February 25, 2019
Karen Shanahan Olson
Senior Program Manager
PDC Energy, Inc.
1775 Sherman Street, Suite 3000
Denver, CO 80203

RE: Produced Water Vessel Closure Report
Former Lajco 17C, 17ND, 17RD, 17SD/Coming 17-3, 4 Tank Battery
Facility ID #: 302671
SENE S17 T4N R67W

Dear Mrs. Olson,

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 in accordance with Colorado Oil and Gas Conservation Commission (COGCC) Rule 905 – Closure of Buried or Partially Buried Produced Water Vessels.

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

Site Assessment Activities

On February 20, 2019, confirmation sampling activities were conducted following the removal of the partially buried produced water vessel. Soil encountered in the excavation was field screened for volatile organic compound (VOC) concentrations in soil using a photoionization detector (PID) [Table 2]. 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, and total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH) – gasoline range organics (GRO) by United States Environmental Protection Agency (USEPA) Method 8260B, TPH – diesel range organics (DRO) by USEPA Method 8015, pH, and electrical conductivity (EC).

Analytical results indicated that organic compound concentrations and geochemical parameters 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 included as 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 (912) 230-2807 if you have questions regarding this report.

Sincerely,

Tasman Geosciences, Inc.

Brock Nelson
Project Manager

Enclosures:

Figure 1 – Excavation Site Map
Table 1 – Soil Analytical Results Summary Table
Table 2 – VOC Concentrations Summary Table
Attachment A – Laboratory Analytical Report

DATE: February 25, 2019 DESIGNED BY: B. Nelson DRAWN BY: K. Chritz	TASMAN GEOSCIENCES	**Tasman Geosciences, Inc.** 6899 Pecos Street – Unit C Denver, CO 80221	**PDC Energy, Inc. – DJ Basin** **Former Lajco 17C,17ND,17RD,17SD/Coming 17-3,4 Battery** SENE, Section 17, Township 4 North, Range 67 West Weld County, Colorado	EXCAVATION SITE MAP	FIGURE 1

TABLE 1
FORMER LAJCO 17C, 17ND, 17RD, 17SD/ COMING 17-3,4 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'	2/20/2019	5	<0.0020	<0.0050	<0.0050	<0.010	<0.010	0.79	7.93	0.766

Notes:

1. Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective May 1, 2018.
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

TABLE 2

FORMER LAJCO 17C, 17ND, 17RD, 17SD/ COMING 17-3,4 TANK BATTERY

VOC CONCENTRATIONS SUMMARY TABLE

Sample ID	Date Sampled	Depth (feet bgs)	Sample Location[1]	Field Measured VOC Concentration[2] (ppm)
SS01 @ 5'	2/20/2019	5	Excavation Base	0.0
SS02 @ 3'	2/20/2019	3	North Sidewall	1.1
SS02 @ 3'	2/20/2019	3	West Sidewall	0.2
SS04 @ 3'	2/20/2019	3	South Sidewall	0.0
SS05 @ 3'	2/20/2019	3	East Sidewall	0.1

Notes:

1. Refers to the sample location within the excavation area below the former produced water vessel.
2. Volatile organic compound (VOC) concentrations are measured in the field using a photoionization detector (PID).

bgs = Below ground surface

ppm = Parts per million

= Sample submitted for laboratory analysis.

Attachment A

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

February 25, 2019

Mark Longhurst

PDC Energy

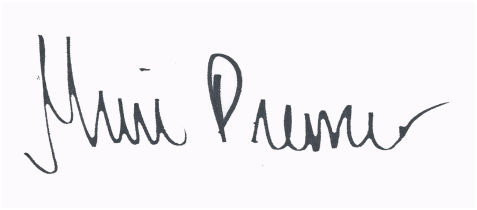
1775 Sherman St. STE. 3000

Denver, CO 80203

RE: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4

Enclosed are the results of analyses for samples received by Summit Scientific on 02/20/19 17:00. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Muri Premer For Paul Shrewsbury

President

S2

PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS01@5'	1902198-01	Soil	02/20/19 09:51	02/20/19 17:00

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.

1902198

Summit Scientific

741 Corporate Circle Suite I ♦ Golden, Colorado 80401
303-277-9310 ♦ 303-374-5933 Fax

Client: PDC
Address:
City/State/Zip:
Phone: Fax:
Sampler Name: Brock Nelson

Project Manager: Mark Longhurst
E-Mail: Mark.Longhurst@pdce.com
Project Name: Lajco 17C, 17ND, 17RD, 17SD, Coming 17-3,4
Project Number:

Sample Description	Date Sampled	Time Sampled	Number of Containers	Preservative: HCl	Preservative: HNO_3	Preservative: None	Preservative: Other (Specify)	Matrix: Groundwater	Matrix: Soil	Matrix: Air - Canister Serial #	Matrix: Other (Specify)	Analyze For: BTEX N	Analyze For: TPH - DRO	Analyze For: TPH-GRO	Analyze For: EC	Analyze For: pH	Analyze For:	Analyze For:	Analyze For:	Special Instructions
SS01@5'	2/20/19	951	1			X			X			X	X	X	X	X				Hold Samples
SS02@3'		954	1			X			X											
SS03@3'		957	1			X			X											
SS04@3'		1000	1			X			X											
SS05@3'		1003	1			X			X											

Relinquished by: Date/Time: 2/20/19 1600
Received by: Tasman Lock Box Date/Time: 2/20/19 1605

Relinquished by: TASMAN LOCK BOX Date/Time: 2-20-19 17:00
Received by: Date/Time: 2-20-19 17:00

Relinquished by: Date/Time:
Received in Lab by: Date/Time:

Turn Around Time (Check)
Same Day ☐ 72 Hours ☐
24 Hours ☐ Standard ☒
48 Hours ☐

Sample Integrity:
Temperature Upon Receipt: .6
Intact: Yes ☒ No ☐

Sample Receipt Checklist

S2 Work Order 1902198

Client: PDC Client Project ID: LAJCO 17C, 17ND, 17RD, 17SO COMING 17-3,4

Shipped Via: H.D./P.U./FedEx/UPS/USPS/Other_____ Airbill #: _____

Matrix (check all that apply): _____Air __X__Soil/Solid _____Water ____Other:_____ (Describe)

Temp (°C)	.6

Thermometer ID: 61857155-K

	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature at 4°C +/- 2°C [1]? NOTE: If samples are delivered the same day of sampling, this requirement is met provided that there is evidence that cooling has begun.	x			ON ICE
Were all samples received intact [1]?	x			
Was adequate sample volume provided [1]?	x			
If custody seals are present, are they intact [1]?			x	
Are samples with holding times due within 48 hours sample due within 48 hours present?			x	
Is a chain-of-custody (COC) form present and filled out completely [1]?	x			
Does the COC agree with the number and type of sample bottles received [1]?	x			
Do the sample IDs on the bottle labels match the COC [1]?	x			
Is the COC properly relinquished by the client w/ date and time recorded [1]?	x			
For volatiles in water – is there headspace present? **If yes, contact client and note in narrative.**			x	
Are samples preserved that require preservation **(excluding cooling)** [1]? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect			x	
If samples are acid preserved for metals, is the pH ≤ 2[1]? Record the pH in Comments.			x	
If dissolved metals are requested, were samples field filtered?			x	
Additional Comments (if any):				

[1] **If NO, then contact the client before proceeding with analysis and note in case narrative.**

Muri — **Custodian Printed Name or Initials**

2-20-19 — **Signature of Custodian**

17:50 — **Date/Time**

S2

PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

SS01@5'

1902198-01 (Soil)

Summit Scientific

Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **02/20/19 09:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Benzene	ND	0.0020	mg/kg	1	1902257	02/21/19	02/22/19	EPA 8260B	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.010	"	"	"	"	"	"	
Naphthalene	ND	0.010	"	"	"	"	"	"	
Gasoline Range Hydrocarbons	**0.79**	0.50	"	"	"	"	"	"	

Date Sampled: **02/20/19 09:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: 1,2-Dichloroethane-d4		*98.0 %*	*23-173*		"	"	"	"	
Surrogate: Toluene-d8		*92.8 %*	*20-170*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*96.8 %*	*21-167*		"	"	"	"	

Extractable Petroleum Hydrocarbons by 8015

Date Sampled: **02/20/19 09:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C10-C28 (DRO)	ND	50	mg/kg	1	1902258	02/21/19	02/22/19	EPA 8015M	

Date Sampled: **02/20/19 09:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Surrogate: o-Terphenyl		*102 %*	*30-150*		"	"	"	"	

Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: **02/20/19 09:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
pH	**7.93**		pH Units	1	1902253	02/21/19	02/21/19	EPA 9045D	

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.

S2

PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

SS01@5'

1902198-01 (Soil)

Summit Scientific

Physical Parameters by APHA/ASTM/EPA Methods

Specific Conductance by EPA Method 120.1

Date Sampled: **02/20/19 09:51**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Specific Conductance (EC)	**0.766**	0.0100	mmhos/cm	1	1902252	02/21/19	02/21/19	EPA 120.1	

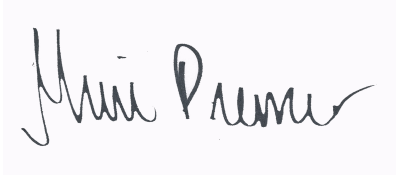
S2

PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1902257 - EPA 5030 Soil MS										
Blank (1902257-BLK1)				Prepared: 02/21/19 Analyzed: 02/22/19						
Benzene	ND	0.0020	mg/kg							
Toluene	ND	0.0050	"							
Ethylbenzene	ND	0.0050	"							
Xylenes (total)	ND	0.010	"							
Naphthalene	ND	0.010	"							
Gasoline Range Hydrocarbons	ND	0.50	"							
Surrogate: 1,2-Dichloroethane-d4	*0.0393*		"	*0.0400*		*98.2*	*23-173*			
Surrogate: Toluene-d8	*0.0403*		"	*0.0400*		*101*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*0.0394*		"	*0.0400*		*98.6*	*21-167*			
LCS (1902257-BS1)				Prepared: 02/21/19 Analyzed: 02/22/19						
Benzene	0.100	0.0020	mg/kg	0.100		100	70-130			
Toluene	0.107	0.0050	"	0.100		107	70-130			
Ethylbenzene	0.113	0.0050	"	0.100		113	70-130			
m,p-Xylene	0.235	0.010	"	0.200		117	70-130			
o-Xylene	0.107	0.0050	"	0.100		107	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0392*		"	*0.0400*		*98.0*	*23-173*			
Surrogate: Toluene-d8	*0.0400*		"	*0.0400*		*99.9*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*0.0391*		"	*0.0400*		*97.8*	*21-167*			
Matrix Spike (1902257-MS1)		**Source: 1902204-01**		Prepared: 02/21/19 Analyzed: 02/22/19						
Benzene	0.101	0.0020	mg/kg	0.100	0.00372	97.7	70-130			
Toluene	0.106	0.0050	"	0.100	0.00357	103	70-130			
Ethylbenzene	0.115	0.0050	"	0.100	ND	115	70-130			
m,p-Xylene	0.235	0.010	"	0.200	0.00312	116	70-130			
o-Xylene	0.106	0.0050	"	0.100	ND	106	70-130			
Surrogate: 1,2-Dichloroethane-d4	*0.0403*		"	*0.0400*		*101*	*23-173*			
Surrogate: Toluene-d8	*0.0389*		"	*0.0400*		*97.3*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*0.0389*		"	*0.0400*		*97.2*	*21-167*			



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PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1902257 - EPA 5030 Soil MS										
Matrix Spike Dup (1902257-MSD1)	**Source: 1902204-01**			Prepared: 02/21/19 Analyzed: 02/22/19						
Benzene	0.101	0.0020	mg/kg	0.100	0.00372	97.4	70-130	0.326	30	
Toluene	0.106	0.0050	"	0.100	0.00357	103	70-130	0.113	30	
Ethylbenzene	0.112	0.0050	"	0.100	ND	112	70-130	2.45	30	
m,p-Xylene	0.229	0.010	"	0.200	0.00312	113	70-130	2.57	30	
o-Xylene	0.105	0.0050	"	0.100	ND	105	70-130	0.654	30	
Surrogate: 1,2-Dichloroethane-d4	*0.0406*		*"*	*0.0400*		*101*	*23-173*			
Surrogate: Toluene-d8	*0.0396*		*"*	*0.0400*		*99.0*	*20-170*			
Surrogate: 4-Bromofluorobenzene	*0.0396*		*"*	*0.0400*		*98.9*	*21-167*			

Summit Scientific

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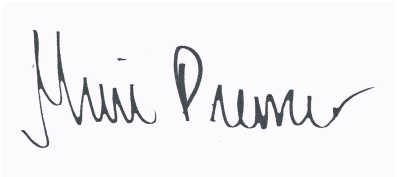
PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

Extractable Petroleum Hydrocarbons by 8015 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1902258 - EPA 3550A										
Blank (1902258-BLK1)				Prepared: 02/21/19 Analyzed: 02/22/19						
C10-C28 (DRO)	ND	50	mg/kg							
LCS (1902258-BS1)				Prepared: 02/21/19 Analyzed: 02/22/19						
C10-C28 (DRO)	445	50	mg/kg	500		89.1	70-130			
Matrix Spike (1902258-MS1)	**Source: 1902189-01**			Prepared: 02/21/19 Analyzed: 02/22/19						
C10-C28 (DRO)	528	50	mg/kg	500	72.0	91.1	70-130			
Matrix Spike Dup (1902258-MSD1)	**Source: 1902189-01**			Prepared: 02/21/19 Analyzed: 02/22/19						
C10-C28 (DRO)	556	50	mg/kg	500	72.0	96.8	70-130	5.20	20	



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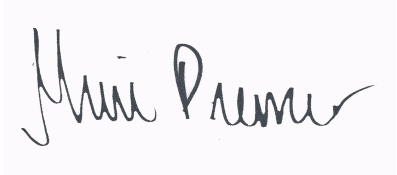
PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

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

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1902253 - General Preparation										
LCS (1902253-BS1)				Prepared & Analyzed: 02/21/19						
pH	9.25		pH Units	9.23		100	95-105			
Duplicate (1902253-DUP1)		**Source: 1902189-01**		Prepared & Analyzed: 02/21/19						
pH	7.53		pH Units		7.54			0.133	20	

Summit Scientific



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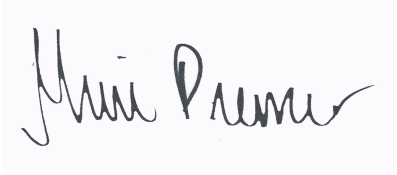
PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

Specific Conductance by EPA Method 120.1 - Quality Control

Summit Scientific

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1902252 - General Preparation										
Blank (1902252-BLK1)				Prepared & Analyzed: 02/21/19						
Specific Conductance (EC)	ND	0.0100	mmhos/cm							
LCS (1902252-BS1)				Prepared & Analyzed: 02/21/19						
Specific Conductance (EC)	0.790	0.0100	mmhos/cm	0.750		105	90-110			
Duplicate (1902252-DUP1)		**Source: 1902189-01**		Prepared & Analyzed: 02/21/19						
Specific Conductance (EC)	7.91	0.0100	mmhos/cm		7.92			0.0632	20	



S2

PDC Energy	Project: Lajco 17C,17ND,17RD,17SD, Coming 17-3,4	
1775 Sherman St. STE. 3000	Project Number: [none]	**Reported:**
Denver CO, 80203	Project Manager: Mark Longhurst	02/25/19 10:52

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