

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**  
**Kielian 1-14 Tank Battery**  
**Facility ID: 322906**  
**SESW S14 T5N 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 March 4, 2014, excavation and 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 produced water vessel location at approximately 4 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, and TPH - diesel range organics (DRO) by EPA Method 8015.

Analytical results indicated constituent concentrations were below COGCC Table 910-1 standards soil sample SS01.

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 in exceedance of regulatory standards 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,






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



DRAWN BY: MAP	<b>Facility Diagram</b> PDC Energy – DJ Basin Kielian 1-14 Tank Battery SESW S14 T5N R64W Weld County, CO	 <b>TASMAN</b> GEOSCIENCES 6899 Pecos St., Unit C Denver, CO 80221	<b>LEGEND</b>  Excavation Extent  Soil Sample Location <p style="text-align: right; font-size: small;">All locations are approximate unless otherwise noted</p>	<b>FIGURE 1</b>  <b>SOIL SAMPLE LOCATION MAP</b>
DATE: 12/23/2015				

**TABLE 1**  
**KIELIAN 1-14 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)
<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>
SS01 @ 4'	3/4/2014	4	<0.0020	<0.0050	<0.0050	0.086	0.031	224

**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

**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

March 04, 2014

Brandon Bruns  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Kielian 14-1

Enclosed are the results of analyses for samples received by Summit Scientific on 03/04/14 17:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to be 'BS' with a long, sweeping horizontal line extending to the right.

Ben Shrewsbury  
President / Laboratory Manager

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

Project: Kielian 14-1

Project Number: [none]  
Project Manager: Brandon Bruns

**Reported:**  
03/04/14 22:29

## ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@4'	1403020-01	Soil	03/04/14 09:10	03/04/14 17:00

[illegible]



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

Project: Kielian 14-1  
Project Number: [none]  
Project Manager: Brandon Brunns

Reported:  
03/04/14 22:29

SS01@4'  
1403020-01 (Soil)

Summit Scientific

Extractable Petroleum Hydrocarbons by 8015

Date Sampled: 03/04/14 09:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	54	50	mg/kg	1	1403029	03/04/14	03/04/14	8015M	

Date Sampled: 03/04/14 09:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		103 %	30-150		"	"	"	"	

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: 03/04/14 09:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	0.031	0.010	mg/kg	1	1403026	03/04/14	03/04/14	EPA 8260B	
Benzene	ND	0.0020	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	0.086	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	170	5.0	"	10	"	"	"	"	

Date Sampled: 03/04/14 09:10

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		95.1 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		101 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		104 %	21-167		"	"	"	"	

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.



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Denver CO, 80203

Project: Kielian 14-1  
Project Number: [none]  
Project Manager: Brandon Brunns

**Reported:**  
03/04/14 22:29

**Extractable Petroleum Hydrocarbons by 8015 - Quality Control**  
**Summit Scientific**

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

**Batch 1403029 - EPA 3550A**

**Blank (1403029-BLK1)**

Prepared & Analyzed: 03/04/14

C10-C28 (DRO) ND 50 mg/kg

**LCS (1403029-BS1)**

Prepared & Analyzed: 03/04/14

C10-C28 (DRO) 535 50 mg/kg 499 107 73-134

**Matrix Spike (1403029-MS1)**

**Source: 1403018-01**

Prepared & Analyzed: 03/04/14

C10-C28 (DRO) 491 50 mg/kg 491 ND 100 50-148

**Matrix Spike Dup (1403029-MSD1)**

**Source: 1403018-01**

Prepared & Analyzed: 03/04/14

C10-C28 (DRO) 500 50 mg/kg 489 ND 102 50-148 1.65 13

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Project: Kielian 14-1  
Project Number: [none]  
Project Manager: Brandon Bruns

Reported:  
03/04/14 22:29

**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 1403026 - EPA 5030 Soil MS**

**Blank (1403026-BLK1)**

Prepared & Analyzed: 03/04/14

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>0.0390</i>		<i>"</i>	<i>0.0395</i>		<i>98.6</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0319</i>		<i>"</i>	<i>0.0398</i>		<i>80.1</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0415</i>		<i>"</i>	<i>0.0398</i>		<i>104</i>	<i>21-167</i>			

**LCS (1403026-BS1)**

Prepared & Analyzed: 03/04/14

Naphthalene	0.129	0.010	mg/kg	0.148		87.3	66-138			
Benzene	0.148	0.0020	"	0.148		99.8	58-130			
Toluene	0.130	0.0050	"	0.148		87.9	61-134			
Ethylbenzene	0.169	0.0050	"	0.148		114	74-139			
m,p-Xylene	0.335	0.010	"	0.296		113	73-137			
o-Xylene	0.199	0.0050	"	0.148		135	73-141			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0349</i>		<i>"</i>	<i>0.0392</i>		<i>89.2</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0350</i>		<i>"</i>	<i>0.0394</i>		<i>88.7</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0514</i>		<i>"</i>	<i>0.0394</i>		<i>130</i>	<i>21-167</i>			

**Matrix Spike (1403026-MS1)**

Source: 1403016-05

Prepared & Analyzed: 03/04/14

Naphthalene	0.172	0.010	mg/kg	0.145	ND	119	10-158			
Benzene	0.112	0.0020	"	0.145	ND	77.7	30-131			
Toluene	0.0927	0.0050	"	0.145	ND	64.1	30-134			
Ethylbenzene	0.135	0.0050	"	0.145	ND	93.2	22-153			
m,p-Xylene	0.268	0.010	"	0.289	ND	92.8	10-159			
o-Xylene	0.134	0.0050	"	0.145	ND	92.6	31-151			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0370</i>		<i>"</i>	<i>0.0382</i>		<i>96.6</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0281</i>		<i>"</i>	<i>0.0385</i>		<i>73.0</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0398</i>		<i>"</i>	<i>0.0385</i>		<i>103</i>	<i>21-167</i>			

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Project: Kielian 14-1  
Project Number: [none]  
Project Manager: Brandon Brunns

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**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 1403026 - EPA 5030 Soil MS**

Matrix Spike Dup (1403026-MSD1)		Source: 1403016-05			Prepared & Analyzed: 03/04/14					
Naphthalene	0.134	0.010	mg/kg	0.147	ND	91.5	10-158	24.8	42	
Benzene	0.146	0.0020	"	0.147	ND	99.2	30-131	25.9	34	
Toluene	0.110	0.0050	"	0.147	ND	74.9	30-134	17.1	30	
Ethylbenzene	0.165	0.0050	"	0.147	ND	112	22-153	20.0	24	
m,p-Xylene	0.323	0.010	"	0.294	ND	110	10-159	18.5	68	
o-Xylene	0.161	0.0050	"	0.147	ND	109	31-151	18.2	38	
Surrogate: 1,2-Dichloroethane-d4	0.0353		"	0.0388		90.9	23-173			
Surrogate: Toluene-d8	0.0290		"	0.0391		74.1	20-170			
Surrogate: 4-Bromofluorobenzene	0.0407		"	0.0391		104	21-167			

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Project Number: [none]  
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### 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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