



PDC Energy, Inc.
Third Quarter 2016 Groundwater Monitoring Summary

October 25, 2016

Cottonwood #1 Tank Battery
NESE Section 13 T6N R66W
Weld County, API # 05-123-11801
Facility ID # 322644
Remediation # 9319

This groundwater summary has been prepared by Tasman Geosciences, Inc. for the Cottonwood #1 tank battery. On September 29, 2016, groundwater monitoring was conducted at all seven monitoring well locations at the site (BH01-BH03, BH04-R, and BH05-BH07). Prior the third quarter 2016 groundwater sampling event, temporary monitoring well BH04 was replaced (BH04-R). Seven 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 and the laboratory report is included as Attachment A. Sample locations and corresponding analytical results are illustrated on Figure 1. Third quarter 2016 analytical results indicate that the benzene concentration is above the applicable COGCC Table 910-1 groundwater standard in well BH01. BTEX concentrations are below COGCC regulatory standards in the remaining six well locations.

Tasman initiated enhanced fluid recovery (EFR) and air sparge (AS) events on site during the fourth quarter 2012. A summary of the EFR/AS operational data is provided in Table 2. Mobile EFR/AS will remain the selected remediation strategy through the fourth quarter 2016.

Historical sampling results for naphthalene and gasoline range organics (GRO) are presented in Table 3. Analysis of these constituents was discontinued following the third quarter 2012.

Fourth quarter 2016 groundwater sampling will be conducted during December 2016.

TABLE 1
COTTONWOOD #1 TANK BATTERY
SURFACE WATER AND GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE - BTEX

Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Depth to Water ⁽²⁾ (feet)
COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
SW01	8/20/2012	<1.0	<1.0	<1.0	<1.0	NM
GW01	8/21/2012	3,000	1.7	320	1,900	~ 14
BH01	9/24/2012	160	<1.0	40	<1.0	16.31
BH01	12/20/2012	5.0	<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
BH01	3/26/2015	<1.0	<1.0	<1.0	<1.0	12.60
BH01	6/16/2015	<1.0	<1.0	<1.0	<1.0	11.33
BH01	9/28/2015	<1.0	<1.0	<1.0	<1.0	11.31
BH01	12/17/2015	3.8	<1.0	<1.0	<1.0	11.99
BH01	3/14/2016	3.5	<1.0	<1.0	<1.0	11.81
BH01	6/22/2016	37	<1.0	<1.0	<1.0	8.93
BH01	9/29/2016	5.4	3.1	<1.0	3.4	11.08
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
BH02	3/26/2015	47	<1.0	2.5	<1.0	13.65
BH02	6/16/2015	35	<1.0	<1.0	<1.0	12.55
BH02	9/28/2015	80	<1.0	2.2	<1.0	12.27

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Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Depth to Water ⁽²⁾ (feet)
COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
BH02	12/17/2015	9.5	<1.0	<1.0	<1.0	13.01
BH02	3/14/2016	8.0	<1.0	<1.0	<1.0	12.75
BH02	6/22/2016	1.8	<1.0	<1.0	<1.0	10.13
BH02	9/29/2016	1.1	2.4	<1.0	2.4	12.00
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
BH03	3/26/2015	8.0	<1.0	<1.0	<1.0	13.24
BH03	6/16/2015	19	<1.0	<1.0	<1.0	12.03
BH03	9/28/2015	7.7	<1.0	<1.0	<1.0	11.82
BH03	12/17/2015	2.0	<1.0	<1.0	<1.0	12.61
BH03	3/14/2016	1.0	<1.0	<1.0	<1.0	12.43
BH03	6/22/2016	<1.0	<1.0	<1.0	<1.0	9.61
BH03	9/29/2016	<1.0	2.1	<1.0	<1.0	11.62
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
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
BH04	3/26/2015	<1.0	<1.0	<1.0	<1.0	10.40
BH04	6/16/2015	1.8	<1.0	3.8	<1.0	9.09

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Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Depth to Water ⁽²⁾ (feet)
COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
BH04	9/28/2015	<1.0	<1.0	<1.0	<1.0	9.07
BH04	12/17/2015	<1.0	<1.0	<1.0	<1.0	9.81
BH04	3/14/2016	<1.0	<1.0	<1.0	<1.0	9.64
BH04	6/22/2016	Destroyed				
BH04-R	9/29/2016	<1.0	1.8	8.2	16	8.39
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
BH05	3/26/2015	<1.0	<1.0	<1.0	<1.0	13.30
BH05	6/16/2015	<1.0	<1.0	<1.0	<1.0	11.96
BH05	9/28/2015	<1.0	<1.0	<1.0	<1.0	11.98
BH05	12/17/2015	<1.0	<1.0	<1.0	<1.0	12.73
BH05	3/14/2016	<1.0	<1.0	<1.0	<1.0	12.58
BH05	6/22/2016	<1.0	<1.0	<1.0	<1.0	11.22
BH05	9/29/2016	<1.0	1.4	<1.0	<1.0	11.75
BH06	9/24/2012	6.7	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

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COGCC Table 910-1 Groundwater Standard (µg/L) ⁽¹⁾		5	560	700	1,400	
BH06	3/26/2015	<1.0	<1.0	<1.0	<1.0	13.45
BH06	6/16/2015	<1.0	<1.0	<1.0	<1.0	12.28
BH06	9/28/2015	<1.0	<1.0	<1.0	<1.0	12.09
BH06	12/17/2015	<1.0	<1.0	<1.0	<1.0	12.78
BH06	3/14/2016	<1.0	<1.0	<1.0	<1.0	12.80
BH06	6/22/2016	<1.0	<1.0	<1.0	<1.0	9.77
BH06	9/29/2016	<1.0	1.3	<1.0	<1.0	11.84
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
BH07	3/26/2015	<1.0	1.2	<1.0	<1.0	14.93
BH07	6/16/2015	<1.0	<1.0	<1.0	<1.0	13.71
BH07	9/28/2015	<1.0	<1.0	<1.0	<1.0	13.38
BH07	12/17/2015	<1.0	<1.0	<1.0	<1.0	14.03
BH07	3/14/2016	<1.0	<1.0	<1.0	<1.0	13.81
BH07	6/22/2016	<1.0	<1.0	<1.0	<1.0	11.22
BH07	9/29/2016	<1.0	1.2	<1.0	<1.0	13.12

Notes:

COGCC = Colorado Oil and Gas Conservation Commission

1. Groundwater standards referenced from 2 CCR 404-1, Table 910-1, effective January 30, 2015.

2. Depth to water measured from top of well casing or ground surface for monitoring well samples and excavation samples, respectively.

µg/L = Micrograms per liter

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

NM = Not measured

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

TABLE 2
COTTONWOOD #1 TANK BATTERY
EFR / AS OPERATIONAL SUMMARY TABLE

Date	EFR Wells	Total EFR/AS Duration (hours)	Approximate Gallons Extracted	AS Wells	Air Injection Pressure (psi)
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	BH02, BH03	6.5	185	BH01, BH02	10
1/18/2013	BH01, BH02, BH03, BH04	6.25	272	BH01, BH02, BH03, BH04	10
2/2/2013		6	278		10
2/15/2013		7	180		9.5
3/5/2013		6.75	364		10
3/22/2013		4.25	180		10
Quarterly Totals		36.75	1459		-
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		4.75	300		10
Quarterly Totals		34.25	1871		-
Third Quarter 2013					
7/16/2013	BH01, BH02, BH03, BH04	6	340	BH01, BH02, BH03, BH04	10
7/30/2013	BH01, BH02, BH04, BH07	6	320	BH01, BH02, BH04, BH07	10
8/13/2013	BH02, BH03, BH04, BH07	6	294	BH02, BH03, BH04, BH07	10
8/30/2013		5.5	182		10
9/12/2013	BH01, BH02, BH03, BH04	5.75	180	BH01, BH02, BH03, BH04	10
9/27/2013	BH01, BH02, BH04, BH07	6	80	BH01, BH02, BH04, BH07	10
Quarterly Totals		35.25	1396		-
Fourth Quarter 2013					
10/10/2013	BH01, BH02, BH03, BH04, BH07	6	132	BH01, BH02, BH03, BH04, BH07	10
10/22/2013	BH02, BH03, BH04, BH06	6	159	BH02, BH03, BH04, BH06	11.5
11/12/2013		6	115		10
11/25/2013		6	65		10
12/13/2013		6	60		10
Quarterly Totals		30	531		-

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Date	EFR Wells	Total EFR/AS Duration (hours)	Approximate Gallons Extracted	AS Wells	Air Injection Pressure (psi)
First Quarter 2014					
1/3/2014	BH02, BH03, BH04, BH06	6	10	BH02, BH03, BH04, BH06	10
1/17/2014		6	240		10
2/17/2014	BH01, BH02, BH03, BH04	6	180	BH01, BH02, BH03, BH04	10
3/5/2014		5.25	270		10
3/14/2014		6	300		10
Quarterly Totals		29.25	1000		
Second Quarter 2014					
4/3/2014	BH01, BH02, BH03, BH04	6	120	BH01, BH02, BH04, BH05	10
4/18/2014		6	360	BH01, BH02, BH03, BH04	20
5/7/2014		6	225		10
5/22/2014		6	400		20
6/7/2014		6	200		10
6/20/2014		6	300		20
Quarterly Totals		36	1605		
Third Quarter 2014					
7/10/2014	BH02, BH03	6	250	BH02, BH03	10
7/25/2014		6	220		10
8/16/2014		6	120		10
9/8/2014		6	450		20
9/19/2014		6	150		20
Quarterly Totals		30	1190		
Fourth Quarter 2014					
10/8/2014	BH02, BH03	6	100	BH02, BH03	20
10/25/2014	BH01, BH02	6	260	BH01, BH02	20
11/7/2014	BH02, BH03	6	112	BH02, BH03	20
12/2/2014		6	250		20
12/15/2014		6	270		20
Quarterly Totals		30	992		
First Quarter 2015					
1/5/2015	BH02, BH03	6	0	BH02, BH03	20
1/16/2015		6	315		20
2/7/2015		6	410		20
3/2/2015		6	0		20
3/19/2015		6	0		20
Quarterly Totals		30	725		
Second Quarter 2015					
4/8/2015	BH02, BH03	6	0	BH02, BH03	20
4/15/2015		5.45	0		20
4/29/2015		6	320		20
5/13/2015		6	360		20
5/27/2015		6	480		20
6/10/2015		6	600		20
6/24/2015		6	480		20
Quarterly Totals		41.45	2240		

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Third Quarter 2015					
7/8/2015	BH02, BH03	6	400	BH02, BH03	20
7/22/2015		6	280		20
8/5/2015		6	250		20
8/17/2015		4	375		20
9/2/2015		6	640		20
9/30/2015	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	800	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	20
Quarterly Totals		34	2745		
Fourth Quarter 2015					
10/15/2015	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	230	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	20
10/23/2015		5	552		20
11/5/2015		6	644	BH02, BH03, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	20
11/18/2015		6	480		20
12/3/2015		6	786	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	20
12/19/2015		6	320		20
12/31/2015		6	746	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR06, EFR07, EFR08, EFR09	20
Quarterly Totals		41	3758		
Third Quarter 2016					
1/28/2016	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	480	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	20
2/9/2016		6	924		20
2/23/2016		6	1600		20
3/8/2016		6	840		20
3/22/2016		6	900		30
Quarterly Totals		30	4744		

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Date	EFR Wells	Total EFR/AS Duration (hours)	Approximate Gallons Extracted	AS Wells	Air Injection Pressure (psi)
Second Quarter 2016					
4/5/2016	BH02, BH03, EFR01,	6	960	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	22
4/13/2016	None	6	0		20
4/19/2016	BH02, BH03, EFR01, EFR02, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	1764		20
4/25/2016	None	6	0	BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	15
5/5/2016	BH02, BH03, EFR03,	6	600	BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	27
5/10/2016	None	6	0		15
5/17/2016	BH02, BH03, EFR01,	6	800		15
5/23/2016	None	6	0		0
6/9/2016	BH02, BH03, EFR03,	6	1260	BH02, BH03, EFR03, EFR04, EFR05, EFR06,	30
6/14/2016	None	6	0		10
6/23/2016	BH02, BH03, EFR03,	6	1596	BH02, BH03, EFR03, EFR04, EFR05, EFR06,	10
6/28/2016	None	6	0		10
Quarterly Totals		72	6980		
Third Quarter 2016					
7/7/2016	BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	1386	BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10,	20
7/12/2016	None	6	0	BH01, BH02, BH03, EFR03, EFR04, EFR05,	10
7/21/2016	BH01, BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	1554		20
8/4/2016		6	1470	BH01, BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	10
8/13/2016	None	6	0	BH01, BH02, BH03, EFR03, EFR04, EFR06, EFR07, EFR08, EFR09, EFR10	5
8/18/2016	BH01, BH02, BH03, EFR03, EFR04, EFR06, EFR07, EFR08, EFR09, EFR10	6	1260		15
8/27/2016	None	6	0		20
9/2/2016	BH01, BH02, BH03, EFR03, EFR04, EFR05,	6	1680		7.5
9/15/2016		6	2100		20
9/20/2016	None	6	0	BH01, BH02, BH03, EFR03, EFR04, EFR05,	10
9/26/2016	BH01, BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	6	1680	BH01, BH02, BH03, EFR03, EFR04, EFR05, EFR06, EFR07, EFR08, EFR09, EFR10	20
Quarterly Totals		66	11130		-

TABLE 2
COTTONWOOD #1 TANK BATTERY
EFR / AS OPERATIONAL SUMMARY TABLE

Notes:

EFR = Enhanced fluid recovery

AS = Air sparge

psi = Pounds per square inch

NR = Not recorded

TABLE 3
COTTONWOOD #1 TANK BATTERY
SURFACE WATER AND GROUNDWATER ANALYTICAL RESULTS SUMMARY TABLE
GRO & NAPHTHALENE

Sample ID	Date Sampled	Naphthalene (µg/L)	TPH-GRO (µg/L)
CDPHE WQCC Groundwater Standard ⁽¹⁾		140	NS
SW01	8/20/2012	<1.0	<500
GW01	8/21/2012	200	32,000
BH01	9/24/2012	5.5	830
BH02	9/24/2012	25	6,800
BH03	9/24/2012	13	2,900
BH04	9/24/2012	14	3,100
BH05	9/24/2012	<1.0	<500
BH06	9/24/2012	<1.0	<500
BH07	9/24/2012	1.6	<500

Notes:

1. Groundwater standards referenced from Colorado Department of Public Health Water Quality Control Commission 5CCR 1002-41 Basic Standards for Groundwater.

TPH-GRO = Total Petroleum Hydrocarbons - Gasoline Range Organics

µg/L = Micrograms per liter

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

NS = No Standard

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



Irrigation
Canal Flow

Surface
Drainage

BH06		
Compound (µg/L)	6/22/2016	9/29/2016
Benzene	<1.0	<1.0
Toluene	<1.0	1.3
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH01		
Compound (µg/L)	6/22/2016	9/29/2016
Benzene	37	5.4
Toluene	<1.0	3.1
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	3.4

BH07		
Compound (µg/L)	6/22/2016	9/29/2016
Benzene	<1.0	<1.0
Toluene	<1.0	1.2
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH02		
Compound (µg/L)	6/22/2016	9/29/2016
Benzene	1.8	1.1
Toluene	<1.0	2.4
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	2.4

BH04-R	
Compound (µg/L)	9/29/2016
Benzene	<1.0
Toluene	1.8
Ethylbenzene	8.2
Total Xylenes	16

BH05		
Compound (µg/L)	6/22/2016	9/29/2016
Benzene	<1.0	<1.0
Toluene	<1.0	1.4
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH03		
Compound (µg/L)	6/22/2016	9/29/2016
Benzene	<1.0	<1.0
Toluene	<1.0	2.1
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

0 25 ft 50 ft

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

DRAWN BY: BRN

DATE: 10/14/2016

Facility Diagram
PDC Energy, Inc. – DJ Basin
Cottonwood #1 Tank Battery
NESE S13 T6N R66W
Weld County, CO



6899 Pecos Street, Unit C
Denver, CO 80221

LEGEND

- Destroyed Monitoring Well Location
- Monitoring Well Location
- Remediation EFR Well Location
- Excavation Extent
- Point of Release

All locations are approximate unless otherwise noted

Groundwater Flow Direction

FIGURE 1
GROUNDWATER ANALYTICAL RESULTS MAP

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

October 07, 2016

Mark Longhurst
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 09/30/16 17:30. 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
President



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

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

Reported:
10/07/16 09:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	1610022-01	Water	09/29/16 10:20	09/30/16 17:30
BH02	1610022-02	Water	09/29/16 10:31	09/30/16 17:30
BH03	1610022-03	Water	09/29/16 10:42	09/30/16 17:30
BH04-R	1610022-04	Water	09/29/16 10:46	09/30/16 17:30
BH05	1610022-05	Water	09/29/16 10:55	09/30/16 17:30
BH06	1610022-06	Water	09/29/16 10:58	09/30/16 17:30
BH07	1610022-07	Water	09/29/16 11:08	09/30/16 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.



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

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

Reported:
10/07/16 09:18

Sample Receipt Checklist

S2 Work Order: 11610022

Client: PDC Energy

Client Project ID: Cottonwood 1

Shipped Via: DV

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

Airbill #: _____

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

Cooler ID					
Temp (°C)	<u>0.9</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 ⁽¹⁾ ?	<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 ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
If custody seals are present, are they intact ⁽¹⁾ ?			<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 ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<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) ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect				
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ?			<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):				
⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.				

Nakita
Custodian Printed Name

MEB
Signature or Initials of Custodian

9/30/16 1800
Date/Time



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

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

Reported:
10/07/16 09:18

BH01
1610022-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 10:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	5.4	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	3.1	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	3.4	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 10:20**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		110 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		95.1 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.8 %	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: Mark Longhurst

Reported:
10/07/16 09:18

BH02
1610022-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 10:31**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	1.1	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	2.4	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	2.4	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 10:31**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		109 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		95.5 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		102 %	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: Mark Longhurst

Reported:
10/07/16 09:18

BH03
1610022-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 10:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	2.1	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 10:42**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		108 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		94.6 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.6 %	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: Mark Longhurst

Reported:
10/07/16 09:18

BH04-R
1610022-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 10:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	1.8	1.0	"	"	"	"	"	"	
Ethylbenzene	8.2	1.0	"	"	"	"	"	"	
Xylenes (total)	16	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 10:46**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		108 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		98.2 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.2 %	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: Mark Longhurst

Reported:
10/07/16 09:18

BH05
1610022-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 10:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	1.4	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 10:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		104 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		94.5 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.9 %	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: Mark Longhurst

Reported:
10/07/16 09:18

BH06
1610022-06 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 10:58**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	1.3	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 10:58**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		104 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		94.0 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		99.6 %	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: Mark Longhurst

Reported:
10/07/16 09:18

BH07
1610022-07 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **09/29/16 11:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	1610047	10/06/16	10/06/16	EPA 8260B	
Toluene	1.2	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **09/29/16 11:08**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		110 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.8 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.9 %	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: Mark Longhurst

Reported:
10/07/16 09:18

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 1610047 - EPA 5030 Water MS

Blank (1610047-BLK1)

Prepared & Analyzed: 10/05/16

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	14.1		"	13.3		105	37-154			
Surrogate: Toluene-d8	12.6		"	13.3		94.3	45-149			
Surrogate: 4-Bromofluorobenzene	13.4		"	13.3		101	45-146			

LCS (1610047-BS1)

Prepared & Analyzed: 10/05/16

Benzene	39.0	1.0	ug/l	33.3		117	51-132			
Toluene	39.2	1.0	"	33.3		118	51-138			
Ethylbenzene	43.2	1.0	"	33.1		131	58-146			
m,p-Xylene	77.2	2.0	"	66.5		116	57-144			
o-Xylene	40.5	1.0	"	32.7		124	53-146			
Surrogate: 1,2-Dichloroethane-d4	14.1		"	13.3		106	37-154			
Surrogate: Toluene-d8	13.1		"	13.3		98.4	45-149			
Surrogate: 4-Bromofluorobenzene	13.4		"	13.3		100	45-146			

Matrix Spike (1610047-MS1)

Source: 1610015-19

Prepared & Analyzed: 10/06/16

Benzene	38.7	1.0	ug/l	33.3	ND	116	34-141			
Toluene	39.1	1.0	"	33.3	ND	117	27-151			
Ethylbenzene	43.3	1.0	"	33.1	ND	131	29-160			
m,p-Xylene	78.0	2.0	"	66.5	ND	117	20-166			
o-Xylene	40.9	1.0	"	32.7	ND	125	33-159			
Surrogate: 1,2-Dichloroethane-d4	14.4		"	13.3		108	37-154			
Surrogate: Toluene-d8	13.0		"	13.3		97.5	45-149			
Surrogate: 4-Bromofluorobenzene	13.6		"	13.3		102	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: Mark Longhurst

Reported:
10/07/16 09:18

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 1610047 - EPA 5030 Water MS

Matrix Spike Dup (1610047-MSD1)		Source: 1610015-19			Prepared & Analyzed: 10/06/16					
Benzene	40.1	1.0	ug/l	33.3	ND	120	34-141	3.43	32	
Toluene	40.4	1.0	"	33.3	ND	121	27-151	3.30	25	
Ethylbenzene	44.4	1.0	"	33.1	ND	134	29-160	2.39	50	
m,p-Xylene	79.5	2.0	"	66.5	ND	119	20-166	1.91	36	
o-Xylene	42.4	1.0	"	32.7	ND	130	33-159	3.55	26	
Surrogate: 1,2-Dichloroethane-d4	14.3		"	13.3		107	37-154			
Surrogate: Toluene-d8	13.2		"	13.3		98.7	45-149			
Surrogate: 4-Bromofluorobenzene	13.5		"	13.3		101	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: Mark Longhurst

Reported:
10/07/16 09:18

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