

**PDC Energy, Inc.**  
Second Quarter 2021 Remediation Summary

June 18, 2021

Former Booth 11, 12, 21, 22-31U & 31AU Tank Battery  
NWNW Section 31 T4N R63W  
Remediation # 4826

This remediation summary has been prepared by Tasman Geosciences, Inc. (Tasman) on behalf of PDC Energy, Inc. (PDC) to summarize remediation and sampling activities conducted during the second quarter 2021 at the former Booth 11, 12, 21-31U & 31AU tank battery (Site).

### **Site Background**

On July 28, 2008, petroleum hydrocarbon impacts were discovered below the dump lines during routine maintenance at the Booth 11, 12, 21, 22-31U & 31AU tank battery. Following the discovery, an estimated 3,800 cubic yards of impacted material was removed from the source area and transported to a licensed disposal facility under PDC waste manifests. The approximate dimensions of the excavation were 40 feet wide by 50 feet long with a depth of 35 feet below ground surface (bgs). Excavation oversight and sampling were conducted by LT Environmental (LTE). Soil sample results indicated that organic compound concentrations were in exceedance of COGCC Table 910-1 standards within the final extent of the excavation.

Following initial excavation activities, a site investigation was conducted by LTE to delineate the extent of remaining hydrocarbon impacts and install a passive soil vapor extraction (SVE) well. The 2008 excavation extent and SVE well location are illustrated on Figure 1. A Form 27 Site Investigation and Remediation Work Plan was submitted to the COGCC on March 3, 2009, and Remediation Number 4826 was issued to the project.

A supplemental site investigation was conducted by Tasman Geosciences between May 6 and June 4, 2019, to determine the extent of potential hydrocarbon impacts and evaluate lithologic conditions adjacent to the 2008 release. Based on the data collected during the assessment, PDC has selected monitored natural attenuation (MNA) as the remedial strategy for this site.

### **Current Remediation Activities**

Quarterly vapor samples are collected from the existing SVE well to monitor VOC concentrations and evaluate the passive system operation and efficacy. Vapor samples are submitted for laboratory analysis of benzene and TPH – GRO by EPA Method TO-15. Analytical results are summarized in Table 1 and laboratory reports are included in Attachment A.

### **Path Forward**

Monitored natural attenuation (MNA) was selected as the remediation strategy during the second quarter 2019 and will continue as the selected remediation strategy through the third quarter 2021.

Third quarter 2021 vapor sampling will be conducted during July 2021.



**Legend**

-  Excavation Extent (LTE – 2008)
-  8-Inch Passive SVE Well (LTE – 2008)

**Notes**

All locations are approximate unless otherwise noted.

Excavation extent approximated based on March 31, 2009, LT Environmental, Inc. (LTE) report.

SVE – Soil Vapor Extraction

0 ft.                      30 ft.                      60 ft.

Image Source: Google Earth; 2017 Google  
Projection: WGS 84 UTM Zone 13 North



DATE:	February 26, 2021
DESIGNED BY:	B. Nelson
DRAWN BY:	B. Nelson



**Tasman Geosciences, Inc.**  
6899 Pecos Street – Unit C  
Denver, CO 80221

**PDC Energy, Inc. – DJ Basin**  
**Booth 11, 12, 21, 22-31U & 31AU Tank Battery**  
 NWNW, Section 31, Township 4 North, Range 63 West  
 Weld County, Colorado

REMEDICATION WELL  
LOCATION MAP

FIGURE  
1

**TABLE 1**  
**BOOTH 11, 12, 21, 22, 31U 31AU**  
**VAPOR ANALYTICAL RESULTS SUMMARY TABLE**

Sample ID	Date Sampled	Benzene ( $\mu\text{g}/\text{m}^3$ )	Toluene ( $\mu\text{g}/\text{m}^3$ )	Ethylbenzene ( $\mu\text{g}/\text{m}^3$ )	Total Xylenes ( $\mu\text{g}/\text{m}^3$ )	TVPH - GRO ( $\mu\text{g}/\text{m}^3$ )
V001	7/25/2019	<5.66	14.2	<10.1	43.7	3,570
V001	10/17/2019	3,510	2,810	<193	5,040	1,460,000
V001	1/24/2020	163	212	<125	2,195	542,000
V001	4/27/2020	328	1,320	385	4,568	199,000
V001	8/19/2020	57.8	50.9	<10.0	416.3	22,400
V001	11/11/2020	72.7	42.1	10.2	116.0	2,550
V001	2/4/2021	12,800	18,500	<1,50	37,620	3,650,000
V001	4/27/2021	<5.60	<10.0	<10.0	<38.0	4,060

**Notes:**

TVPH - GRO = Total volatile petroleum hydrocarbons - gasoline range organics (C6 - C10)

$\mu\text{g}/\text{m}^3$  = Micrograms per cubic meter

## Attachment A



May 06, 2021

**Tasman Geosciences**

**Brock Nelson**

**6855 West 119th Avenue**

**Broomfield CO 80020**

**Project Name - PDC - Booth H11,12,21-31U &  
31AU**

**Project Number - [none]**

Attached are your analytical results for PDC - Booth H11,12,21-31U & 31AU received by Origins Laboratory, Inc. April 27, 2021. This project is associated with Origins project number Y104483-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.  
303.433.1322  
o-squad@oelabinc.com



1725 Elk Place, Denver, CO 80211 | Phone: 303.433.1322 | Fax: 303.265.9645

Tasman Geosciences  
6855 West 119th Avenue  
Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth H11,12,21-31U & 31AU

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
V001	Y104483-01	Air	April 27, 2021 12:10	04/27/2021 17:11

Origins Laboratory, Inc.



*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.*



Tasman Geosciences  
 6855 West 119th Avenue  
 Broomfield CO 80020

Brock Nelson  
 Project Number: [none]  
 Project: PDC - Booth H11,12,21-31U & 31AU

Origins Laboratory

F-012207-01-R1  
 Effective Date: 01/09/12

Sample Receipt Checklist

Origins Work Order: Y104483 Client: Tasman  
 Client Project ID: Booth  
 Checklist Completed by: JG KDK Shipped Via: HD  
 Date/time completed: 04/28/21 (UPS, FedEx, Hand Delivered, Pick-up, etc.)  
 Airbill #: N/A  
 Matrix(s) Received: (Check all that apply):  Soil/Solid  Water  Other: Air  
 Cooler Number/Temperature: 1 / 1 °C / 1 / 1 °C / 1 / 1 °C (Describe)  
 Thermometer ID: T003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Is there ice present (document if blue ice is used)			<input checked="" type="checkbox"/>	
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)			<input checked="" type="checkbox"/>	
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)			<input checked="" type="checkbox"/>	
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation and was it checked <sup>(1)</sup> ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)/(pH <2 for samples preserved with HNO3, HCL, H2SO4) / (pH >10 for samples preserved with NaAsO2+NaOH, ZnAc+NaOH)			<input checked="" type="checkbox"/>	
Additional Comments (if any):				

<sup>(1)</sup>If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by (Project Manager) JM

Date/Time Reviewed 4-29-21

Origins Laboratory, Inc.



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Tasman Geosciences  
 6855 West 119th Avenue  
 Broomfield CO 80020

Brock Nelson  
 Project Number: [none]  
 Project: PDC - Booth H11,12,21-31U & 31AU

V001

4/27/2021 12:10:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
 Y104483-01 (Air)

**GBTEX by TO-15M GC/MS**

										T
Gasoline Range Hydrocarbons	4060	400	ug/m <sup>3</sup> Air	2	B1D2814	DJL	04/28/2021	05/05/2021		
Benzene	ND	5.60	"	"	"	DJL	"	"		U
Toluene	ND	10.0	"	"	"	DJL	"	"		U
Ethylbenzene	ND	10.0	"	"	"	DJL	"	"		U
m,p-Xylene	ND	38.0	"	"	"	DJL	"	"		U
o-Xylene	ND	9.40	"	"	"	DJL	"	"		U
Surrogate: 1,2-Dichloroethane-d4	113 %	70-130			"	"		"		
Surrogate: Toluene-d8	94.9 %	70-130			"	"		"		
Surrogate: 4-Bromofluorobenzene	161 %	70-130			"	"		"	S-04	

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Brock Nelson  
 Project Number: [none]  
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**Volatile Organic Compounds by TO-15 in Air - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B1D2814 - Default Prep - Air</b>										
<b>Blank (B1D2814-BLK1)</b>										
					Prepared: 04/28/2021 Analyzed: 04/28/2021					T
Gasoline Range Hydrocarbons	ND	200	ug/m <sup>3</sup> Air							U
Benzene	ND	2.80	"							U
Toluene	ND	5.00	"							U
Ethylbenzene	ND	5.00	"							U
m,p-Xylene	ND	19.0	"							U
o-Xylene	ND	4.70	"							U
Surrogate: 1,2-Dichloroethane-d4	9.71		ppbv	10.0		97.1	70-130			
Surrogate: Toluene-d8	10.1		"	10.0		101	70-130			
Surrogate: 4-Bromofluorobenzene	12.6		"	10.0		126	70-130			
<b>LCS (B1D2814-BS1)</b>										
					Prepared: 04/28/2021 Analyzed: 04/28/2021					T
Benzene	32.4	2.80	ug/m <sup>3</sup> Air	31.9		101	70-130			
Toluene	31.4	5.00	"	37.7		83.3	70-130			
Ethylbenzene	41.7	5.00	"	43.4		96.1	70-130			
m,p-Xylene	201	19.0	"	174		116	70-130			
o-Xylene	43.9	4.70	"	43.4		101	70-130			
Surrogate: 1,2-Dichloroethane-d4	9.20		ppbv	10.0		92.0	70-130			
Surrogate: Toluene-d8	9.33		"	10.0		93.3	70-130			
Surrogate: 4-Bromofluorobenzene	9.50		"	10.0		95.0	70-130			
<b>LCS Dup (B1D2814-BSD1)</b>										
					Prepared: 04/28/2021 Analyzed: 04/28/2021					T
Benzene	32.4	2.80	ug/m <sup>3</sup> Air	31.9		102	70-130	0.0986	25	
Toluene	31.9	5.00	"	37.7		84.7	70-130	1.67	25	
Ethylbenzene	42.5	5.00	"	43.4		97.9	70-130	1.86	25	
m,p-Xylene	205	19.0	"	174		118	70-130	2.18	25	
o-Xylene	45.3	4.70	"	43.4		104	70-130	3.11	25	
Surrogate: 1,2-Dichloroethane-d4	9.39		ppbv	10.0		93.9	70-130			

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 Broomfield CO 80020

Brock Nelson  
 Project Number: [none]  
 Project: PDC - Booth H11,12,21-31U & 31AU

**Volatile Organic Compounds by TO-15 in Air - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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**Batch B1D2814 - Default Prep - Air**

**LCS Dup (B1D2814-BSD1)**

Prepared: 04/28/2021 Analyzed: 04/28/2021

T

Surrogate: Toluene-d8	9.27		ppbv	10.0		92.7	70-130			
Surrogate: 4-Bromofluorobenzene	9.51		"	10.0		95.1	70-130			

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**Notes and Definitions**

- U Sample is Non-Detect.
- T The TO-15 analysis is not part of the NELAC accreditation
- S-04 The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
- ND Analyte NOT DETECTED at or above the reporting limit
- RPD Relative Percent Difference
- All soil results are reported at a wet weight basis.

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