

January 4, 2016

Mr. Randall Ferguson
EHS Senior Compliance Specialist
PDC Energy, Inc.
1775 Sherman Street, Suite 3000
Denver, CO 80203

Re: **Produced Water Vessel Closure Report
Becker 5-1, 2, 14, 15 Tank Battery
Facility ID: 322943
SE S5 T3N R64W
Blanket Remediation #: 9440**

Dear Mr. Ferguson,

On behalf of PDC Energy, Inc. (PDC), Tasman Geosciences, Inc. (Tasman) has prepared this Produced Water Vessel Closure Report (Report) to document environmental sampling activities performed at the above-referenced site. This Report is being submitted under the Form 27 Management Plan for Closure of Produced Water Vessels, which has been assigned Blanket Remediation #9440 by the Colorado Oil and Gas Conservation Commission (COGCC).

A summary of excavation and environmental sampling activities is provided below.

Site Assessment Activities

On July 16, 2015, confirmation sampling activities were completed following the removal of the partially buried produced water vessel. Soil encountered in the excavation area was field screened for volatile organic compound (VOC) concentrations using a photoionization detector (PID). One soil sample (SS01) was collected below the former vessel location at approximately 5 feet below ground surface (bgs). The sample was submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by Environmental Protection Agency (EPA) Method 8260B, TPH - diesel range organics (DRO) by EPA Method 8015, pH, electrical conductivity (EC), and sodium adsorption ratio (SAR).

Analytical results indicated organic compound concentrations and physical parameters in soil sample SS01 were in compliance with COGCC Table 910-1 soil standards.

The excavation extent and soil sample location are illustrated on Figure 1. Soil analytical data is summarized in Table 1 and the laboratory analytical report is provided in Attachment A.

Conclusions

Based on the soil analytical data described herein, petroleum hydrocarbon impacts were not encountered during the removal of the produced water vessel. Consequently, no further site investigation is recommended at this time. The facility was decommissioned following site assessment activities.

Please contact me at (720) 409-8791 if you have any questions regarding this report.

Sincerely,

A handwritten signature in blue ink that reads 'Christine Wasko'.

Christine Wasko
Project Manager
Tasman Geosciences, Inc.

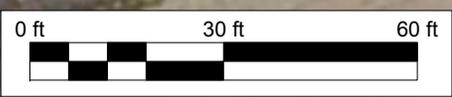
Enclosures:

Figure 1 – Soil Sample Location Map
Table 1 – Soil Analytical Results Summary Table
Attachment A – Laboratory Analytical Report



↑
Surface
Drainage

SS01 @ 5'



Google Earth 2015

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

DRAWN BY: MAP
DATE: 12/22/2015

Facility Diagram
PDC Energy – DJ Basin
Becker 5-1, 2, 14, 15
SE S5 T3N R64W
Weld County, CO

 **TASMAN** 6899 Pecos St., Unit C
GEOSCIENCES Denver, CO 80221

LEGEND
— Excavation Extent
+ Soil Sample Location

All locations are approximate unless otherwise noted

FIGURE 1
SOIL SAMPLE LOCATION MAP

TABLE 1
BECKER 5-1, 2, 14, 15 TANK BATTERY
SOIL ANALYTICAL RESULTS SUMMARY TABLE

Sample ID	Date Sampled	Depth (feet bgs)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Naphthalene (mg/kg)	TPH ⁽²⁾ (mg/kg)	EC (mmhos/cm)	SAR (units)	pH (units)
COGCC standards for soil (mg/kg) ⁽¹⁾			0.17	85	100	175	23	500	<4 or 2x BG	12	6-9
SS01 @ 5'	7/16/2015	5	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	0.415	0.330	8.32

Notes:

1. Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective February 1, 2014.

2. TPH - Total volatile and extractable petroleum hydrocarbons. Value calculated by adding GRO and DRO concentrations.

COGCC = Colorado Oil and Gas Conservation Commission

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

GRO = Total volatile petroleum hydrocarbons - gasoline range organics

DRO = Total extractable petroleum hydrocarbons - diesel range organics

mg/kg = Milligrams per kilogram

bgs = Below ground surface

EC = Electrical conductivity

mmhos/cm = Millimhos per centimeter

BG = Background

SAR = Sodium adsorption ratio

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

ATTACHMENT A

Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

July 22, 2015

Mark Longhurst
PDC Energy
1775 Sherman St. STE. 3000
Denver, CO 80203
RE: Becker 5-1,2,14,15

Enclosed are the results of analyses for samples received by Summit Scientific on 07/16/15 17:45. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'Paul Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury
President



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

Project: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@5'	1507176-01	Soil	07/16/15 08:00	07/16/15 17:45

Summit Scientific
S₂

1507176

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

Page 1 of 1

Client: PDC Energy Project Manager: Mark Longhurst
Address: _____ E-Mail: mark.longhurst@pdc.com
City/State/Zip: _____
Phone: _____ Fax: _____ Project Name: Becker 5-1, 2, 14, 15
Sampler Name: Paul Downey Project Number: _____

ID	Sample Description	Date Sampled	Time Sampled	Qty of containers	Preservative				Matrix			Analysis Requested							Special Instructions	
					HCl	HNO3	None	Other (Specify)	Groundwater	Soil	Air-Canister #	Other (Specify)	BTEX	TPH	GRD/DAO	NAP	PH	EC		SAR
1	SS01@5'	7/16/15	8:00	2			X			X			X	X	X	X	X	X		
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Relinquished by: <u>[Signature]</u> Date/Time: <u>7/16/15 5:49</u>	Received by: <u>[Signature]</u> Date/Time: <u>7/16/15 1745</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: <u>on ice</u>
Relinquished by: <u>[Signature]</u> Date/Time: <u>7/16/15 1815</u>	Received by: _____ Date/Time: _____	Sample Integrity: Temperature Upon Receipt: <u>70</u> Intact: <input checked="" type="radio"/> Yes <input type="radio"/> No	

www.s2scientific.com

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: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

SS01@5'
1507176-01 (Soil)

Summit Scientific

Extractable Petroleum Hydrocarbons by 8015

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1507207	07/17/15	07/20/15	8015M	

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		113 %	30-150		"	"	"	"	

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1507214	07/17/15	07/20/15	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	ND	0.50	"	"	"	"	"	"	

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		102 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		97.5 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		98.8 %	21-167		"	"	"	"	

Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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Summit Scientific

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

Project: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

SS01@5'
1507176-01 (Soil)

Summit Scientific

Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Calcium	842	10.8	mg/kg dry	1	1507227	07/20/15	07/20/15	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	182	5.39	"	"	"	"	"	"	
Sodium	42.0	5.39	"	"	"	"	"	"	

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.330		units	"	1507244	07/21/15	07/21/15	"	

Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.415	0.0100	mmhos/cm	1	1507236	07/20/15	07/20/15	SM 2510B	

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	8.32	0.100	pH Units	"	1507200	07/17/15	07/17/15	EPA 9045	

Date Sampled: 07/16/15 08:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	92.7		%	"	1507233	07/20/15	07/21/15	% calculation	

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

Project: Becker 5-1,2,14,15

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 07/22/15 15:26

Extractable Petroleum Hydrocarbons by 8015 - Quality Control
Summit Scientific

Analyte	Reporting			Spike Level	Source		%REC		RPD		Notes
	Result	Limit	Units		Result	%REC	Limits	RPD	Limit		

Batch 1507207 - EPA 3550A

Blank (1507207-BLK1)

Prepared: 07/17/15 Analyzed: 07/20/15

C10-C28 (DRO)	ND	50	mg/kg								
<i>Surrogate: o-Terphenyl</i>	13.7		"	12.2		112	30-150				

LCS (1507207-BS1)

Prepared: 07/17/15 Analyzed: 07/20/15

C10-C28 (DRO)	468	50	mg/kg	501		93.5	73-134				
<i>Surrogate: o-Terphenyl</i>	12.9		"	12.2		106	30-150				

Matrix Spike (1507207-MS1)

Source: 1507202-02

Prepared: 07/17/15 Analyzed: 07/20/15

C10-C28 (DRO)	871	50	mg/kg	480	667	42.6	50-148				QM-07
<i>Surrogate: o-Terphenyl</i>	14.0		"	11.7		120	30-150				

Matrix Spike Dup (1507207-MSD1)

Source: 1507202-02

Prepared: 07/17/15 Analyzed: 07/20/15

C10-C28 (DRO)	1080	50	mg/kg	484	667	85.9	50-148	21.6	13		QM-07
<i>Surrogate: o-Terphenyl</i>	20.4		"	11.8		173	30-150				S-02

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

Project: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

Batch 1507214 - EPA 5030 Soil MS

Blank (1507214-BLK1)

Prepared: 07/17/15 Analyzed: 07/20/15

Naphthalene	ND	0.010	mg/kg							
Benzene	ND	0.0020	"							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.010	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0384</i>		<i>"</i>	<i>0.0396</i>		<i>97.0</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0388</i>		<i>"</i>	<i>0.0400</i>		<i>97.1</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0393</i>		<i>"</i>	<i>0.0400</i>		<i>98.2</i>	<i>21-167</i>			

LCS (1507214-BS1)

Prepared: 07/17/15 Analyzed: 07/20/15

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.107	0.0020	"	0.100		107	58-130			
Toluene	0.106	0.0050	"	0.100		106	61-134			
Ethylbenzene	0.104	0.0050	"	0.0992		105	74-139			
m,p-Xylene	0.217	0.010	"	0.200		109	73-137			
o-Xylene	0.107	0.0050	"	0.0984		109	73-141			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0374</i>		<i>"</i>	<i>0.0396</i>		<i>94.5</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0434</i>		<i>"</i>	<i>0.0400</i>		<i>109</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0383</i>		<i>"</i>	<i>0.0400</i>		<i>95.8</i>	<i>21-167</i>			

Matrix Spike (1507214-MS1)

Source: 1507201-01

Prepared: 07/17/15 Analyzed: 07/20/15

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.109	0.0020	"	0.0931	ND	118	30-131			
Toluene	0.107	0.0050	"	0.0931	ND	115	30-134			
Ethylbenzene	0.115	0.0050	"	0.0924	ND	125	22-153			
m,p-Xylene	0.233	0.010	"	0.186	ND	126	10-159			
o-Xylene	0.114	0.0050	"	0.0916	ND	125	31-151			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0372</i>		<i>"</i>	<i>0.0369</i>		<i>101</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0382</i>		<i>"</i>	<i>0.0372</i>		<i>102</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0354</i>		<i>"</i>	<i>0.0372</i>		<i>95.2</i>	<i>21-167</i>			

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

Project: Becker 5-1,2,14,15

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 07/22/15 15:26

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source	%REC			RPD	Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

Batch 1507214 - EPA 5030 Soil MS

Matrix Spike Dup (1507214-MSD1)	Source: 1507201-01			Prepared: 07/17/15	Analyzed: 07/20/15					
Naphthalene	ND	0.010	mg/kg	ND	ND	10-158				42
Benzene	0.116	0.0020	"	0.0940	ND	124	30-131	5.94		34
Toluene	0.115	0.0050	"	0.0940	ND	123	30-134	7.37		30
Ethylbenzene	0.127	0.0050	"	0.0932	ND	136	22-153	9.48		24
m,p-Xylene	0.260	0.010	"	0.188	ND	139	10-159	10.9		68
o-Xylene	0.128	0.0050	"	0.0925	ND	138	31-151	10.9		38
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0401</i>		<i>"</i>	<i>0.0372</i>		<i>108</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0378</i>		<i>"</i>	<i>0.0376</i>		<i>100</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0372</i>		<i>"</i>	<i>0.0376</i>		<i>98.9</i>	<i>21-167</i>			

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

Project: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

Soluble Nutrients by EPA 6020/Mod. USDA60 6(2, 3A) - Dry Weight Basis - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source	%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit	

Batch 1507227 - General Preparation

Blank (1507227-BLK1)

Prepared & Analyzed: 07/20/15

Calcium	ND	10.0	mg/kg wet						
Magnesium	ND	5.00	"						
Sodium	ND	5.00	"						

LCS (1507227-BS1)

Prepared & Analyzed: 07/20/15

Calcium	507	10.0	mg/kg wet	500	101	82.9-118			
Magnesium	501	5.00	"	500	100	77.1-123			
Sodium	529	5.00	"	500	106	71-129			

Duplicate (1507227-DUP1)

Source: 1507176-01

Prepared & Analyzed: 07/20/15

Calcium	889	10.8	mg/kg dry	842			5.46	200	
Magnesium	184	5.39	"	182			1.40	200	
Sodium	111	5.39	"	42.0			90.2	200	

Matrix Spike (1507227-MS1)

Source: 1507176-01

Prepared & Analyzed: 07/20/15

Calcium	1320	10.8	mg/kg dry	510	842	94.5	75-125		
Magnesium	700	5.39	"	510	182	102	75-125		
Sodium	554	5.39	"	510	42.0	100	75-125		

Matrix Spike Dup (1507227-MSD1)

Source: 1507176-01

Prepared & Analyzed: 07/20/15

Calcium	1330	10.8	mg/kg dry	510	842	96.4	75-125	0.717	25
Magnesium	654	5.39	"	510	182	92.6	75-125	6.84	25
Sodium	517	5.39	"	510	42.0	93.2	75-125	6.92	25

Summit Scientific

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

Project: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

Physical Parameters by APHA/ASTM/EPA Methods - Quality Control
Summit Scientific

Analyte	Reporting			Spike	Source		%REC		RPD		Notes
	Result	Limit	Units	Level	Result	%REC	Limits	RPD	Limit		

Batch 1507200 - General Preparation

LCS (1507200-BS1)				Prepared & Analyzed: 07/17/15							
pH	8.22	0.100	pH Units	8.00		103	95-105				
Duplicate (1507200-DUP1)				Source: 1507194-01		Prepared & Analyzed: 07/17/15					
pH	7.99	0.100	pH Units		8.03				0.499	20	

Batch 1507233 - General Preparation

Duplicate (1507233-DUP1)				Source: 1507176-01		Prepared: 07/20/15		Analyzed: 07/21/15			
% Solids	94.8		%		92.7				2.22	20	

Batch 1507236 - General Preparation

Blank (1507236-BLK1)				Prepared & Analyzed: 07/20/15							
Specific Conductance (EC)	ND	0.0100	mmhos/cm								
LCS (1507236-BS1)				Prepared & Analyzed: 07/20/15							
Specific Conductance (EC)	475	0.0100	mmhos/cm	500		94.9	90-110				
Duplicate (1507236-DUP1)				Source: 1507176-01		Prepared & Analyzed: 07/20/15					
Specific Conductance (EC)	0.385	0.0100	mmhos/cm		0.415				7.36	20	

Summit Scientific

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

Project: Becker 5-1,2,14,15

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
07/22/15 15:26

Notes and Definitions

- S-02 The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample extract.
- QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference