | ND | 102  | 70-130 | 0.383 | 30 |  |
| m,p-Xylene                       | 51.6               | 2.0 | "    | 66.7                                  | ND | 77.4 | 70-130 | 1.10  | 30 |  |
| o-Xylene                         | 32.1               | 1.0 | "    | 33.3                                  | ND | 96.3 | 70-130 | 0.688 | 30 |  |
| Surrogate: 1,2-Dichloroethane-d4 | 13.4               |     | "    | 13.2                                  |    | 102  | 23-173 |       |    |  |
| Surrogate: Toluene-d8            | 13.0               |     | "    | 13.3                                  |    | 97.8 | 20-170 |       |    |  |
| Surrogate: 4-Bromofluorobenzene  | 12.5               |     | "    | 13.3                                  |    | 93.8 | 21-167 |       |    |  |

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PDC Energy

1775 Sherman St. STE. 3000

Denver CO, 80203

Project: Barrell 41-4

Project Number: [none]

Project Manager: Mark Longhurst

**Reported:**

08/16/18 15:56

### 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                          |