

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 5-3, 5-12, 12-10I Tank Battery  
Facility ID: 329405  
NE 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 21, 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

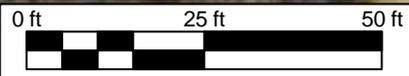


Surface  
Drainage

SS01 @ 5'



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



Google earth

(Historical Image 2014)

DRAWN BY:	MAP
DATE:	12/21/2015

**Facility Diagram**  
 PDC Energy – DJ Basin  
 Becker 5-3, 5-12, 12-10I Tank Battery  
 NE 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 5-3, 5-12, 12-10I 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 <sup>(2)</sup> (mg/kg)	pH (units)	EC (mmhos/cm)	SAR (units)
<b>COGCC standards for soil (mg/kg) <sup>(1)</sup></b>			<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>23</b>	<b>500</b>	<b>6-9</b>	<b>&lt;4 or 2x BG</b>	<b>12</b>
SS01 @ 5'	7/21/2015	5	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	7.72	0.334	0.184

**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

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741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

July 28, 2015

Mark Longhurst  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Becker 5-3, 5-12, 12-10i

Enclosed are the results of analyses for samples received by Summit Scientific on 07/21/15 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Paul Shrewsbury  
President





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

Project: Becker 5-3, 5-12, 12-10i

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
07/28/15 10:54

**SS01@5**  
**1507238-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1507255	07/22/15	07/23/15	8015M	

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		108 %	30-150		"	"	"	"	

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

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1507258	07/22/15	07/23/15	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: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		107 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		98.6 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		96.1 %	21-167		"	"	"	"	

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

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
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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 5-3, 5-12, 12-10i

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/28/15 10:54

**SS01@5**  
**1507238-01 (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	1860	8.64	mg/kg dry	1	1507280	07/24/15	07/24/15	EPA 6020/Mod. USDA60 6(2, 3A)	
Magnesium	364	4.32	"	"	"	"	"	"	
Sodium	35.3	4.32	"	"	"	"	"	"	

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Sodium Adsorption Ratio	0.184		units	"	1507284	07/27/15	07/27/15	"	

**Physical Parameters by APHA/ASTM/EPA Methods**

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	0.334	0.0100	mmhos/cm	1	1507288	07/27/15	07/27/15	SM 2510B	

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	7.72	0.100	pH Units	"	1507287	07/27/15	07/27/15	EPA 9045	

Date Sampled: 07/21/15 16:08

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
% Solids	87.4		%	"	1507281	07/24/15	07/27/15	% calculation	

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

Project: Becker 5-3, 5-12, 12-10i

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/28/15 10:54

**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 1507255 - EPA 3550A**

<b>Blank (1507255-BLK1)</b>				Prepared & Analyzed: 07/22/15							
C10-C28 (DRO)	ND	50	mg/kg								
<i>Surrogate: o-Terphenyl</i>	14.3		"	12.2		117	30-150				
<b>LCS (1507255-BS1)</b>				Prepared & Analyzed: 07/22/15							
C10-C28 (DRO)	474	50	mg/kg	501		94.7	73-134				
<i>Surrogate: o-Terphenyl</i>	13.1		"	12.2		108	30-150				
<b>Matrix Spike (1507255-MS1)</b>				Source: 1507217-11		Prepared & Analyzed: 07/22/15					
C10-C28 (DRO)	677	50	mg/kg	496	950	NR	50-148				QM-07
<i>Surrogate: o-Terphenyl</i>	20.3		"	12.1		168	30-150				S-02
<b>Matrix Spike Dup (1507255-MSD1)</b>				Source: 1507217-11		Prepared & Analyzed: 07/22/15					
C10-C28 (DRO)	468	50	mg/kg	482	950	NR	50-148	36.4	13		QM-07
<i>Surrogate: o-Terphenyl</i>	9.01		"	11.7		76.8	30-150				

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

Project: Becker 5-3, 5-12, 12-10i

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
07/28/15 10:54

**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 1507258 - EPA 5030 Soil MS**

**Blank (1507258-BLK1)**

Prepared: 07/22/15 Analyzed: 07/23/15

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>0.0427</i>		<i>"</i>	<i>0.0396</i>		<i>108</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0392</i>		<i>"</i>	<i>0.0400</i>		<i>98.1</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0385</i>		<i>"</i>	<i>0.0400</i>		<i>96.3</i>	<i>21-167</i>			

**LCS (1507258-BS1)**

Prepared: 07/22/15 Analyzed: 07/23/15

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.0988	0.0020	"	0.100		98.8	58-130			
Toluene	0.103	0.0050	"	0.100		103	61-134			
Ethylbenzene	0.108	0.0050	"	0.0992		109	74-139			
m,p-Xylene	0.219	0.010	"	0.200		110	73-137			
o-Xylene	0.109	0.0050	"	0.0984		111	73-141			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0429</i>		<i>"</i>	<i>0.0396</i>		<i>108</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0393</i>		<i>"</i>	<i>0.0400</i>		<i>98.3</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0381</i>		<i>"</i>	<i>0.0400</i>		<i>95.2</i>	<i>21-167</i>			

**Matrix Spike (1507258-MS1)**

Source: 1507226-01

Prepared: 07/22/15 Analyzed: 07/23/15

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.0991	0.0020	"	0.100	ND	99.1	30-131			
Toluene	0.103	0.0050	"	0.100	ND	103	30-134			
Ethylbenzene	0.108	0.0050	"	0.0992	ND	109	22-153			
m,p-Xylene	0.220	0.010	"	0.200	ND	110	10-159			
o-Xylene	0.111	0.0050	"	0.0984	ND	112	31-151			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0454</i>		<i>"</i>	<i>0.0396</i>		<i>115</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0394</i>		<i>"</i>	<i>0.0400</i>		<i>98.6</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0388</i>		<i>"</i>	<i>0.0400</i>		<i>97.0</i>	<i>21-167</i>			

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

Project: Becker 5-3, 5-12, 12-10i

Project Number: [none]  
 Project Manager: Mark Longhurst

**Reported:**  
 07/28/15 10:54

**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 1507258 - EPA 5030 Soil MS**

<b>Matrix Spike Dup (1507258-MSD1)</b>	<b>Source: 1507226-01</b>			Prepared: 07/22/15		Analyzed: 07/23/15				
Naphthalene	ND	0.010	mg/kg		ND		10-158			42
Benzene	0.0926	0.0020	"	0.0919	ND	101	30-131	6.81		34
Toluene	0.0979	0.0050	"	0.0919	ND	107	30-134	5.37		30
Ethylbenzene	0.100	0.0050	"	0.0912	ND	110	22-153	7.63		24
m,p-Xylene	0.205	0.010	"	0.183	ND	112	10-159	7.09		68
o-Xylene	0.104	0.0050	"	0.0904	ND	115	31-151	6.36		38
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0434</i>		<i>"</i>	<i>0.0364</i>		<i>119</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0362</i>		<i>"</i>	<i>0.0368</i>		<i>98.5</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0360</i>		<i>"</i>	<i>0.0368</i>		<i>97.8</i>	<i>21-167</i>			

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

Project: Becker 5-3, 5-12, 12-10i

Project Number: [none]  
Project Manager: Mark Longhurst

Reported:  
07/28/15 10:54

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

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

**Batch 1507280 - General Preparation**

**Blank (1507280-BLK1)**

Prepared & Analyzed: 07/24/15

Calcium	ND	10.0	mg/kg wet						
Magnesium	ND	5.00	"						
Sodium	11.0	5.00	"						

**LCS (1507280-BS1)**

Prepared & Analyzed: 07/24/15

Calcium	481	10.0	mg/kg wet	500	96.3	82.9-118			
Magnesium	475	5.00	"	500	94.9	77.1-123			
Sodium	501	5.00	"	500	100	71-129			

**Duplicate (1507280-DUP1)**

Source: 1507216-04

Prepared & Analyzed: 07/24/15

Calcium	1750	8.82	mg/kg dry	2000			13.4	200	
Magnesium	398	4.41	"	443			10.5	200	
Sodium	32.6	4.41	"	35.4			8.34	200	

**Matrix Spike (1507280-MS1)**

Source: 1507216-04

Prepared & Analyzed: 07/24/15

Calcium	2350	8.82	mg/kg dry	441	2000	80.3	75-125		
Magnesium	838	4.41	"	441	443	89.7	75-125		
Sodium	486	4.41	"	441	35.4	102	75-125		

**Matrix Spike Dup (1507280-MSD1)**

Source: 1507216-04

Prepared & Analyzed: 07/24/15

Calcium	2540	8.82	mg/kg dry	441	2000	123	75-125	7.64	25
Magnesium	774	4.41	"	441	443	75.1	75-125	7.98	25
Sodium	461	4.41	"	441	35.4	96.6	75-125	5.18	25

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

Project: Becker 5-3, 5-12, 12-10i

Project Number: [none]  
Project Manager: Mark Longhurst

**Reported:**  
07/28/15 10:54

### 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