



**PDC Energy, Inc.**  
**Fourth Quarter 2014 Groundwater Monitoring Summary**

January 14, 2015

Cottonwood #1 Tank Battery  
NESE Section 13 T6N R66W  
Weld County, API # 05-123-11801

This groundwater summary has been prepared by Tasman Geosciences, LLC for the Cottonwood #1 tank battery. On December 17, 2014 groundwater sampling was conducted at seven monitoring well locations. Groundwater samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B. Analytical results are summarized in Table 1 below and the laboratory report is included as Attachment A. Sample locations and corresponding analytical results are illustrated on Figure 1. Fourth quarter analytical results indicate that benzene concentrations are in exceedance of COGCC regulatory standards in one monitoring well (BH02). BTEX concentrations are below regulatory standards in the remaining six sample locations.

Tasman continued enhanced fluid recovery (EFR) and air sparge (AS) events at the site during the fourth quarter 2014. A summary of the EFR/AS operational data is provided in Table 2. EFR/AS activities will continue through the first quarter 2015.

First quarter 2015 groundwater sampling will be conducted during March 2015.

**TABLE 1**  
**COTTONWOOD #1**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**

Sample ID	Date Sampled	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Depth to Water (feet)
GW01	8/21/2012	3,000	1.7	320	1,900	NM
BH01	9/24/2012	160	<1.0	40	<1.0	16.31
BH01	12/20/2012	5	<1.0	<1.0	6.8	16.13
BH01	3/18/2013	<1.0	<1.0	<1.0	<1.0	16.58
BH01	6/20/2013	<1.0	<1.0	<1.0	<1.0	11.16
BH01	9/25/2013	<1.0	<1.0	<1.0	<1.0	13.61
BH01	12/30/2013	1.8	<1.0	<1.0	<1.0	14.38
BH01	3/28/2014	<1.0	<1.0	<1.0	<1.0	14.03
BH01	6/24/2014	<1.0	<1.0	<1.0	<1.0	11.79
BH01	9/24/2014	<1.0	<1.0	<1.0	<1.0	12.48
BH01	12/17/2014	<1.0	<1.0	<1.0	<1.0	13.16
BH02	9/24/2012	1,300	<1.0	190	1,100	18.42
BH02	12/20/2012	24	<1.0	3.9	8.1	17.35
BH02	3/18/2013	18	<1.0	<1.0	<1.0	17.80
BH02	6/20/2013	15	<1.0	<1.0	<1.0	12.58
BH02	9/25/2013	8.6	<1.0	<1.0	<1.0	14.68
BH02	12/30/2013	16	<1.0	<1.0	<1.0	15.44
BH02	3/28/2014	<1.0	<1.0	<1.0	<1.0	15.15
BH02	6/24/2014	14	<1.0	1.6	<1.0	12.94
BH02	9/24/2014	59	<1.0	2.5	2.7	13.28
BH02	12/17/2014	29	<1.0	<1.0	<1.0	14.19
BH03	9/24/2012	350	<1.0	120	300	18.28
BH03	12/20/2012	15	<1.0	6.7	7.9	17.04
BH03	3/18/2013	14	<1.0	1.5	<1.0	17.46
BH03	6/20/2013	11	<1.0	2.1	<1.0	12.01
BH03	9/25/2013	39	<1.0	16	<1.0	14.26
BH03	12/30/2013	48	<1.0	3.6	<1.0	15.02
BH03	3/28/2014	<1.0	<1.0	<1.0	<1.0	14.79
BH03	6/24/2014	13	<1.0	1.2	<1.0	12.43
BH03	9/24/2014	45	<1.0	1.8	3.0	12.91
BH03	12/17/2014	<1.0	<1.0	<1.0	<1.0	13.72
BH04	9/24/2012	150	<1.0	96	400	16.58
BH04	12/20/2012	38	<1.0	40	170	13.95
BH04	3/18/2013	2.6	<1.0	<1.0	<1.0	14.38
BH04	6/20/2013	1.3	<1.0	5.4	19	8.70
BH04	9/25/2013	1.5	<1.0	2.5	<1.0	11.32
BH04	12/30/2013	<1.0	<1.0	<1.0	<1.0	12.12
BH04	3/28/2014	<1.0	<1.0	<1.0	<1.0	11.80
BH04	6/24/2014	<1.0	<1.0	2.2	<1.0	9.43

**TABLE 1**  
**COTTONWOOD #1**  
**GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE**

Sample ID	Date Sampled	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Total Xylenes (ug/L)	Depth to Water (feet)
BH04	9/24/2014	<1.0	<1.0	1.2	3.1	10.22
BH04	12/17/2014	<1.0	<1.0	<1.0	<1.0	10.96
BH05	9/24/2012	<1.0	<1.0	<1.0	<1.0	15.42
BH05	12/20/2012	<1.0	<1.0	<1.0	<1.0	16.86
BH05	3/18/2013	<1.0	<1.0	<1.0	<1.0	17.31
BH05	6/20/2013	<1.0	<1.0	<1.0	<1.0	11.42
BH05	9/25/2013	<1.0	<1.0	<1.0	<1.0	14.02
BH05	12/30/2013	<1.0	<1.0	<1.0	<1.0	14.80
BH05	3/28/2014	<1.0	<1.0	<1.0	<1.0	14.45
BH05	6/24/2014	<1.0	<1.0	<1.0	<1.0	12.00
BH05	9/24/2014	<1.0	<1.0	<1.0	<1.0	12.93
BH05	12/17/2014	<1.0	<1.0	<1.0	<1.0	13.69
BH06	9/24/2012	<b>6.7</b>	18	7.5	50	15.35
BH06	12/20/2012	<1.0	<1.0	<1.0	<1.0	16.79
BH06	3/18/2013	3.6	1.2	<1.0	<1.0	14.74
BH06	6/20/2013	<1.0	<1.0	<1.0	<1.0	11.72
BH06	9/25/2013	1.9	<1.0	<1.0	<1.0	14.05
BH06	12/30/2013	<1.0	<1.0	<1.0	<1.0	15.12
BH06	3/28/2014	<1.0	<1.0	<1.0	<1.0	14.78
BH06	6/24/2014	<1.0	<1.0	<1.0	<1.0	12.52
BH06	9/24/2014	<1.0	<1.0	<1.0	<1.0	13.26
BH06	12/17/2014	<1.0	<1.0	<1.0	<1.0	13.94
BH07	9/24/2012	<1.0	<1.0	<1.0	<1.0	16.86
BH07	12/20/2012	<1.0	<1.0	<1.0	<1.0	18.32
BH07	3/18/2013	<1.0	<1.0	<1.0	<1.0	18.77
BH07	6/20/2013	1.6	<1.0	<1.0	<1.0	13.70
BH07	9/25/2013	<1.0	<1.0	<1.0	<1.0	15.95
BH07	12/30/2013	<1.0	<1.0	<1.0	<1.0	16.68
BH07	3/28/2014	<1.0	<1.0	<1.0	<1.0	16.39
BH07	6/24/2014	<1.0	<1.0	<1.0	<1.0	14.30
BH07	9/24/2014	<1.0	<1.0	<1.0	<1.0	14.84
BH07	12/17/2014	<1.0	<1.0	<1.0	<1.0	15.46
<b>COGCC standards for groundwater (ug/L) <sup>(1)</sup></b>		<b>5</b>	<b>560</b>	<b>700</b>	<b>1,400</b>	

Notes:

1). The environmental cleanup standards for groundwater that are applicable to this site are the Colorado Oil and Gas Conservation Commission (COGCC) standards for contaminants in groundwater according to Table 910-1 of the COGCC 900 Series Rule for E&P Waste Management.

**Bold red** values indicate an exceedance of the COGCC groundwater standards for the site.

ug/L-Micrograms per liter

NM - Not Measured

**TABLE 2**  
**COTTONWOOD #1**  
**AIR SPARGE / EFR OPERATIONAL SUMMARY TABLE**

Date	EFR Wells	Total EFR/AS Duration (hours)	Approximate Gallons Extracted	AS Wells	Air Injection Pressure (psi)	Average Air Flow Rate (cfm)
Fourth Quarter 2012						
11/2/2012	BH01, BH02, BH03, BH04	6.75	13.8	BH01, BH02, BH03, BH04	8	
11/14/2012		6	110		8	
12/12/2012		6	400		8	
Quarterly Totals		18.75	523.8		-	
First Quarter 2013						
1/4/2013	BH01, BH02, BH03, BH04	6.5	185	BH01, BH02, BH03, BH04	10	
1/18/2013		6.25	272		10	
2/2/2013		6	278		10	
2/15/2013		7	180		9	
3/5/2013		6.75	364		10	
3/22/2013		4	90		10	
Quarterly Totals		36.5	1369		-	
Second Quarter 2013						
4/3/2013	BH01, BH02, BH03, BH04	5	275	BH01, BH02, BH03, BH04	10	
4/19/2013		6.5	373		10	
5/13/2013		6	385		10	
5/23/2013		6	151		10	
6/6/2013		6	387		10	
6/17/2013		5	300		10	
Quarterly Totals		34.5	1871		-	
Third Quarter 2013						
7/16/2013	BH01, BH02, BH03, BH04, BH07	6	340	BH01, BH02, BH03, BH04, BH07	10	
7/30/2013		6	320		10	
8/13/2013		6	294		10	
8/30/2013		5.5	182		10	
9/12/2013		5.5	180		10	
9/27/2013		6	80		10	
Quarterly Totals		35	1396		-	
Fourth Quarter 2013						
10/10/2013	BH01, BH02, BH03, BH04, BH06, BH07	6	132	BH01, BH02, BH03, BH04, BH06, BH07	10	
10/22/2013		6	159		11	
11/12/2013		6	115		10	
11/25/2013		6	65		10	
12/13/2013		6	60		10	
Quarterly Totals		30	531		-	

**TABLE 2**  
**COTTONWOOD #1**  
**AIR SPARGE / EFR OPERATIONAL SUMMARY TABLE**

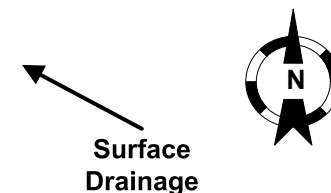
AIR STARGET / EFR OPERATIONAL SUMMARY TABLE						
Date	EFR Wells	Total EFR/AS Duration (hours)	Approximate Gallons Extracted	AS Wells	Air Injection Pressure (psi)	Average Air Flow Rate (cfm)
First Quarter 2014						
1/3/2014	BH01, BH02, BH03, BH04	6	10	BH01, BH02, BH03, BH04	10	
1/17/2014		6	240		10	
2/17/2014		6	180		10	42
3/5/2014		5.25	270		10	30.5
3/14/2014		6	300		10	34
Quarterly Totals		29.25	1000		-	
Second Quarter 2014						
4/3/2014	BH01, BH02, BH03, BH04	6	120	BH01, BH02, BH03, BH04	10	20
4/18/2014		6	360		20	33
5/7/2014		6	225		10	10
5/22/2014		6	400		20	30
6/7/2014		6	200		10	21.5
6/20/2014		6	300		20	30
Quarterly Totals		36	1605		-	
Third Quarter 2014						
7/10/2014	BH02, BH03	6	250	BH02, BH03	10	12.5
7/25/2014		6	220		10	27.5
8/16/2014		6	120		10	25
9/8/2014		6	450		20	41.6
9/19/2014		6	150		20	40
Quarterly Totals		30	1190		-	
Fourth Quarter 2014						
10/8/2014	BH02, BH03	6	100	BH02, BH03	20	20
10/25/2014		6	260		20	33.5
11/7/2014		6	112		20	20
12/2/2014		6	250		20	37.5
12/15/2014		6	270		20	20
Quarterly Totals		30	992		-	

Separator  
Secondary  
Containment

BH06		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH-07 ⊕

BH07		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0



Private Land

Native  
Vegetation

⊕  
BH-06

BH01		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

⊕  
BH-01

BH02		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	59	29
Toluene	<1.0	<1.0
Ethylbenzene	2.5	<1.0
Total Xylenes	2.7	<1.0

⊕  
BH-02

BH04		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	1.2	<1.0
Total Xylenes	3.1	<1.0

Irrigation Canal

Flow

BH05		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

⊗  
SW01

⊕  
BH-05

⊕  
BH-04

100 bbl  
PW Tank

300 bbl  
Condensate Tank

300 bbl  
Condensate Tank

⊗  
GW01

BH03		
Compound (ug/L)	9/24/2014	12/17/2014
Benzene	45	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	1.8	<1.0
Total Xylenes	3.0	<1.0

⊕  
BH-03

Access Road

Note: Surface drainage is approximated based on visual observation of the tank battery. It is not based on regional topography.

DRAWN BY: PD

**Facility Diagram**  
PDC Energy – DJ Basin  
Cottonwood #1  
NESE S13 T6N R66W  
Weld County, CO



6899 Pecos Street  
Unit C  
Denver, CO 80221

LEGEND

- ⊕ Earthen Berm
- ⊕ Temporary Monitoring Well
- ⊗ Surface Water Sample Location Collected During Excavation Activities
- ⊗ Groundwater Sample Location Collected During Excavation Activities

FIGURE 1

GROUNDWATER  
ANALYTICAL RESULTS

Not to Scale

DATE: 1/6/2015

## **ATTACHMENT A**

# Summit Scientific

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

December 23, 2014

Brandon Bruns  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Cottonwood #1

Enclosed are the results of analyses for samples received by Summit Scientific on 12/17/14 15:54. 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  
President





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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1412154-01	Water	12/17/14 14:00	12/17/14 15:54
BH02	1412154-02	Water	12/17/14 14:10	12/17/14 15:54
BH03	1412154-03	Water	12/17/14 14:20	12/17/14 15:54
BH04	1412154-04	Water	12/17/14 14:30	12/17/14 15:54
BH05	1412154-05	Water	12/17/14 14:40	12/17/14 15:54
BH06	1412154-06	Water	12/17/14 14:50	12/17/14 15:54
BH07	1412154-07	Water	12/17/14 15:00	12/17/14 15:54

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: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Bruns

Reported:  
12/23/14 12:14

# Summit Scientific <sup>1412154</sup> S<sub>2</sub>

741 Corporate Circle, Suite J&K ♦ Golden, Colorado 80401  
303-277-9310 ♦ 303-374-5933

Page 1 of 1

Client: PDC/Tasman Project Manager: Brandon Bruns  
Address: \_\_\_\_\_ E-Mail: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Project Name: Cottonwood #1  
Sampler Name: Eric Sigel Project Number: \_\_\_\_\_

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested				Special Instructions
					HCl	HNO <sub>3</sub>	None	Other (Specify)	Groundwater	Soil	Air-Canister #	Other (Specify)					
1	BH01	12/17/14	1400	✓			X		X				X				
2	BH02	↓	1410	↓	X								X				
3	BH03	↓	1420	↓			X										
4	BH04	↓	1430	↓	X												
5	BH05	↓	1440	↓													
6	BH06	↓	1450	↓													
7	BH07	↓	1500	↓													
8																	
9																	
10																	

Relinquished by: <u>Eric A. Sigel</u>	Date/Time: <u>1534 12/17/14</u>	Received by: <u>Olivia Oldham</u>	Date/Time: <u>1554 12/17/14</u>	Turn Around Time (Check) Same Day <input type="checkbox"/> 72 hours <input type="checkbox"/> 24 hours <input type="checkbox"/> Standard <input checked="" type="checkbox"/> 48 hours <input type="checkbox"/>	Notes:
Relinquished by:	Date/Time:	Received by:	Date/Time:	Sample Integrity: Temperature Upon Receipt: <u>4.0</u> Intact: Yes No	
Relinquished by:	Date/Time:	Received by:	Date/Time:		

www.s2scientific.com

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Bruns

Reported:  
12/23/14 12:14

### Sample Receipt Checklist

S2 Work Order: 1412154

Client: PDC

Client Project ID: Cottonwood #1

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

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

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

Cooler ID	<u>1</u>				
Temp (°C)	<u>4.0</u>				

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature just above 0°C to ≤ 6°C <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
NOTE: If samples are delivered the same day of sampling, this requirement is waived provided that there is evidence that cooling has begun.				
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
If custody seals are present, are they intact <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Are short holding time analytes or samples with HTs due within 48 hours present?		<input checked="" type="checkbox"/>		
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		<input checked="" type="checkbox"/>		
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			HCl
Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, etc.				2 Samples Unpres
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Record the pH in Comments.				
If dissolved metals are requested, were samples field filtered?			<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.

Joseph T Eary  
Custodian Printed Name

[Signature]  
Signature or Initials of Custodian

12/18/14  
Date/Time



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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH01**  
**1412154-01 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 14:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1412219	12/21/14	12/21/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: 12/17/14 14:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		104 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		94.8 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.7 %	45-146		"	"	"	"	

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH02**  
**1412154-02 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 14:10

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>Benzene</b>	<b>29</b>	1.0	ug/l	1	1412219	12/21/14	12/21/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: 12/17/14 14:10

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Surrogate: 1,2-Dichloroethane-d4		105 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		95.9 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.1 %	45-146		"	"	"	"	

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: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH03**  
**1412154-03 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 14:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1412219	12/21/14	12/21/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: 12/17/14 14:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		104 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		92.1 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		95.9 %	45-146		"	"	"	"	

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH04**  
**1412154-04 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 14:30

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Benzene	ND	1.0	ug/l	1	1412219	12/21/14	12/21/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: 12/17/14 14:30

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Surrogate: 1,2-Dichloroethane-d4		106 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		92.8 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.7 %	45-146		"	"	"	"	

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH05**  
**1412154-05 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 14:40

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1412219	12/21/14	12/21/14	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	1.0		"	"	"	"	"	"	

Date Sampled: 12/17/14 14:40

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		107 %		37-154		"	"	"	"	
Surrogate: Toluene-d8		93.2 %		45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.3 %		45-146		"	"	"	"	

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH06**  
**1412154-06 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 14:50

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Benzene	ND	1.0		ug/l	1	1412219	12/21/14	12/21/14	EPA 8260B	
Toluene	ND	1.0		"	"	"	"	"	"	
Ethylbenzene	ND	1.0		"	"	"	"	"	"	
Xylenes (total)	ND	1.0		"	"	"	"	"	"	

Date Sampled: 12/17/14 14:50

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: 1,2-Dichloroethane-d4		109 %		37-154		"	"	"	"	
Surrogate: Toluene-d8		91.3 %		45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.3 %		45-146		"	"	"	"	

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**BH07**  
**1412154-07 (Water)**

**Summit Scientific**

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

Date Sampled: 12/17/14 15:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1412219	12/22/14	12/22/14	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: 12/17/14 15:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		92.8 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.8 %	45-146		"	"	"	"	

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Bruns

**Reported:**  
12/23/14 12:14

## 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 1412219 - EPA 5030 Water MS

##### Blank (1412219-BLK1)

Prepared & Analyzed: 12/20/14

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	13.5		"	13.2	102	37-154				
Surrogate: Toluene-d8	12.5		"	13.3	94.1	45-149				
Surrogate: 4-Bromofluorobenzene	12.7		"	13.3	95.6	45-146				

##### LCS (1412219-BS1)

Prepared & Analyzed: 12/20/14

Benzene	31.0	1.0	ug/l	33.3	93.1	51-132				
Toluene	29.6	1.0	"	33.3	88.9	51-138				
Ethylbenzene	32.3	1.0	"	33.1	97.6	58-146				
m,p-Xylene	63.0	2.0	"	66.5	94.6	57-144				
o-Xylene	32.6	1.0	"	32.8	99.4	53-146				
Surrogate: 1,2-Dichloroethane-d4	13.8		"	13.2	105	37-154				
Surrogate: Toluene-d8	12.7		"	13.3	95.5	45-149				
Surrogate: 4-Bromofluorobenzene	12.6		"	13.3	94.5	45-146				

##### LCS (1412219-BS2)

Prepared & Analyzed: 12/20/14

Benzene	30.5	1.0	ug/l	33.3	91.6	51-132				
Toluene	29.6	1.0	"	33.3	88.9	51-138				
Ethylbenzene	32.2	1.0	"	33.1	97.3	58-146				
m,p-Xylene	63.2	2.0	"	66.5	95.1	57-144				
o-Xylene	32.6	1.0	"	32.8	99.3	53-146				
Surrogate: 1,2-Dichloroethane-d4	13.6		"	13.2	103	37-154				
Surrogate: Toluene-d8	12.6		"	13.3	94.7	45-149				
Surrogate: 4-Bromofluorobenzene	12.5		"	13.3	93.6	45-146				

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Bruns

Reported:  
12/23/14 12:14

**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 1412219 - EPA 5030 Water MS**

Matrix Spike (1412219-MS1)		Source: 1412152-01			Prepared & Analyzed: 12/20/14					
Benzene	30.8	1.0	ug/l	33.3	ND	92.5	34-141			
Toluene	29.9	1.0	"	33.3	ND	89.7	27-151			
Ethylbenzene	32.1	1.0	"	33.1	ND	97.0	29-160			
m,p-Xylene	62.8	2.0	"	66.5	ND	94.3	20-166			
o-Xylene	32.7	1.0	"	32.8	ND	99.7	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.4		"	13.2		109	37-154			
Surrogate: Toluene-d8	12.8		"	13.3		95.6	45-149			
Surrogate: 4-Bromofluorobenzene	12.4		"	13.3		92.8	45-146			

Matrix Spike (1412219-MS2)		Source: 1412152-02			Prepared & Analyzed: 12/21/14					
Benzene	31.2	1.0	ug/l	33.3	ND	93.6	34-141			
Toluene	29.7	1.0	"	33.3	ND	89.2	27-151			
Ethylbenzene	32.7	1.0	"	33.1	ND	99.0	29-160			
m,p-Xylene	63.4	2.0	"	66.5	ND	95.3	20-166			
o-Xylene	33.3	1.0	"	32.8	ND	101	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.2		"	13.2		108	37-154			
Surrogate: Toluene-d8	12.6		"	13.3		94.6	45-149			
Surrogate: 4-Bromofluorobenzene	12.2		"	13.3		91.8	45-146			

Matrix Spike Dup (1412219-MSD1)		Source: 1412152-01			Prepared & Analyzed: 12/21/14					
Benzene	31.5	1.0	ug/l	33.3	ND	94.6	34-141	2.28	32	
Toluene	30.0	1.0	"	33.3	ND	90.1	27-151	0.467	25	
Ethylbenzene	33.1	1.0	"	33.1	ND	100	29-160	3.01	50	
m,p-Xylene	64.6	2.0	"	66.5	ND	97.0	20-166	2.81	36	
o-Xylene	33.5	1.0	"	32.8	ND	102	33-159	2.36	26	
Surrogate: 1,2-Dichloroethane-d4	14.4		"	13.2		109	37-154			
Surrogate: Toluene-d8	12.8		"	13.3		96.2	45-149			
Surrogate: 4-Bromofluorobenzene	12.3		"	13.3		92.6	45-146			

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
12/23/14 12:14

**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 1412219 - EPA 5030 Water MS**

<b>Matrix Spike Dup (1412219-MSD2)</b>	<b>Source: 1412152-02</b>			<b>Prepared &amp; Analyzed: 12/21/14</b>						
Benzene	30.9	1.0	ug/l	33.3	ND	92.6	34-141	1.06	32	
Toluene	30.0	1.0	"	33.3	ND	90.0	27-151	0.904	25	
Ethylbenzene	32.9	1.0	"	33.1	ND	99.5	29-160	0.518	50	
m,p-Xylene	64.3	2.0	"	66.5	ND	96.6	20-166	1.38	36	
o-Xylene	33.4	1.0	"	32.8	ND	102	33-159	0.390	26	
Surrogate: 1,2-Dichloroethane-d4	14.0		"	13.2		106	37-154			
Surrogate: Toluene-d8	12.7		"	13.3		95.5	45-149			
Surrogate: 4-Bromofluorobenzene	12.5		"	13.3		93.7	45-146			

Summit Scientific

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

Project: Cottonwood #1  
Project Number: [none]  
Project Manager: Brandon Bruns

**Reported:**  
12/23/14 12:14

### 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

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Summit Scientific

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A handwritten signature in black ink, appearing to be 'MSM'.