



PDC Energy, Inc.
First Quarter 2013 Groundwater Monitoring Summary

May 8, 2013

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 March 18, 2013 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 laboratory reports are included as Attachment A. Sample locations and corresponding fourth quarter 2012 and first quarter 2013 analytical results are illustrated on Figure 2. First quarter analytical results indicate a continued site-wide reduction in BTEX concentrations since the previous monitoring event. Benzene concentrations in monitoring wells BH01 and BH04 decreased below COGCC regulatory limits. Elevated benzene concentrations persist in monitoring wells BH02 and BH03, although BTEX levels in these wells continue to decline. Dissolved-phase petroleum hydrocarbon concentrations remained below laboratory detection limits in boundary wells BH05 and BH07.

Tasman continued enhanced fluid recovery (EFR) and air sparge (AS) events at the site during the first quarter 2013. A summary of the EFR/AS operational data is provided in Table 2. EFR/AS activities will continue through the second quarter 2013.

The second quarter 2013 groundwater sampling event will be conducted during June 2013.

**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
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
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
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
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
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
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
COGCC standards for Groundwater (ug/L) ⁽¹⁾		5	560	700	1,400	

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	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	BH01, BH02, BH03, BH04	6	110	BH01, BH02, BH03, BH04	8
12/12/2012	BH01, BH02, BH03, BH04	6	400	BH01, BH02, BH03, BH04	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	BH01, BH02, BH03, BH04	5.83	278	BH01, BH02, BH03, BH04	10
2/15/2013	BH01, BH02, BH03, BH04	7	180	BH01, BH02, BH03, BH04	9
3/5/2013	BH01, BH02, BH03, BH04	6.75	364	BH01, BH02, BH03, BH04	10
3/22/2013	BH01, BH02, BH03, BH04	4.25	360	BH01, BH02, BH03, BH04	10
TOTALS		55.33	2,162.8		

Notes:

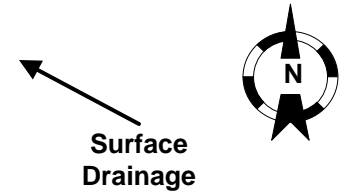
psi = pounds per square inch

Separator
Secondary
Containment

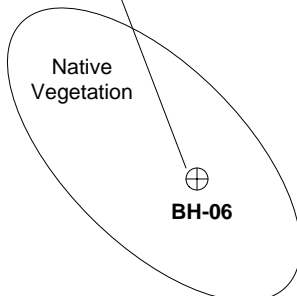
BH06		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	<1.0	3.6
Toluene	<1.0	1.2
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH-07 ⊕

BH07		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0



Private Land



BH-06

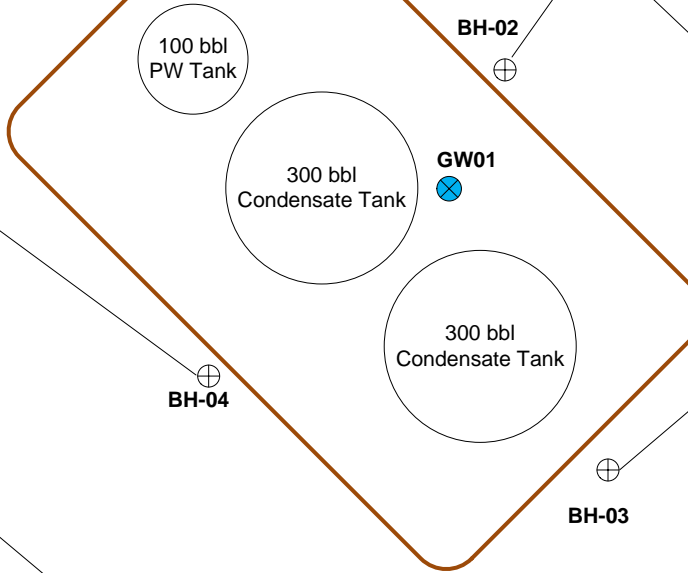
BH01		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	5	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	6.8	<1.0

BH-01 ⊕

BH02		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	24	18
Toluene	<1.0	<1.0
Ethylbenzene	3.9	<1.0
Total Xylenes	8.1	<1.0

BH-02 ⊕

BH04		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	38	2.6
Toluene	<1.0	<1.0
Ethylbenzene	40	<1.0
Total Xylenes	170	<1.0



BH03		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	15	14
Toluene	<1.0	<1.0
Ethylbenzene	6.7	1.5
Total Xylenes	7.9	<1.0

BH-03

BH05		
Compound (ug/L)	12/20/2012	3/18/2013
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

BH-05

SW01 ⊗

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

PROJECT
NO:

DRAWN BY: ESS

DATE: 4/15/2013

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 2
GROUNDWATER
ANALYTICAL RESULTS

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

March 26, 2013

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 03/19/13 16:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Joseph J Egry IV
Laboratory Director

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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:
03/26/13 11:44

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
BH01	R303133-01	Water	03/18/13 09:30	03/19/13 16:30
BH02	R303133-02	Water	03/18/13 09:35	03/19/13 16:30
BH03	R303133-03	Water	03/18/13 09:40	03/19/13 16:30
BH04	R303133-04	Water	03/18/13 09:45	03/19/13 16:30
BH05	R303133-05	Water	03/18/13 09:50	03/19/13 16:30
BH06	R303133-06	Water	03/18/13 09:55	03/19/13 16:30
BH07	R303133-07	Water	03/18/13 10:00	03/19/13 16:30

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:
03/26/13 11:44

R303133
Summit Scientific

741 Corporate Circle Suite 1 • Golden, Colorado 80401
303-277-9510 • 303-277-9531 Fax

Client: PDC Energy
Address: 1775 Sherman St Suite 3000
City/State/Zip: Denver, CO 80203
Phone: (303) 860-3800
Fax:
Sample Name: C-141820
Project Manager: Brandon Bruns
E-Mail: bbruns@summit-sc.com
Project Name: Cottonwood
Project Number:

Page 1 of 1

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative	Matrix	Analyze For:	Special Instructions
BH01	3/18/13	930	3	HCl	Soil		
BH02	3/18/13	935	1	None	Groundwater		
BH03	3/18/13	940	1	None	Other (Specify)		
BH04	3/18/13	945	1	None	Other (Specify)		
BH05	3/18/13	950	1	None	Other (Specify)		
BH06	3/18/13	955	1	None	Other (Specify)		
BH07	3/18/13	1000	1	None	Other (Specify)		
Requisitioned by: [Signature] Date/Time: 3/18/13 1630							
Received by: [Signature] Date/Time: 3/18/13 1630							
Relinquished by: [Signature] Date/Time: 3/18/13 1630							
Received in Lab by: [Signature] Date/Time: 3/18/13 1630							
Relinquished by: [Signature] Date/Time: 3/18/13 1630							
Sample Integrity: Temperature Upon Receipt: 5.0 Impact: Yes No							
Turn Around Time (Check): Same Day 72 Hours Standard							
Notes:							

www.SummitScientific.com

[Signature]



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

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

Reported:
03/26/13 11:44

BH01
R303133-01 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 09:30**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Benzene	ND	1.0	ug/l	1	3032308	03/23/13	03/23/13	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 09:30**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Surrogate: 1,2-Dichloroethane-d4		97.5 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		94.7 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		88.0 %	45-146		"	"	"	"	

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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:
03/26/13 11:44

BH02
R303133-02 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 09:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	18	1.0	ug/l	1	3032308	03/23/13	03/24/13	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 09:35**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		98.3 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.2 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		89.2 %	45-146		"	"	"	"	

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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:
03/26/13 11:44

BH03
R303133-03 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 09:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	14	1.0	ug/l	1	3032308	03/23/13	03/24/13	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	1.5	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 09:40**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		98.4 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.5 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.1 %	45-146		"	"	"	"	

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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:
03/26/13 11:44

BH04
R303133-04 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 09:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	2.6	1.0	ug/l	1	3032308	03/23/13	03/24/13	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 09:45**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		100 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		97.8 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		101 %	45-146		"	"	"	"	

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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:
03/26/13 11:44

BH05
R303133-05 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 09:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	3032308	03/23/13	03/24/13	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 09:50**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		95.0 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.7 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		92.0 %	45-146		"	"	"	"	

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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:
03/26/13 11:44

BH06
R303133-06 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 09:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	3.6	1.0	ug/l	1	3032308	03/23/13	03/24/13	EPA 8260B	
Toluene	1.2	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 09:55**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		97.3 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.2 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		91.7 %	45-146		"	"	"	"	

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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:
03/26/13 11:44

BH07
R303133-07 (Water)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **03/18/13 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	1.0	ug/l	1	3032308	03/23/13	03/24/13	EPA 8260B	
Toluene	ND	1.0	"	"	"	"	"	"	
Ethylbenzene	ND	1.0	"	"	"	"	"	"	
Xylenes (total)	ND	1.0	"	"	"	"	"	"	

Date Sampled: **03/18/13 10:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		95.4 %	37-154		"	"	"	"	
Surrogate: Toluene-d8		96.6 %	45-149		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		91.6 %	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:
03/26/13 11:44

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 3032308 - EPA 5030 Water MS

Blank (3032308-BLK1)

Prepared & Analyzed: 03/23/13

Benzene	ND	1.0	ug/l							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
Xylenes (total)	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	12.7		"	13.2		95.7	37-154			
Surrogate: Toluene-d8	12.6		"	13.3		94.4	45-149			
Surrogate: 4-Bromofluorobenzene	12.1		"	13.3		90.8	45-146			

LCS (3032308-BS1)

Prepared & Analyzed: 03/23/13

Benzene	34.4	1.0	ug/l	33.3		103	51-132			
Toluene	36.1	1.0	"	33.3		108	51-138			
Ethylbenzene	36.4	1.0	"	33.3		109	58-146			
m,p-Xylene	72.4	2.0	"	66.7		109	57-144			
o-Xylene	36.5	1.0	"	33.3		110	53-146			
Surrogate: 1,2-Dichloroethane-d4	12.2		"	13.2		92.0	37-154			
Surrogate: Toluene-d8	12.8		"	13.3		96.2	45-149			
Surrogate: 4-Bromofluorobenzene	12.3		"	13.3		92.0	45-146			

LCS Dup (3032308-BSD1)

Prepared & Analyzed: 03/23/13

Benzene	35.7	1.0	ug/l	33.3		107	51-132	3.70	17	
Toluene	37.4	1.0	"	33.3		112	51-138	3.70	17	
Ethylbenzene	37.2	1.0	"	33.3		112	58-146	2.25	16	
m,p-Xylene	73.4	2.0	"	66.7		110	57-144	1.37	16	
o-Xylene	37.3	1.0	"	33.3		112	53-146	2.03	15	
Surrogate: 1,2-Dichloroethane-d4	12.9		"	13.2		97.3	37-154			
Surrogate: Toluene-d8	12.9		"	13.3		96.9	45-149			
Surrogate: 4-Bromofluorobenzene	11.9		"	13.3		89.6	45-146			

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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:
03/26/13 11:44

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 3032308 - EPA 5030 Water MS

Matrix Spike (3032308-MS1)		Source: R303133-01			Prepared & Analyzed: 03/23/13					
Benzene	34.9	1.0	ug/l	33.3	ND	105	34-141			
Toluene	36.5	1.0	"	33.3	ND	109	27-151			
Ethylbenzene	36.6	1.0	"	33.3	ND	110	29-160			
m,p-Xylene	72.4	2.0	"	66.7	ND	109	20-166			
o-Xylene	36.8	1.0	"	33.3	ND	110	33-159			
Surrogate: 1,2-Dichloroethane-d4	12.8		"	13.2		96.5	37-154			
Surrogate: Toluene-d8	13.1		"	13.3		98.0	45-149			
Surrogate: 4-Bromofluorobenzene	12.3		"	13.3		92.4	45-146			
Matrix Spike Dup (3032308-MSD1)		Source: R303133-01			Prepared & Analyzed: 03/23/13					
Benzene	35.6	1.0	ug/l	33.3	ND	107	34-141	2.02	32	
Toluene	36.9	1.0	"	33.3	ND	111	27-151	1.09	25	
Ethylbenzene	36.3	1.0	"	33.3	ND	109	29-160	0.823	50	
m,p-Xylene	72.3	2.0	"	66.7	ND	108	20-166	0.124	36	
o-Xylene	36.8	1.0	"	33.3	ND	110	33-159	0.163	26	
Surrogate: 1,2-Dichloroethane-d4	12.8		"	13.2		96.4	37-154			
Surrogate: Toluene-d8	13.0		"	13.3		97.7	45-149			
Surrogate: 4-Bromofluorobenzene	12.1		"	13.3		90.8	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: Brandon Bruns

Reported:
03/26/13 11:44

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

A handwritten signature in black ink, appearing to read 'Daniel A. Bruns IV'.