

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  
Koehler Frank 13-27 Tank Battery  
Facility ID: 322556  
NWSW S27 T6N R65W  
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 January 15, 2014, excavation and sampling activities were completed following the removal of two partially buried concrete produced water vessels. Soil encountered in the excavation areas 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 (Vault 1) located near the separator at approximately 8 feet below ground surface (bgs). A second soil sample (SS02) was collected below the former produced water vessel (Vault 2) located near production tanks at approximately 7 feet bgs. Both soil samples were 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 in both soil sample locations.

The excavation extent and soil sample locations are illustrated on Figures 1 and 2. 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 vessels. Consequently, no further site investigation is recommended at this time.

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 (Vault 1)
- Figure 2 – Soil Sample Location Map (Vault 2)
- Table 1 – Soil Analytical Results Summary Table
- Attachment A – Laboratory Analytical Report

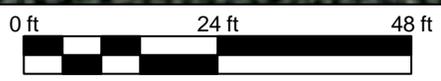


SS01 @ 8'

Surface  
Drainage



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



Google earth

(Historical Image 2012)

DRAWN BY: MAP  
DATE: 12/23/2015

**Facility Diagram**  
PDC Energy – DJ Basin  
Koehler Frank 13-27 Tank Battery  
NWSW S27 T6N R65W  
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  
(VAULT 1)



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



(Historical Image 2012)

DRAWN BY: MAP  
DATE: 12/23/2015

**Facility Diagram**  
PDC Energy – DJ Basin  
Koehler Frank 13-27 Tank Battery  
NWSW S27 T6N R65W  
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 2**  
**SOIL SAMPLE LOCATION MAP (VAULT 2)**

**TABLE 1**  
**KOEHLER FRANK 13-27 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 @ 8'	1/15/2014	8	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50
SS02 @ 7'	1/15/2014	7	<0.0020	<0.0050	<0.0050	<0.010	<0.010	<50

**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

---

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

January 22, 2014

Brandon Bruns  
PDC Energy  
1775 Sherman St. STE. 3000  
Denver, CO 80203  
RE: Koehler Frank 13-27

Enclosed are the results of analyses for samples received by Summit Scientific on 01/15/14 16:50. 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: Koehler Frank 13-27

Project Number: [none]  
Project Manager: Brandon Bruns

**Reported:**  
01/22/14 18:30

### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@8'	1401066-01	Soil	01/15/14 12:00	01/15/14 16:50
SS02@7'	1401066-02	Soil	01/15/14 12:15	01/15/14 16:50

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: Koehler Frank 13-27

Project Number: [none]  
Project Manager: Brandon Bruns

**Reported:**  
01/22/14 18:30

**SS01@8'**  
**1401066-01 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **01/15/14 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1401061	01/15/14	01/16/14	8015M	

Date Sampled: **01/15/14 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		72.3 %	30-150		"	"	"	"	

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

Date Sampled: **01/15/14 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1401060	"	01/15/14	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: **01/15/14 12:00**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		98.5 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		97.0 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.2 %	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.



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

Project: Koehler Frank 13-27

Project Number: [none]  
Project Manager: Brandon Bruns

Reported:  
01/22/14 18:30

**SS02@7'**  
**1401066-02 (Soil)**

**Summit Scientific**

**Extractable Petroleum Hydrocarbons by 8015**

Date Sampled: **01/15/14 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1401061	01/15/14	01/16/14	8015M	

Date Sampled: **01/15/14 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: <i>o</i> -Terphenyl		72.7 %	30-150		"	"	"	"	

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

Date Sampled: **01/15/14 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Naphthalene	ND	0.010	mg/kg	1	1401060	"	01/15/14	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: **01/15/14 12:15**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		105 %	23-173		"	"	"	"	
Surrogate: Toluene-d8		97.5 %	20-170		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		94.4 %	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.



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

Project: Koehler Frank 13-27

Project Number: [none]  
 Project Manager: Brandon Brunns

**Reported:**  
 01/22/14 18:30

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

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

**Batch 1401061 - EPA 3550A**

<b>Blank (1401061-BLK1)</b>				Prepared: 01/15/14 Analyzed: 01/16/14						
C10-C28 (DRO)	ND	50	mg/kg							
<b>LCS (1401061-BS1)</b>				Prepared: 01/15/14 Analyzed: 01/16/14						
C10-C28 (DRO)	492	50	mg/kg	495	37.8	87.7	73-134			
<b>Matrix Spike (1401061-MS1)</b>				Source: 1401063-03 Prepared: 01/15/14 Analyzed: 01/16/14						
C10-C28 (DRO)	470	50	mg/kg	492	37.8	87.7	50-148			
<b>Matrix Spike Dup (1401061-MSD1)</b>				Source: 1401063-03 Prepared: 01/15/14 Analyzed: 01/16/14						
C10-C28 (DRO)	477	50	mg/kg	488	37.8	90.0	50-148	1.59	13	

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: Koehler Frank 13-27

Project Number: [none]  
Project Manager: Brandon Brunns

Reported:  
01/22/14 18:30

**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 1401060 - EPA 5030 Soil MS**

**Blank (1401060-BLK1)**

Prepared & Analyzed: 01/15/14

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>0.0404</i>		<i>"</i>	<i>0.0397</i>		<i>102</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0390</i>		<i>"</i>	<i>0.0400</i>		<i>97.5</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0385</i>		<i>"</i>	<i>0.0400</i>		<i>96.2</i>	<i>21-167</i>			

**LCS (1401060-BS1)**

Prepared & Analyzed: 01/15/14

Naphthalene	ND	0.010	mg/kg				66-138			
Benzene	0.123	0.0020	"	0.0994		124	58-130			
Toluene	0.114	0.0050	"	0.0994		115	61-134			
Ethylbenzene	0.121	0.0050	"	0.0994		122	74-139			
m,p-Xylene	0.242	0.010	"	0.199		122	73-137			
o-Xylene	0.118	0.0050	"	0.0994		119	73-141			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0401</i>		<i>"</i>	<i>0.0395</i>		<i>102</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0387</i>		<i>"</i>	<i>0.0398</i>		<i>97.3</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0388</i>		<i>"</i>	<i>0.0398</i>		<i>97.5</i>	<i>21-167</i>			

**Matrix Spike (1401060-MS1)**

Source: 1401063-03

Prepared & Analyzed: 01/15/14

Naphthalene	ND	0.010	mg/kg		ND		10-158			
Benzene	0.100	0.0020	"	0.0962	ND	104	30-131			
Toluene	0.0956	0.0050	"	0.0962	ND	99.5	30-134			
Ethylbenzene	0.106	0.0050	"	0.0962	ND	110	22-153			
m,p-Xylene	0.212	0.010	"	0.192	ND	110	10-159			
o-Xylene	0.106	0.0050	"	0.0962	ND	110	31-151			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0390</i>		<i>"</i>	<i>0.0382</i>		<i>102</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0377</i>		<i>"</i>	<i>0.0385</i>		<i>98.1</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0375</i>		<i>"</i>	<i>0.0385</i>		<i>97.5</i>	<i>21-167</i>			

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: Koehler Frank 13-27

Project Number: [none]  
 Project Manager: Brandon Brunns

Reported:  
 01/22/14 18:30

**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 1401060 - EPA 5030 Soil MS**

<b>Matrix Spike Dup (1401060-MSD1)</b>	<b>Source: 1401063-03</b>			<b>Prepared &amp; Analyzed: 01/15/14</b>						
Naphthalene	ND	0.010	mg/kg	ND	ND	100	10-158		42	
Benzene	0.0954	0.0020	"	0.0951	ND	100	30-131	5.13	34	
Toluene	0.0912	0.0050	"	0.0951	ND	96.0	30-134	4.71	30	
Ethylbenzene	0.103	0.0050	"	0.0951	ND	108	22-153	3.18	24	
m,p-Xylene	0.202	0.010	"	0.190	ND	106	10-159	4.99	68	
o-Xylene	0.101	0.0050	"	0.0951	ND	106	31-151	4.54	38	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	<i>0.0386</i>		<i>"</i>	<i>0.0377</i>		<i>102</i>	<i>23-173</i>			
<i>Surrogate: Toluene-d8</i>	<i>0.0368</i>		<i>"</i>	<i>0.0380</i>		<i>96.8</i>	<i>20-170</i>			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>0.0376</i>		<i>"</i>	<i>0.0380</i>		<i>98.8</i>	<i>21-167</i>			

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: Koehler Frank 13-27

Project Number: [none]  
Project Manager: Brandon Bruns

**Reported:**  
01/22/14 18:30

### 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

*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.*