

January 27, 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**
Spaur 10-1 Tank Battery
Facility ID: 323182
NWSW S10 T4N R67W
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 December 29, 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, and electrical conductivity (EC).

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



DRAWN BY: EMB

DATE: 1/26/2016

Facility Diagram
 PDC Energy – DJ Basin
 Spaur 10-1 Tank Battery
 NWSW S10 T4N R67W
 Weld County, CO

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

LEGEND

 Excavation Extent

 Soil Sample Location

All locations are approximate unless otherwise noted

FIGURE 1
SOIL SAMPLE LOCATION MAP

TABLE 1
SPAUR 10-1 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)	pH (units)	EC (mmhos/cm)
COGCC standards for soil (mg/kg) ⁽¹⁾			0.17	85	100	175	23	500	6-9	<4
SS01 @ 5'	12/29/2015	5	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50	7.96	1.64

Notes:

1. Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective January 30, 2015.
 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
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

January 07, 2016

Mark Longhurst
PDC Energy
1775 Sherman St. STE. 3000
Denver, CO 80203
RE: Spaur 10-1

Enclosed are the results of analyses for samples received by Summit Scientific on 12/30/15 17:00. 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: Spaur 10-1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
01/07/16 16:23

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@5'	1512249-01	Soil	12/29/15 13:20	12/30/15 17:00

Summit Scientific

1512249

741 Corporate Circle Suite I • Golden, Colorado 80401
303-277-9310 • 303-277-9531 Fax

Client: PDC Energy
Address: _____
City/State/Zip: _____
Phone: 970 470 9042 Fax: _____
Sampler Name: Rob Irwin

Project Manager: Mark Longhurst
E-Mail: mark.longhurst@pdc.com
Project Name: Spaur 10-1
Project Number: _____

Page 1 of 1

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix		Analyze For:					Special Instructions		
				HCl	HNO ₃	None	Other (Specify)	Groundwater	Soil	Air - Canister Serial #	Other (Specify)	B260 GSTEN	B015 DRD	FC		PH	SAR (or HOLD)
SS01@5'	12/29	1320	1		X							X	X	X	X	X	keep SAR on hold until further notice
Relinquished by: <u>[Signature]</u>		Date/Time: <u>12/30/2015</u>	Received by: <u>[Signature]</u>		Date/Time: <u>12/30/15 1700</u>	Turn Around Time (Check)		Notes:									
Relinquished by: <u>[Signature]</u>		Date/Time: <u>12/30/15 1735</u>	Received by:		Date/Time:	Same Day <input type="checkbox"/>	24 Hours <input type="checkbox"/>	48 Hours <input type="checkbox"/>	72 Hours <input type="checkbox"/>	Standard <input checked="" type="checkbox"/>	On Ice						
Relinquished by:		Date/Time:	Received in Lab by:		Date/Time:	Sample Integrity:		Temperature Upon Receipt: <u>4.2°C</u>									
						Intact: <input checked="" type="radio"/> Yes <input type="radio"/> No	on ice										

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: Spaur 10-1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
01/07/16 16:23

SS01@5'
1512249-01 (Soil)

Summit Scientific

Extractable Petroleum Hydrocarbons by 8015

Date Sampled: 12/29/15 13:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1512282	12/31/15	12/31/15	8015M	

Date Sampled: 12/29/15 13:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		94.4 %	30-150		"	"	"	"	

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: 12/29/15 13:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1512281	12/31/15	12/31/15	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: 12/29/15 13:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		115 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		100 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		97.6 %	21-167		"	"	"	"	

Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: 12/29/15 13:20

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	1.64	0.0100	mmhos/cm	1	1601018	01/07/16	01/07/16	SM 2510B	

Summit Scientific

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

Project: Spaur 10-1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
01/07/16 16:23

SS01@5'
1512249-01 (Soil)

Summit Scientific

Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: **12/29/15 13:20**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
pH	7.96	0.100	pH Units	1	1601017	01/07/16	01/07/16	EPA 9045	

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PDC Energy
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 Denver CO, 80203

Project: Spaur 10-1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 01/07/16 16:23

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 1512282 - EPA 3550A

Blank (1512282-BLK1)

Prepared & Analyzed: 12/31/15

C10-C28 (DRO)	ND	50	mg/kg								
<i>Surrogate: o-Terphenyl</i>	<i>11.7</i>		"	<i>12.5</i>		<i>93.7</i>	<i>30-150</i>				

LCS (1512282-BS1)

Prepared & Analyzed: 12/31/15

C10-C28 (DRO)	534	50	mg/kg	499		107	73-134				
<i>Surrogate: o-Terphenyl</i>	<i>12.8</i>		"	<i>12.5</i>		<i>102</i>	<i>30-150</i>				

Matrix Spike (1512282-MS1)

Source: 1512248-01

Prepared & Analyzed: 12/31/15

C10-C28 (DRO)	541	50	mg/kg	499	23.1	104	50-148				
<i>Surrogate: o-Terphenyl</i>	<i>12.5</i>		"	<i>12.5</i>		<i>99.6</i>	<i>30-150</i>				

Matrix Spike Dup (1512282-MSD1)

Source: 1512248-01

Prepared & Analyzed: 12/31/15

C10-C28 (DRO)	512	50	mg/kg	499	23.1	98.0	50-148	5.56		13	
<i>Surrogate: o-Terphenyl</i>	<i>11.8</i>		"	<i>12.5</i>		<i>94.2</i>	<i>30-150</i>				

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

Project: Spaur 10-1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
01/07/16 16:23

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 1512281 - EPA 5030 Soil MS

Blank (1512281-BLK1)

Prepared & Analyzed: 12/31/15

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>0.0440</i>		<i>"</i>	<i>0.0400</i>		<i>110</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0416</i>		<i>"</i>	<i>0.0400</i>		<i>104</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0396</i>		<i>"</i>	<i>0.0400</i>		<i>98.9</i>	<i>21-167</i>			

LCS (1512281-BS1)

Prepared & Analyzed: 12/31/15

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.0891	0.0020	"	0.100		89.1	58-130			
Toluene	0.0988	0.0050	"	0.100		98.8	61-134			
Ethylbenzene	0.119	0.0050	"	0.0992		120	74-139			
m,p-Xylene	0.228	0.010	"	0.200		114	73-137			
o-Xylene	0.102	0.0050	"	0.0984		104	73-141			
Xylenes (total)	0.330	0.010	"				0-200			
Gasoline Range Hydrocarbons	2.26	0.50	"				30-150			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0440</i>		<i>"</i>	<i>0.0400</i>		<i>110</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0400</i>		<i>"</i>	<i>0.0400</i>		<i>100</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0380</i>		<i>"</i>	<i>0.0400</i>		<i>95.0</i>	<i>21-167</i>			

Matrix Spike (1512281-MS1)

Source: 1512248-01

Prepared & Analyzed: 12/31/15

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.0899	0.0020	"	0.100	ND	89.9	30-131			
Toluene	0.0997	0.0050	"	0.100	ND	99.7	30-134			
Ethylbenzene	0.121	0.0050	"	0.0992	ND	122	22-153			
m,p-Xylene	0.234	0.010	"	0.200	ND	117	10-159			
o-Xylene	0.106	0.0050	"	0.0984	ND	108	31-151			
Xylenes (total)	0.340	0.010	"		0.00		30-160			
Gasoline Range Hydrocarbons	2.32	0.50	"		ND		30-160			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0448</i>		<i>"</i>	<i>0.0400</i>		<i>112</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0404</i>		<i>"</i>	<i>0.0400</i>		<i>101</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0396</i>		<i>"</i>	<i>0.0400</i>		<i>99.0</i>	<i>21-167</i>			

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

Project: Spaur 10-1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 01/07/16 16:23

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 1512281 - EPA 5030 Soil MS

Matrix Spike Dup (1512281-MSD1)	Source: 1512248-01			Prepared & Analyzed: 12/31/15						
Naphthalene	ND	0.010	mg/kg	ND	ND	10-158			42	
Benzene	0.0880	0.0020	"	0.100	ND	88.0	30-131	2.09	34	
Toluene	0.0998	0.0050	"	0.100	ND	99.8	30-134	0.180	30	
Ethylbenzene	0.119	0.0050	"	0.0992	ND	120	22-153	1.98	24	
m,p-Xylene	0.230	0.010	"	0.200	ND	115	10-159	1.90	68	
o-Xylene	0.104	0.0050	"	0.0984	ND	105	31-151	2.03	38	
Xylenes (total)	0.334	0.010	"		0.00		30-160	1.94	30	
Gasoline Range Hydrocarbons	2.30	0.50	"		ND		30-160	0.571	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0446</i>		<i>"</i>	<i>0.0400</i>		<i>111</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0396</i>		<i>"</i>	<i>0.0400</i>		<i>99.1</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0383</i>		<i>"</i>	<i>0.0400</i>		<i>95.7</i>	<i>21-167</i>			

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

Project: Spaur 10-1

Project Number: [none]
 Project Manager: Mark Longhurst

Reported:
 01/07/16 16:23

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 1601017 - General Preparation

LCS (1601017-BS1)					Prepared & Analyzed: 01/05/16					
pH	8.06	0.100	pH Units	8.00	101	95-105				
Duplicate (1601017-DUP1)					Source: 1601012-02 Prepared & Analyzed: 01/05/16					
pH	8.15	0.100	pH Units	8.15	0.00	20				

Batch 1601018 - General Preparation

Blank (1601018-BLK1)					Prepared & Analyzed: 01/05/16					
Specific Conductance (EC)	ND	0.0100	mmhos/cm							
LCS (1601018-BS1)					Prepared & Analyzed: 01/05/16					
Specific Conductance (EC)	0.489	0.0100	mmhos/cm	0.500	97.9	90-110				
Duplicate (1601018-DUP1)					Source: 1601012-02 Prepared & Analyzed: 01/05/16					
Specific Conductance (EC)	0.270	0.0100	mmhos/cm	0.263	2.44	20				

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

Project: Spaur 10-1

Project Number: [none]
Project Manager: Mark Longhurst

Reported:
01/07/16 16:23

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

Summit Scientific

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