

Methane Mitigation System
Operations and Monitoring (O&M)
Summary

**DWR WATER WELL
PERMIT # 137465**

13646 WCR 2 ½
Brighton, Colorado
NWSE S32 T1N R66W

COGCC Remediation # 15469

Prepared by:



6855 WEST 119TH AVENUE
BROOMFIELD, COLORADO 80020

September 4, 2020

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1.0 Introduction

Tasman Geosciences, Inc. (Tasman) has prepared this operations and monitoring (O&M) summary on behalf of PDC Energy, Inc. (PDC) and Great Western Operating Company, LLC (collectively referred to as the Operators) for the methane mitigation system (System) installed at the property (Property) associated with the Colorado Division of Water Resources (DWR) Well Permit Number 137465 (Well). The System was designed to mitigate methane concentrations in the Well water.

2.0 Location and Background

The Property is located at 13646 West County Road (WCR) 2 ½ in Brighton, Colorado, within the NWSE Quarter of Section 32, Township 1 North, Range 66 West. The Property coordinates are approximately 40.007168 degrees north latitude and -104.798050 degrees west longitude.

The Well is permitted for domestic use and is completed within the Laramie Fox Hills aquifer. The Well is constructed with a screened interval between 825 and 1,056 feet below ground surface (bgs), with a static water level of 374 feet bgs, according to the Pump Installation Report filed with the DWR in September 1985. Water from the Well is pumped and conveyed to an outdoor hydrant and the residential water system, located within an exterior cellar.

In response to a landowner request, PDC retained Olsson Associates (Olsson) on March 11, 2020, to collect a preliminary baseline water sample from the Well in accordance with the Colorado Oil and Gas Conservation Commission (COGCC) Baseline Water Quality Sampling Program, Rule 318A. Laboratory results indicated that the sample exhibited a methane concentration of 26 milligrams per liter (mg/L) [Table 1]. Notification was provided to the COGCC, as the concentration exceeded the maximum reporting threshold of 10 mg/L. Subsequent isotopic and gas compositional analysis indicated that the methane exhibited properties of both thermogenic and biogenic origin.

Based on the results of the preliminary water sample, the COGCC directed the Operators to conduct an area water well study. In accordance with this study, PDC retained Tasman to collect a supplemental baseline water sample from the Well on May 6, 2020. Laboratory and isotopic analyses confirmed an elevated methane concentration of 22.7 mg/L, with properties of thermogenic and biogenic origin. Baseline water analytical data is summarized in Table 1 and the laboratory report is provided as Attachment A.

As a result of the elevated methane concentration and properties of thermogenic origin, the Operators obtained consent from the landowners to install the System.

3.0 System Design

The System was designed to mitigate methane concentrations detected in the Well using a two-phased approach. The following sections summarize the design and installation for each component of the System. A System process and instrumentation diagram (P&ID) is provided as Figure 1. A photographic overview of the System is provided as Attachment B.

3.1 Well Ventilation

The ventilation portion of the System is designed to allow for passive ventilation of methane from the Well casing. A schedule-80 polyvinyl chloride (PVC) pipe stack is constructed directly over the Well, and is sealed with an aluminum screened vent cap (Figure 1).

The Well ventilation stack was installed on July 10, 2020. Following installation, approximately ½-gallon of Clorox® bleach was poured into the Well as a precautionary measure to ensure that no foreign elements were introduced during construction.

3.2 Water Treatment System

The water treatment portion of the System is designed to remove methane dissolved in the Well water using a combination of aeration technology and carbon filtration (Figure 1). All System equipment is housed within a custom shed constructed above the existing cellar (Figure 2). The water is conveyed from the Well through the existing residential pressure tanks, into the System for treatment.

Once water enters the System, it is conveyed via 1-inch schedule-40 PVC piping through a screen filter and into an aeration tank equipped with enclosed misters. The process water is sprayed, or atomized, within the tank, thereby volatilizing the dissolved methane. Methane vapors are then transferred from the tank via a small blower through a 3-inch PVC vent stack for discharge to atmosphere. The vent stack is installed above the shed roof and away from the windows of the residence. Vapor collection and conveyance operate as a closed system to prevent methane accumulation within the shed.

Once treated, process water collects at the bottom of the aeration tank. When the water level in the tank falls below the low liquid level switch (LSL), the switch is engaged thereby opening the solenoid valve and initiating Well pump operation. When the water level in the tank reaches the maximum fill level, the high liquid level switch (LSH) is engaged and the solenoid valve closes.

As water is consumed within the residence, process water is transferred from the aeration tank using an enclosed submersible pump into a small pressure tank. Prior to entering the residential supply stream, process water is conveyed through a granular activated carbon (GAC) filter as a polishing measure.

The shed and water treatment equipment were installed at the Property between July 21 and August 5, 2020. The System became operational on August 6, 2020.

4.0 System Sampling Program

The System sampling program is used to monitor operational efficacy and confirm methane concentrations are reduced below the target level of 10 mg/L. The following sections provide an overview to the sampling program, as well as data for the reporting period.

4.1 Overview

Water samples are collected from the influent and effluent process streams of the System (Figure 1). The effluent sample port (EFF) is located downstream of the aeration tank and GAC filter. The influent sample port (INF) is located upstream of the aeration tank and downstream of existing residential pressure tanks.

Effluent water samples are collected following one minute of purging at a rate of 250 to 500 milliliters (mL) per minute (min). Influent water samples are collected following parameter stabilization while purging at a rate of 250 to 500 mL/min, to ensure that samples are representative of formation conditions.

Samples are collected in laboratory-provided unpreserved glass 40-mL vials and designated using the following sample identification nomenclature:

Prefix [INF or EFF] – mmddyy – time [24-hour]

Sample vials are subsequently placed in an ice-filled cooler to maintain a temperature of approximately 4 degrees Celsius during transportation to the laboratory. Samples are submitted to Summit Scientific Laboratory (Summit) under standard chain-of-custody procedures for analysis of dissolved gases (methane, ethane, propane) by Environmental Protection Agency (EPA) Method RSK-175.

4.2 Reporting Period Data

During the first month of System operation, water samples were collected on a weekly basis. Analytical results indicated that post-treatment methane concentrations were reduced below the target level of 10 mg/L. Analytical results are summarized in Table 2 and the laboratory reports are provided as Attachment A.

5.0 Upcoming Site Activities

Analytical results collected during the reporting period demonstrate System efficacy and compliance with the required methane target level. Based on this information, the System sampling program will be conducted on a quarterly basis.

System maintenance activities will be conducted concurrent with System sampling events. Maintenance will include inspection, cleaning, and replacement of the System components, as needed.

System sampling and maintenance events are scheduled for the second month of each quarter.

TABLES

TABLE 1
DWR WATER WELL PERMIT # 137465
BASELINE WATER ANALYTICAL RESULTS SUMMARY TABLE



	Analyte	CDPHE WQCC MCL in Groundwater ⁽¹⁾	Units	Morales0248601	Casias-Morales Well
				3/11/2020 ⁽²⁾	5/6/2020 ⁽³⁾
Organic Compounds	Benzene	0.005	mg/L	<0.001	<0.001
	Toluene	0.56	mg/L	<0.001	<0.001
	Ethylbenzene	0.70	mg/L	<0.001	<0.001
	Total Xylenes	1.4	mg/L	<0.001	<0.001
	Gasoline Range Organics	-	mg/L	0.468	0.302
	Diesel Range Organics	-	mg/L	<0.2	<0.19
Dissolved Gases	Methane	-	mg/L	26.0	22.7
	Ethane	-	mg/L	8.11	6.52
	Propane	-	mg/L	4.91	3.93
Dissolved Metals	Barium	2.0	mg/L	0.0485	0.0523
	Boron	0.75	mg/L	0.393	0.410
	Calcium	-	mg/L	1.7	1.72
	Iron	0.3	mg/L	0.212	0.221
	Magnesium	-	mg/L	0.394	0.414
	Manganese	0.05	mg/L	0.017	0.0121
	Potassium	-	mg/L	1.68	1.49
	Selenium	0.05	mg/L	<0.005	<0.005
	Sodium	-	mg/L	308	340
	Strontium	-	mg/L	0.0745	0.0755
General Chemistry	Bromide	-	mg/L	1.07	1.16
	Chloride	250	mg/L	109	105
	Fluoride	4.0	mg/L	2.28	2.19
	Nitrate - Nitrite	10.0	mg/L	<0.0200	<0.100
	Sulfate	250	mg/L	0.540	<0.400
	Total Alkalinity	-	mg/L	538	541
	Bicarbonate Alkalinity	-	mg/L	491	490
	Carbonate	-	mg/L	46.2	50.2
	Total Phosphorus	-	mg/L	0.124	0.116
	Specific Conductivity (EC)	-	µS/cm	1310	1300
	Total Dissolved Solids	500	mg/L	740	748
	pH	6.5-8.5	units	8.47	8.48
BART	Iron Related Bacteria		CFU/mL	~ 35000	~ 9000
	Sulfate Reducing Bacteria		CFU/mL	~ 67000	~ 100
	Slime Forming Bacteria	-	CFU/mL	~ 27000	~ 1400

Notes:

1. Domestic Water Supply - Human Health Standards referenced from Water Quality Control Commission (WQCC) 5 CCR 1002-41, Basic Standards for Groundwater, effective December 30, 2016.

2. Sample collected by Olsson Associates.

3. Sample collected by Tasman Geosciences, Inc.

CDPHE = Colorado Department of Public Health and Environment

mg/L = Milligrams per liter

µS/cm = MicroSiemens per centimeter

CFU/mL = Colony forming unit per milliliter

BART = Biological Activity and Reaction Test

Secondary Standard - Drinking Water

TABLE 1
DWR WATER WELL PERMIT # 137465
BASELINE WATER ANALYTICAL RESULTS SUMMARY TABLE



Agricultural Standard

(<) = Analytical result is less than the indicated laboratory reporting limit.

BOLD = Analytical result is in exceedance of applicable standard.

TABLE 2
DWR WATER WELL PERMIT # 137465
SYSTEM PROCESS WATER ANALYTICAL RESULTS SUMMARY TABLE

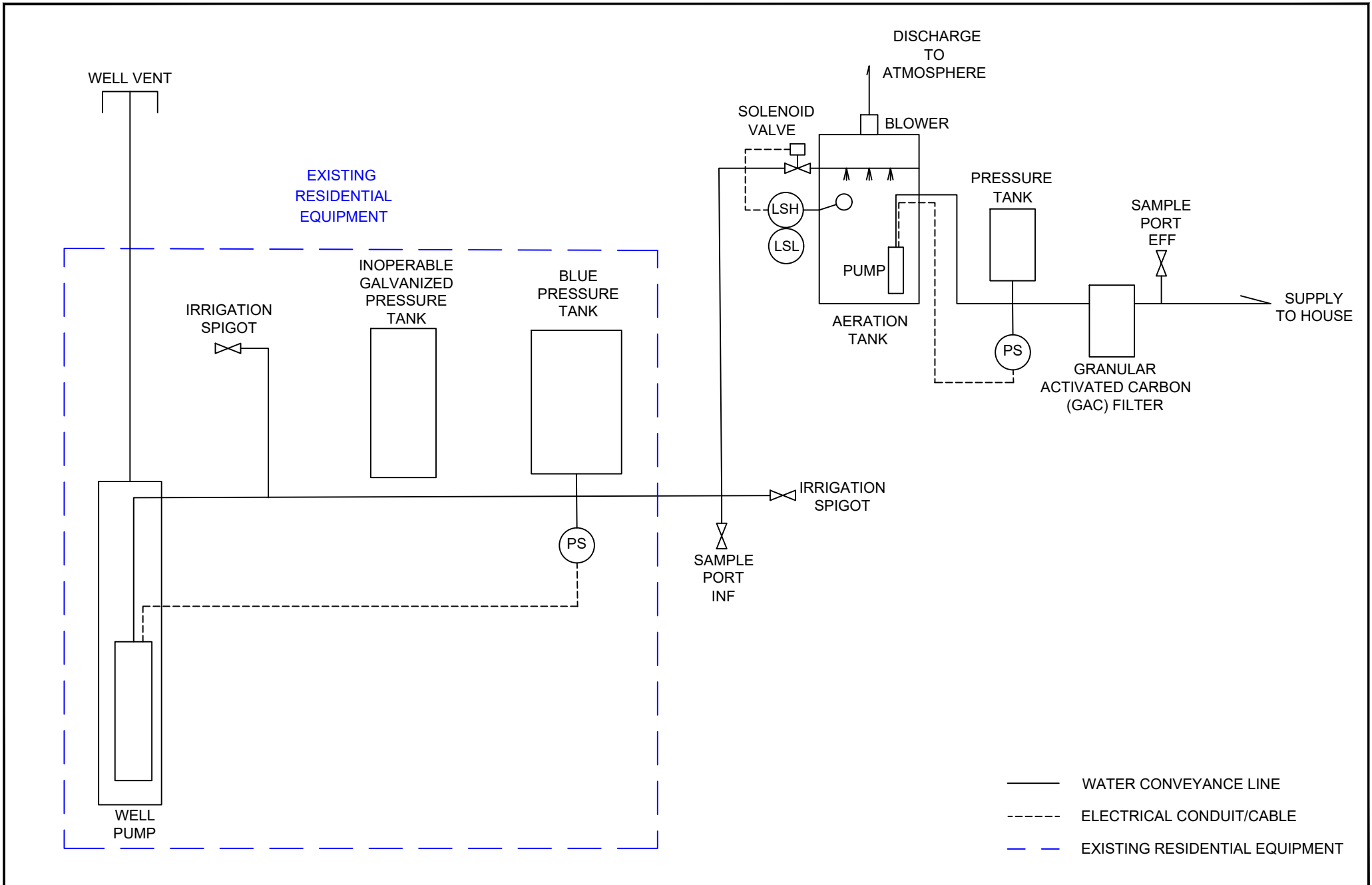


Sample ID	Date Sampled	Methane ¹ (mg/L)	Ethane (mg/L)	Propane (mg/L)
Target Level (mg/L)		10	-	-
EFF-080720-1100	8/7/2020	7.8	1.18	0.488
EFF-081220-0832	8/12/2020	3.3	0.95	0.46
EFF-081920-0855	8/19/2020	2.2	1.2	0.75
EFF-082620-0921	8/26/2020	2.9	0.99	0.65
INF-080720-1145	8/7/2020	38.6	6.79	4.03
INF-081220-0927	8/12/2020	10	2.8	2.4
INF-081920-0956	8/19/2020	12	3.9	2.8
INF-082620-1013	8/26/2020	11	3.7	2.0

Notes:

mg/L= Milligrams per liter

FIGURES



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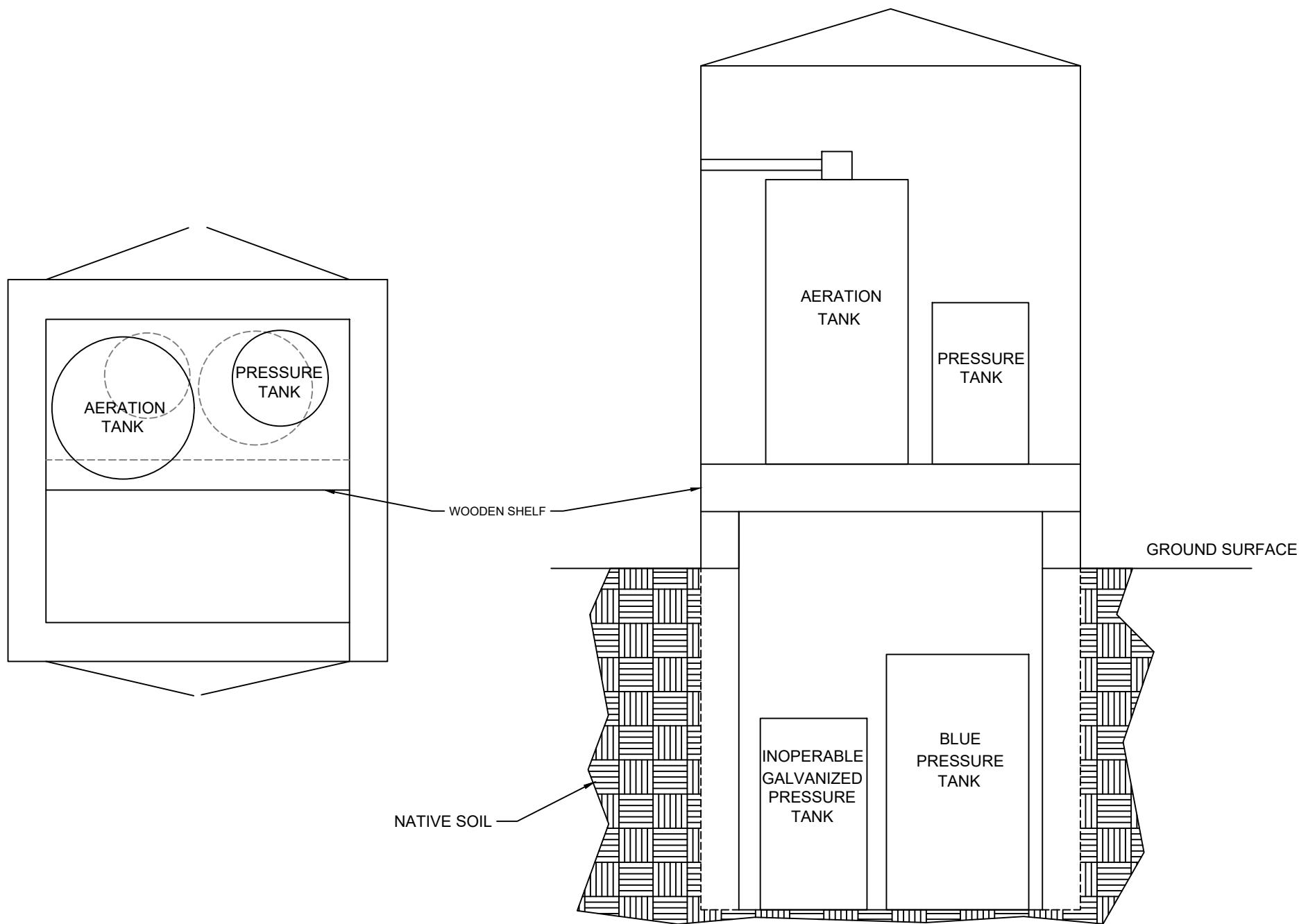


Methane Mitigation System Process and Instrumentation Diagram

DWR Permit Number 137465

TASMAN GEOSCIENCES PROJECT:	
Date:	June 2020
TASMAN GEOSCIENCES BROOMFIELD CO 80020 TELEPHONE NO 303-487-1228	

Figure
1



Project Manager's name		TRAVIS JOHANSEN	
Professional Engineer's No.			
State		TJ	
Date Signed		TJ	
Project Mgr.		TJ	
Designed by		DAG	
Drawn by		DAG	
Checked by		TJ	
No.		Date	
Revisions		By	
Ckcd			



Methane Mitigation System System Enclosure Layout

DWR Permit Number 137465

TASMAN GEOSCIENCES PROJECT	
Date	June 2020
TASMAN GEOSCIENCES	
BROOKFIELD CO 80020	
TELEPHONE NO 303-487-1228	

Figure
2

ATTACHMENT A



May 15, 2020

Tasman Geosciences

Christine Hamlin

6855 West 119th Avenue

Broomfield CO 80020

**Project Name - PDC - Morales Methane
Investigation**

Project Number - [none]

Attached are your analytical results for PDC - Morales Methane Investigation received by Origins Laboratory, Inc. May 06, 2020. This project is associated with Origins project number Y005081-01.

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

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Casias-Morales Well	Y005081-01	Water	May 6, 2020 14:55	05/06/2020 16:45

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

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

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www.originslaboratory.com

1005001

page | of |

Client: PDC Energy
Address: _____
Project Manager: Karen Olson
Project Name: Morales Methane Investigation
Project Number: _____
Telephone Number: _____
Samples Collected By: CHamlin

Email Address: chamlin@tasman-geo.com
karen.olson@pdc.com

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix			Analysis	Sample Instructions
				Unpreserved	HCl	HNO ₃	Other	Groundwater	Soil	Air Summa Canister #		
CASAS-Morales Well	5/6/10	1455	10	X	X	X		X				1
												2
												3
												4
												5
												6
												7
												8
												9
												10

Relinquished By:	Date:	Time:	Received By:	Date:	Time:	Turnaround Time:
<u>J. Hamlin</u>	5/6/10	1609	<u>CHamlin</u>	5/6/10	1609	Same Day <input type="checkbox"/> 24 Hr <input type="checkbox"/>
<u>J. Hamlin</u>	5/6/10	1609	<u>CHamlin</u>	5/6/10	1645	48 Hr <input type="checkbox"/> 72 Hr <input type="checkbox"/> Standard <input checked="" type="checkbox"/>

Date Results Needed

Temp Received-13.7

Origins Laboratory, Inc.

J. Merrill

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

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: Y005081

Client: Tasman

Client Project ID: Morales Methane Investigation

Checklist Completed by: JG

Shipped Via: HD
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 5/7/2020

Airbill #: N/A

Matrix(s) Received: (Check all that apply): Soil/Solid ☒ Water ☐ Other: ☐ (Describe)

Cooler Number/Temperature: 1 13.7 °C 1 °C 1 °C 1 °C

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 ⁽¹⁾ ?		<input checked="" type="checkbox"/>		<u>Same Day</u>
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 ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?		<input checked="" type="checkbox"/>		
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<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 ⁽¹⁾ ? (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 HNO ₃ , HCL, H ₂ SO ₄) / (pH >10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)		<input checked="" type="checkbox"/>		
Additional Comments (if any):				

⁽¹⁾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

5-8-20
Date/Time Reviewed

Origins Laboratory, Inc.

Jm

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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Casias-Morales Well

5/6/2020 2:55:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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GEL Laboratories, LLC

Y005081-01 (Water)

Anions by EPA 300.0

Bromide	1.16	0.800	mg/L	4	1995945	JLD1	05/06/2020	05/08/2020	
Chloride	105	5.00	"	25	"	JLD1	"	05/11/2020	
Fluoride	2.19	0.100	"	1	"	JLD1	"	05/08/2020	
Nitrate	ND	0.100	"	"	"	JLD1	"	"	U
Nitrite	ND	0.100	"	"	"	JLD1	"	"	U
Sulfate	ND	0.400	"	"	"	JLD1	"	"	U

Bacterial Activity Reaction Tests

Iron Related Bacteria	~9000	CFU/mL	1	11111	ARB	"	05/06/2020	
Slime Forming Bacteria	~100	"	"	"	ARB	"	"	
Sulfate Reducing Bacteria	~1400	"	"	"	ARB	"	"	

BTEX by EPA 8260D

Benzene	ND	1.00	ug/L	1	B0E0702	ZZZ	05/07/2020	05/07/2020	Ua
Toluene	ND	1.00	"	"	"	ZZZ	"	"	Ua
Ethylbenzene	ND	1.00	"	"	"	ZZZ	"	"	Ua
Xylenes, total	ND	1.00	"	"	"	ZZZ	"	"	Ua

Surrogate: 1,2-Dichloroethane-d4	116 %	70-130	"	"	"
Surrogate: Toluene-d8	101 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	80.4 %	70-130	"	"	"

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Casias-Morales Well

5/6/2020 2:55:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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Pace Analytical

Y005081-01 (Water)

Dissolved Gasses by RSK 175

Ethane	6520	10.0	ug/L	1	11111		05/06/2020	05/11/2020	
Methane	22700	10.0	"	"	"		"	"	
n-Propane	3930	20.0	"	"	"		"	"	

Dissolved Metals by 200.8

Barium	52.3	4.00	ug/L	1	1996144	BAJ	05/11/2020	05/13/2020	
Boron	410	150	"	10	"	BAJ	"	"	
Calcium	1720	200	"	1	"	PRB	"	"	
Iron	221	100	"	"	"	BAJ	"	"	
Magnesium	414	30.0	"	"	"	PRB	"	"	
Manganese	12.1	5.00	"	"	"	BAJ	"	"	
Potassium	1490	300	"	"	"	PRB	"	"	
Selenium	ND	5.00	"	"	"	BAJ	"	"	U
Sodium	340000	2500	"	10	"	PRB	"	"	
Strontium	75.5	10.0	"	1	"	BAJ	"	"	

DRO by 8015C

Diesel Range Organics	ND	190	ug/L	1	1995841	RXC1	"	05/11/2020	U
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Surrogate: o-Terphenyl 74 % 40-109 " " "

GRO by 8015C

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Casias-Morales Well

5/6/2020 2:55:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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GEL Laboratories, LLC

Y005081-01 (Water)

GRO by 8015C

Gasoline Range Organics	0.302	0.100	mg/L	1	1996289	RXY1	05/06/2020	05/11/2020
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Surrogate: Bromofluorobenzene	91 %	75-127			"	"	"
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Nitrate/Nitrite by EPA 353.2

Nitrogen, Nitrate/Nitrite	ND	0.100	mg/L	5	1995314	KLP1	"	05/13/2020	U
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pH in Water by EPA 9040C

pH	8.48		pH Units	1	B0E0609	DJL	05/06/2020	05/07/2020
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	1300	5.00	uS/cm	"	B0E0610	DJL	05/06/2020	05/07/2020
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Total Alkalinity by 2320B

Alkalinity, Total as CaCO3	541	4.00	mg/L	1	1995925	RXB5	05/06/2020	05/11/2020
Bicarbonate alkalinity (CaCO3)	490	4.00	"	"	"	RXB5	"	"
Carbonate alkalinity (CaCO3)	50.2	4.00	"	"	"	RXB5	"	"

Total Dissolved Solids by 2540C

Total Dissolved Solids	748	5.00	mg/L	1	B0E0801	DJL	05/08/2020	05/12/2020
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Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Casias-Morales Well

5/6/2020 2:55:00PM

Analyte	Result	Reporting	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
		Limit							

Origins Laboratory, Inc. Y005081-01 (Water)

Total Phosphorus by EPA 365.4

Phosphorus, Total as P	0.116	0.0500	mg/L	1	1995313	KLP1	05/11/2020	05/12/2020
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Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Volatile Organic Compounds by GC/MS SW846 8260D - 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 B0E0702 - EPA 5030B (Water)

Blank (B0E0702-BLK1)

Prepared: 05/07/2020 Analyzed: 05/07/2020

Benzene	ND	1.00	ug/L							Ua
Toluene	ND	1.00	"							Ua
Ethylbenzene	ND	1.00	"							Ua
Xylenes, total	ND	1.00	"							Ua
Surrogate: 1,2-Dichloroethane-d4	62		"	62.5		98.7	70-130			
Surrogate: Toluene-d8	66		"	62.5		106	70-130			
Surrogate: 4-Bromofluorobenzene	53		"	62.5		85.5	70-130			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Volatile Organic Compounds by GC/MS SW846 8260D - 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 B0E0702 - EPA 5030B (Water)

LCS (B0E0702-BS1)

Prepared: 05/07/2020 Analyzed: 05/07/2020

Benzene	49.4	1.00	ug/L	50.0		98.8	70-130			
Toluene	51.3	1.00	"	50.0		103	70-130			
Ethylbenzene	54.2	1.00	"	50.0		108	70-130			
m,p-Xylene	107	2.00	"	100		107	70-130			
o-Xylene	51.6	1.00	"	50.0		103	70-130			
Surrogate: 1,2-Dichloroethane-d4	63		"	62.5		102	70-130			
Surrogate: Toluene-d8	64		"	62.5		103	70-130			
Surrogate: 4-Bromofluorobenzene	55		"	62.5		88.0	70-130			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Volatile Organic Compounds by GC/MS SW846 8260D - 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 B0E0702 - EPA 5030B (Water)

Matrix Spike (B0E0702-MS1)		Source: Y005074-21			Prepared: 05/07/2020 Analyzed: 05/07/2020					
Benzene	43.8	1.00	ug/L	50.0	ND	87.5	70-130			
Toluene	46.4	1.00	"	50.0	ND	92.8	70-130			
Ethylbenzene	49.1	1.00	"	50.0	ND	98.3	70-130			
m,p-Xylene	101	2.00	"	100	ND	101	70-130			
o-Xylene	50.1	1.00	"	50.0	ND	100	70-130			
Surrogate: 1,2-Dichloroethane-d4	69		"	62.5		111	70-130			
Surrogate: Toluene-d8	64		"	62.5		102	70-130			
Surrogate: 4-Bromofluorobenzene	53		"	62.5		84.8	70-130			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Volatile Organic Compounds by GC/MS SW846 8260D - 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 B0E0702 - EPA 5030B (Water)

Matrix Spike Dup (B0E0702-MSD1)		Source: Y005074-21			Prepared: 05/07/2020 Analyzed: 05/07/2020					
Benzene	43.3	1.00	ug/L	50.0	ND	86.7	70-130	0.965	20	
Toluene	47.1	1.00	"	50.0	ND	94.2	70-130	1.45	20	
Ethylbenzene	49.8	1.00	"	50.0	ND	99.7	70-130	1.39	20	
m,p-Xylene	100	2.00	"	100	ND	100	70-130	0.408	20	
o-Xylene	50.4	1.00	"	50.0	ND	101	70-130	0.577	20	
Surrogate: 1,2-Dichloroethane-d4	68		"	62.5		108	70-130			
Surrogate: Toluene-d8	64		"	62.5		103	70-130			
Surrogate: 4-Bromofluorobenzene	53		"	62.5		85.0	70-130			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Volatile Organic Compounds by GC/MS SW846 8260D - 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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Classical Chemistry Parameters - 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 B0E0609 - NO PREP

Duplicate (B0E0609-DUP1)		Source: Y005054-01		Prepared: 05/06/2020 Analyzed: 05/07/2020						
pH	7.50		pH Units		7.65			1.98	200	

Batch B0E0610 - NO PREP

Blank (B0E0610-BLK1)		Prepared: 05/06/2020 Analyzed: 05/07/2020								
Specific Conductance (EC)	2.80	5.00	uS/cm							
Duplicate (B0E0610-DUP1)		Source: Y005054-01		Prepared: 05/06/2020 Analyzed: 05/07/2020						
Specific Conductance (EC)	4790	5.00	uS/cm		4780			0.161	10	

Batch B0E0801 - NO PREP

Blank (B0E0801-BLK1)		Prepared: 05/08/2020 Analyzed: 05/12/2020								
Total Dissolved Solids	ND	5.00	mg/L							
LCS (B0E0801-BS1)		Prepared: 05/08/2020 Analyzed: 05/12/2020								
Total Dissolved Solids	732	5.00	mg/L	716		102	85-115			
Duplicate (B0E0801-DUP1)		Source: Y005081-01		Prepared: 05/08/2020 Analyzed: 05/12/2020						
Total Dissolved Solids	750	5.00	mg/L		748			0.214	20	

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Anions by EPA 300.0 - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1995945 -										
BLANK (1204558529-BLK)					Prepared: Analyzed: 05/08/2020					
Nitrate	ND	0.100	mg/L				-			U
Nitrite	ND	0.100	"				-			U
Fluoride	ND	0.100	"				-			U
Chloride	ND	0.200	"				-			U
Bromide	ND	0.200	"				-			U
Sulfate	ND	0.400	"				-			U
LCS (1204558530-BKS)					Prepared: Analyzed: 05/08/2020					
Bromide	1.20	0.200	mg/L	1.25		96	90-110			
Chloride	4.60	0.200	"	5.00		91.9	90-110			
Fluoride	2.41	0.100	"	2.50		96.4	90-110			
Nitrate	2.33	0.100	"	2.50		93.2	90-110			
Nitrite	2.37	0.100	"	2.50		94.9	90-110			
Sulfate	9.46	0.400	"	10.0		94.6	90-110			
DUP (1204558531 D)					Source: Y005081-01		Prepared: Analyzed: 05/08/2020			
Sulfate	ND	0.400	mg/L		<0.133		0-20	0	20	U
Bromide	1.10	0.800	"		1.16		0-20	4.49	20	
Chloride	105	5.00	"		105		0-20	0.36	20	
Nitrite	ND	0.100	"		<0.0330		0-20	0	20	U
Nitrate	ND	0.100	"		<0.0330		0-20	0	20	U
Fluoride	2.18	0.100	"		2.19		0-20	0.445	20	
PS (1204558532 S)					Source: Y005081-01		Prepared: Analyzed: 05/08/2020			
Fluoride	4.67	0.100	mg/L	2.50		99.2	90-110			
Chloride	238	5.00	"	5.00		106	90-110			
Nitrate	2.31	0.100	"	2.50		92.3	90-110			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Anions by EPA 300.0 - Quality Control
GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1995945 -

PS (1204558532 S)

Source: Y005081-01

Prepared: Analyzed: 05/08/2020

Nitrite	2.62	0.100	mg/L	2.50		105	90-110			
Sulfate	9.63	0.400	"	10.0		96.3	90-110			
Bromide	6.08	0.800	"	1.25		98.5	90-110			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Dissolved Metals by 200.8 - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1996144 -										
FLTB (1204558570-BLK)					Prepared: 05/11/2020 Analyzed: 05/13/2020					
Sodium	ND	250	ug/L				-			U
Selenium	ND	5.00	"				-			U
Potassium	ND	300	"				-			U
Boron	ND	15.0	"				-			U
Manganese	ND	5.00	"				-			U
Magnesium	ND	30.0	"				-			U
Iron	ND	100	"				-			U
Calcium	ND	200	"				-			U
Barium	ND	4.00	"				-			U
Strontium	ND	10.0	"				-			U
BLANK (1204558920-BLK)					Prepared: 05/11/2020 Analyzed: 05/13/2020					
Sodium	ND	250	ug/L				-			U
Iron	ND	100	"				-			U
Strontium	ND	10.0	"				-			U
Selenium	ND	5.00	"				-			U
Potassium	ND	300	"				-			U
Manganese	ND	5.00	"				-			U
Magnesium	ND	30.0	"				-			U
Boron	ND	15.0	"				-			U
Barium	ND	4.00	"				-			U
Calcium	ND	200	"				-			U
LCS (1204558921-BKS)					Prepared: 05/11/2020 Analyzed: 05/13/2020					
Strontium	55.3	10.0	ug/L	50.0		111	85-115			
Boron	108	15.0	"	100		108	85-115			
Calcium	2170	200	"	2000		108	85-115			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Dissolved Metals by 200.8 - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1996144 - EPA 200.2

LCS (1204558921-BKS)

Prepared: 05/11/2020 Analyzed: 05/13/2020

Iron	2300	100	ug/L	2000	115	85-115
Magnesium	2120	30.0	"	2000	106	85-115
Manganese	56.5	5.00	"	50.0	113	85-115
Potassium	2140	300	"	2000	107	85-115
Barium	55.3	4.00	"	50.0	111	85-115
Sodium	2180	250	"	2000	109	85-115
Selenium	56.4	5.00	"	50.0	113	85-115

DUP (1204558922 D)

Source: Y005081-01

Prepared: 05/11/2020 Analyzed: 05/13/2020

Selenium	ND	5.00	ug/L	<2.00	0-20	57.1	20	U
Barium	51.5	4.00	"	52.3	0-20	1.47	20	
Boron	430	150	"	410	0-20	4.8	20	
Calcium	1770	200	"	1720	0-20	2.74	20	
Iron	214	100	"	221	0-20	3.35	20	
Magnesium	404	30.0	"	414	0-20	2.3	20	
Manganese	11.8	5.00	"	12.1	0-20	2.86	20	
Sodium	344000	2500	"	340000	0-20	1.16	20	
Strontium	77.3	10.0	"	75.5	0-20	2.31	20	
Potassium	1480	300	"	1490	0-20	0.876	20	

MS (1204558923 S)

Source: Y005081-01

Prepared: 05/11/2020 Analyzed: 05/13/2020

Strontium	137	10.0	ug/L	50.0	75.5	123	75-125
Calcium	3920	200	"	2000	1720	110	75-125
Iron	2270	100	"	2000	221	103	75-125
Magnesium	2450	30.0	"	2000	414	102	75-125
Boron	537	150	"	100	410	0	75-125
Manganese	64.6	5.00	"	50.0	12.1	105	75-125

Origins Laboratory, Inc.



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6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Dissolved Metals by 200.8 - Quality Control
GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1996144 - EPA 200.2

MS (1204558923 S)		Source: Y005081-01			Prepared: 05/11/2020 Analyzed: 05/13/2020					
Sodium	350000	2500	ug/L	2000	340000	0	75-125			
Selenium	53.9	5.00	"	50.0	<2.00	107	75-125			
Potassium	3590	300	"	2000	1490	105	75-125			
Barium	105	4.00	"	50.0	52.3	105	75-125			

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

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

DRO by 8015C - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1995841 - SW846 3535A										
BLANK (1204558277-BLK)					Prepared: 05/11/2020 Analyzed: 05/11/2020					
Diesel Range Organics	ND	200	ug/L				-			U
Surrogate: o-Terphenyl	13.6		"	20.0		68	40-109			
LCS (1204558278-BKS)					Prepared: 05/11/2020 Analyzed: 05/11/2020					
Diesel Range Organics	913	200	ug/L	1000		91	45-119			
Surrogate: o-Terphenyl	18.9		"	20.0		94	40-109			
MS (1204558588 S)					Source: 510909001 Prepared: 05/11/2020 Analyzed: 05/11/2020					
Diesel Range Organics	3400	1000	ug/L	5000	<375	68	41-118			
Surrogate: o-Terphenyl	72.8		"	100	59.0	73	40-109			
MSD (1204558589 SD)					Source: 510909001 Prepared: 05/11/2020 Analyzed: 05/11/2020					
Diesel Range Organics	3070	1000	ug/L	5000	<375	61	41-118	10	20	
Surrogate: o-Terphenyl	59.8		"	100	59.0	60	40-109			

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

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

GRO by 8015C - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1996289 -										
BLANK (1204559292-BLK)					Prepared: Analyzed: 05/11/2020					
Gasoline Range Organics	ND	0.100	mg/L				-			U
Surrogate: Bromofluorobenzene	0.0464		"	0.0500		93	75-127			
LCS (1204559293-BKS)					Prepared: Analyzed: 05/11/2020					
Gasoline Range Organics	0.447	0.100	mg/L	0.500		89	80-120			
Surrogate: Bromofluorobenzene	0.0476		"	0.0500		95	75-127			
PS (1204559294 S)					Source: 510982001	Prepared: Analyzed: 05/11/2020				
Gasoline Range Organics	0.530	0.100	mg/L	0.500		75	68-127			
Surrogate: Bromofluorobenzene	0.0407		"	0.0500		81	75-127			
PSD (1204559295 SD)					Source: 510982001	Prepared: Analyzed: 05/11/2020				
Gasoline Range Organics	0.503	0.100	mg/L	0.500		69	68-127	5	30	
Surrogate: Bromofluorobenzene	0.0475		"	0.0500		95	75-127			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Nitrate/Nitrite by EPA 353.2 - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1995314 -										
BLANK (1204557298-BLK)					Prepared: Analyzed: 05/13/2020					
Nitrogen, Nitrate/Nitrite	ND	0.0200	mg/L				-			U
LCS (1204557299-BKS)					Prepared: Analyzed: 05/13/2020					
Nitrogen, Nitrate/Nitrite	1.02	0.0200	mg/L	1.00		102	90-110			
DUP (1204557300 D)					Source: 510564001 Prepared: Analyzed: 05/13/2020					
Nitrogen, Nitrate/Nitrite	0.0260	0.0200	mg/L		0.0279		0-20	7.05	20	
PS (1204557302 S)					Source: 510564001 Prepared: Analyzed: 05/13/2020					
Nitrogen, Nitrate/Nitrite	0.970	0.0200	mg/L	1.00		94.2	90-110			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Total Alkalinity by 2320B - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1995925 -										
LCS (1204558468-BKS)					Prepared: Analyzed: 05/11/2020					
Alkalinity, Total as CaCO ₃	106	4.00	mg/L	100	106		90-110			
DUP (1204558469 D)					Source: 510982001 Prepared: Analyzed: 05/11/2020					
Alkalinity, Total as CaCO ₃	553	4.00	mg/L		543		0-20	1.83	20	
Bicarbonate alkalinity (CaCO ₃)	492	4.00	"		488		0-20	0.818	20	
Carbonate alkalinity (CaCO ₃)	60.2	4.00	"		54.2		0-20	10.5	20	
MS (1204558470 S)					Source: 510982001 Prepared: Analyzed: 05/11/2020					
Alkalinity, Total as CaCO ₃	660	4.00	mg/L	100	543	0	80-120			

Origins Laboratory, Inc.



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Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Total Phosphorus by EPA 365.4 - Quality Control GEL Laboratories, LLC

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1995313 - EPA 365.4 Prep										
BLANK (1204557290-BLK)					Prepared: 05/11/2020 Analyzed: 05/12/2020					
Phosphorus, Total as P	ND	0.0500	mg/L				-			U
LCS (1204557291-BKS)					Prepared: 05/11/2020 Analyzed: 05/12/2020					
Phosphorus, Total as P	1.07	0.0500	mg/L	1.00		107	80-124			
DUP (1204557294 D)					Prepared: 05/11/2020 Analyzed: 05/12/2020					
		Source: 510569001								
Phosphorus, Total as P	0.103	0.0500	mg/L		0.0861		0-41	17.9	41	
MS (1204557295 S)					Prepared: 05/11/2020 Analyzed: 05/12/2020					
		Source: 510569001								
Phosphorus, Total as P	1.11	0.0500	mg/L	1.00	0.0861	102	70-136			

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.



August 17, 2020

PDC Energy Inc.

Karen Olson

4000 Burlington Ave.

Evans

CO

80620

Project Name - DWR Permit #137465

Project Number - AFE#EX000335

Attached are your analytical results for DWR Permit #137465 received by Origins Laboratory, Inc. August 07, 2020. This project is associated with Origins project number Y008106-01.

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

PDC Energy Inc.
4000 Burlington Ave.
Evans CO 80620

Karen Olson
Project Number: AFE#EX000335
Project: DWR Permit #137465

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-080720-1100	Y008106-01	Water	August 7, 2020 11:00	08/07/2020 13:22
INF-080720-1145	Y008106-02	Water	August 7, 2020 11:45	08/07/2020 13:22

Origins Laboratory, Inc.



Jen Pellegrini, Project Manager

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 Inc.
4000 Burlington Ave.
Evans CO 80620

Karen Olson
Project Number: AFE#EX000335
Project: DWR Permit #137465

Client: PDC Energy
Address:
Telephone Number:
Email Address: *Chamling@p3man-jco.com*

Project Manager: Karen Olson
Project Name: DWR Permit # 137465
Project Number: AFE # EX-000335
Samples Collected By: *Chamling J. McFarver*

Fax: 303.265.9645

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix			Analysis	Sample Instructions
				Unpreserved	HCl	HNO ₃	Other	Groundwater	Soil	Air Summa #		
AFE-080720-1100	08/07/20	11:00	3	X				X			RSK 175 - Dissolved gas	1
INP-080720-1145	08/07/20	11:45	3	X				X				2
												3
												4
												5
												6
												7
												8
												9
												10
Relinquished By: <i>R</i>	Date: 8/7/20	Time: 1722		Received By: <i>[Signature]</i>	Date: 8/7/20	Time: 1822		Turnaround Time: Same Day <input type="checkbox"/> 24 Hr <input checked="" type="checkbox"/> 48 Hr <input type="checkbox"/> 72 Hr <input type="checkbox"/> Standard <input type="checkbox"/>				
Relinquished By:	Date:	Time:		Received By:	Date:	Time:						

Date Results Needed

1.7

Origins Laboratory, Inc.

Jefe Pellegrini

Jen Pellegrini, Project Manager

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 Inc.
4000 Burlington Ave.
Evans CO 80620

Karen Olson
Project Number: AFE#EX000335
Project: DWR Permit #137465

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: 1008106

Client: PDC Energy
Client Project ID: DWR Permit #137465

Checklist Completed by: SG

Shipped Via: HD
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 8/7/20

Airbill #: 1112

Matrix(s) Received: (Check all that apply): Soil/Solid X Water Other:

Cooler Number/Temperature: 1 16.7 °C 1 °C 1 °C (Describe) °C

Thermometer ID: 9003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?		<input checked="" type="checkbox"/>		<u>Same Day</u>
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 ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?		<input checked="" type="checkbox"/>		
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<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 ⁽¹⁾ ? (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 HNO ₃ , HCL, H ₂ SO ₄) / (pH >10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)		<input checked="" type="checkbox"/>		
Additional Comments (if any):				

⁽¹⁾ 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: Jm (Project Manager)

8-10-20
Date/Time Reviewed

Origins Laboratory, Inc.

Jen Pellegrini

Jen Pellegrini, Project Manager

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 Inc.
4000 Burlington Ave.
Evans CO 80620

Karen Olson
Project Number: AFE#EX000335
Project: DWR Permit #137465

EFF-080720-1100

8/7/2020 11:00:00AM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Pace Analytical

Y008106-01 (Water)

Dissolved Gasses by RSK 175

Ethane	1180	4.07	13.0	ug/L	1	11111	08/07/2020	08/13/2020
Methane	7800	29.1	100	"	10	"	"	08/14/2020
n-Propane	488	5.48	18.6	"	1	"	"	08/13/2020

Origins Laboratory, Inc.



Jen Pellegrini, Project Manager

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 Inc.
4000 Burlington Ave.
Evans CO 80620

Karen Olson
Project Number: AFE#EX000335
Project: DWR Permit #137465

INF-080720-1145

8/7/2020 11:45:00AM

Analyte	Result	Min Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Pace Analytical

Y008106-02 (Water)

Dissolved Gasses by RSK 175

Ethane	6790	4.07	13.0	ug/L	1	11111	08/07/2020	08/13/2020
Methane	38600	29.1	100	"	10	"	"	08/14/2020
n-Propane	4030	5.48	18.6	"	1	"	"	08/13/2020

Origins Laboratory, Inc.



Jen Pellegrini, Project Manager

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 Inc.

4000 Burlington Ave.

Evans CO 80620

Karen Olson

Project Number: AFE#EX000335

Project: DWR Permit #137465

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Origins Laboratory, Inc.



Jen Pellegrini, Project Manager

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 Inc.

4000 Burlington Ave.

Evans CO 80620

Karen Olson

Project Number: AFE#EX000335

Project: DWR Permit #137465

Notes and Definitions

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported on a wet weight basis.

Origins Laboratory, Inc.



Jen Pellegrini, Project Manager

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.

August 17, 2020

Jennifer Pellegrini
Origins Laboratory, Inc
1725 Elk Place
Denver, CO 80211

RE: Project: Y008106
Pace Project No.: 10527768

Dear Jennifer Pellegrini:

Enclosed are the analytical results for sample(s) received by the laboratory on August 08, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Linda Eshelman
linda.eshelman@pacelabs.com
(612)607-1700
Project Manager

Enclosures

cc: Jordan Merrill, Origins Laboratory, Inc.



REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,
without the written consent of Pace Analytical Services, LLC.

SAMPLE SUMMARY

Project: Y008106

Pace Project No.: 10527768

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10527768001	Y008106-01	Water	08/07/20 11:00	08/08/20 11:10
10527768002	Y008106-02	Water	08/07/20 11:45	08/08/20 11:10

REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,
without the written consent of Pace Analytical Services, LLC.



Your Lab's letterhead here...

Address

City, St. Zip

Phone/Fax

SUBCONTRACT ORDER

Sending Laboratory:

Origins Laboratory, Inc.
1725 West Elk Place
Denver, CO 80211
Phone: 303.433.1322
Fax: 303.265.9645

Project Manager: Jen Pellegrini

Subcontracted Laboratory:

Pace Analytical
1700 Elm St, Suite 200
Minneapolis, MN 55414
Phone: (612) 607-6436
Fax: -

Work Order: Y008106

Analysis	Due	Expires	Comments
----------	-----	---------	----------

Sample ID: Y008106-01 *Water* **Sampled: 08/07/2020 11:00**

Methane, Ethane, and Propane by RSK 175 08/12/2020 08/21/2020 11:00 W1

Containers Supplied:

Sample ID: Y008106-02 *Water* **Sampled: 08/07/2020 11:45**

Methane, Ethane, and Propane by RSK 175 08/12/2020 08/21/2020 11:45 W2

Containers Supplied:

WO# : 10527768



10527768

Released By

Date


8/7/20

Received By

Pace

Date

8/8/20 1110

	Document Name: Sample Condition Upon Receipt (SCUR) - MN	Document Revised: 27Mar2020 Page 1 of 1
	Document No.: ENV-FRM-MIN4-0150 Rev.00	Pace Analytical Services - Minneapolis

Sample Condition Upon Receipt Courier: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> USPS <input type="checkbox"/> Client <input type="checkbox"/> Pace <input type="checkbox"/> SpeedDee <input type="checkbox"/> Commercial <input type="checkbox"/> See Exceptions	Client Name: <u>Origin</u> Tracking Number: <u>7712 1005 3534</u>	Project #: WO# : 10527768 PM: LLE Due Date: 08/14/20 CLIENT: ORIGINS LAB
--	--	---

Custody Seal on Cooler/Box Present? ☐ Yes ☒ No **Seals Intact?** ☐ Yes ☒ No **Biological Tissue Frozen?** ☐ Yes ☐ No ☒ N/A
Packing Material: ☒ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other: _____ **Temp Blank?** ☒ Yes ☐ No
Thermometer: ☐ T1(0461) ☒ T2(1336) ☐ T3(0459) ☐ T4(0254) ☐ T5(0489) **Type of Ice:** ☒ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Did Samples Originate in West Virginia? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Were All Container Temps Taken? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Temp should be above freezing to 6°C Cooler Temp Read w/temp blank: <u>2.5</u> °C Correction Factor: <u>-0.2</u> Cooler Temp Corrected w/temp blank: <u>2.3</u> °C	Average Corrected Temp (no temp blank only): <input type="checkbox"/> See Exceptions <input type="checkbox"/> 1 Container
--	--

USDA Regulated Soil: (☒ N/A, water sample/Other: _____) **Date/Initials of Person Examining Contents:** CEG 8/8/20
 Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No **Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)?** ☐ Yes ☐ No
If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

	COMMENTS:
Chain of Custody Present and Filled Out? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1.
Chain of Custody Relinquished? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2.
Sampler Name and/or Signature on COC? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	3.
Samples Arrived within Hold Time? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	4.
Short Hold Time Analysis (<72 hr)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5. <input type="checkbox"/> Fecal Coliform <input type="checkbox"/> HPC <input type="checkbox"/> Total Coliform/E coli <input type="checkbox"/> BOD/cBOD <input type="checkbox"/> Hex Chrome <input type="checkbox"/> Turbidity <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> Orthophos <input type="checkbox"/> Other
Rush Turn Around Time Requested? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6.
Sufficient Volume? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7.
Correct Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No -Pace Containers Used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	8.
Containers Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
Field Filtered Volume Received for Dissolved Tests? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10. Is sediment visible in the dissolved container? <input type="checkbox"/> Yes <input type="checkbox"/> No
Is sufficient information available to reconcile the samples to the COC? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Matrix: <input checked="" type="checkbox"/> Water <input type="checkbox"/> Soil <input type="checkbox"/> Oil <input type="checkbox"/> Other	11. If no, write ID/ Date/Time on Container Below: <input type="checkbox"/> See Exception
All containers needing acid/base preservation have been checked? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	12. Sample # <input type="checkbox"/> NaOH <input type="checkbox"/> HNO ₃ <input type="checkbox"/> H ₂ SO ₄ <input type="checkbox"/> Zinc Acetate
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO ₃ , H ₂ SO ₄ , <2pH, NaOH >9 Sulfide, NaOH >12 Cyanide) <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Positive for Res. <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Exception
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Chlorine? <input type="checkbox"/> Yes <input type="checkbox"/> No pH Paper Lot# <input type="checkbox"/> Res. Chlorine 0-6 Roll 0-6 Strip 0-14 Strip
Extra labels present on soil VOA or WIDRO containers? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13. <input type="checkbox"/> See Exception
Headspace in VOA Vials (greater than 6mm)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14. Pace Trip Blank Lot # (if purchased):
Trip Blank Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Trip Blank Custody Seals Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No
 Person Contacted: _____ Date/Time: _____
 Comments/Resolution: _____

Project Manager Review: [Signature] **Date:** 8/10/2020
 Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: CEG

August 15, 2020

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc

Pace Analytical - Minnesota

Sample Delivery Group: L1249399
Samples Received: 08/12/2020
Project Number: 10527768
Description: Y008106
Site: 001
Report To: Linda Eshelman
1700 Elm Street Suite 200
Minneapolis, MN 55414

Entire Report Reviewed By:



Nancy McLain
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



Cp: Cover Page	1	¹ Cp
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Cn: Case Narrative	4	
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		⁹ Sc



Y008106-01 L1249399-01 GW

				Collected by	Collected date/time	Received date/time
					08/07/20 11:00	08/12/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method RSK175	WG1525159	1	08/13/20 16:19	08/13/20 16:19	DAH	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method RSK175	WG1525815	10	08/14/20 12:36	08/14/20 12:36	DAH	Mt. Juliet, TN

Y008106-02 L1249399-02 GW

				Collected by	Collected date/time	Received date/time
					08/07/20 11:45	08/12/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method RSK175	WG1525159	1	08/13/20 16:22	08/13/20 16:22	DAH	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method RSK175	WG1525815	10	08/14/20 12:38	08/14/20 12:38	DAH	Mt. Juliet, TN

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Nancy McLain
Project Manager

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Volatile Organic Compounds (GC) by Method RSK175

Analyte	Result ug/l	<u>Qualifier</u>	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	<u>Batch</u>
Methane	7800		29.1	100	10	08/14/2020 12:36	WG1525815
Ethane	1180		4.07	13.0	1	08/13/2020 16:19	WG1525159
Propane	488		5.48	18.6	1	08/13/2020 16:19	WG1525159

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Volatile Organic Compounds (GC) by Method RSK175

Analyte	Result ug/l	<u>Qualifier</u>	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	<u>Batch</u>
Methane	38600		29.1	100	10	08/14/2020 12:38	WG1525815
Ethane	6790		4.07	13.0	1	08/13/2020 16:22	WG1525159
Propane	4030		5.48	18.6	1	08/13/2020 16:22	WG1525159

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc

Method Blank (MB)

(MB) R3559554-2 08/13/20 15:04

	MB Result	MB Qualifier	MB MDL	MB RDL
Analyte	ug/l		ug/l	ug/l
Ethane	U		4.07	13.0
Propane	U		5.48	18.6

L1247769-16 Original Sample (OS) • Duplicate (DUP)

(OS) L1247769-16 08/13/20 15:23 • (DUP) R3559554-3 08/13/20 15:45

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	ug/l	ug/l		%		%
Ethane	U	U	1	0.000		20
Propane	U	U	1	0.000		20

L1248875-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1248875-01 08/13/20 16:07 • (DUP) R3559554-4 08/13/20 16:24

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	ug/l	ug/l		%		%
Ethane	U	U	1	0.000		20
Propane	U	U	1	0.000		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3559554-1 08/13/20 14:56 • (LCSD) R3559554-7 08/13/20 16:31

	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Analyte	ug/l	ug/l	ug/l	%	%	%			%	%
Ethane	129	123	123	95.3	95.3	85.0-115			0.000	20
Propane	186	175	177	94.1	95.2	85.0-115			1.14	20

L1247769-21 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1247769-21 08/13/20 15:41 • (MS) R3559554-5 08/13/20 16:27 • (MSD) R3559554-6 08/13/20 16:29

	Spike Amount	Original Result	MS Result	MSD Result	MS Rec.	MSD Rec.	Dilution	Rec. Limits	MS Qualifier	MSD Qualifier	RPD	RPD Limits
Analyte	ug/l	ug/l	ug/l	ug/l	%	%		%			%	%
Ethane	129	31.9	152	149	93.1	90.8	1	85.0-115			1.99	20
Propane	186	U	172	174	92.5	93.5	1	85.0-115			1.16	20

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc

Method Blank (MB)

(MB) R3559843-2 08/14/20 10:35				
	MB Result	<u>MB Qualifier</u>	MB MDL	MB RDL
Analyte	ug/l		ug/l	ug/l
Methane	U		2.91	10.0

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

L1247826-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1247826-01 08/14/20 10:53 • (DUP) R3559843-3 08/14/20 12:07					
	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u> DUP RPD Limits
Analyte	ug/l	ug/l		%	%
Methane	U	U	1	0.000	20

L1247846-08 Original Sample (OS) • Duplicate (DUP)

(OS) L1247846-08 08/14/20 12:10 • (DUP) R3559843-4 08/14/20 12:41					
	Original Result	DUP Result	Dilution	DUP RPD	<u>DUP Qualifier</u> DUP RPD Limits
Analyte	ug/l	ug/l		%	%
Methane	U	U	1	0.000	20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3559843-1 08/14/20 10:29 • (LCSD) R3559843-5 08/14/20 12:43								
	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	<u>LCS Qualifier</u>	<u>LCSD Qualifier</u> RPD RPD Limits
Analyte	ug/l	ug/l	ug/l	%	%	%		% %
Methane	67.8	66.3	68.7	97.8	101	85.0-115		3.56 20



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico ¹	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina ¹	DW21704
Georgia	NELAP	North Carolina ³	41
Georgia ¹	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky ^{1 6}	90010	South Carolina	84004
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1 4}	2006
Louisiana ¹	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas ⁵	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP, LLC EMLAP	100789
A2LA – ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ⁶ Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



Internal Transfer Chain of Custody

☐ Samples Pre-Logged into eCOC.

State Of Origin: CO

Cert. Needed: ☐ Yes ☐ No

Owner Received Date: 8/8/2020

Results Requested By: 8/14/2020



Workorder: 10527768

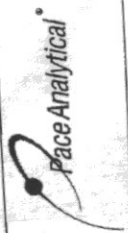
Workorder Name: Y008106

Report To		Subcontract To		Requested Analysis																	
Linda Eshelman Pace Analytical Minnesota 1700 Elm Street Suite 200 Minneapolis, MN 55414 Phone (612)607-1700		Pace Analytical National 12065 Lebanon Rd Mt. Juliet, TN 37122 Phone (615)758-5858		<div style="float: right; text-align: right;"> <p>L1249399</p> <p>D068</p> </div>																	
Item	Sample ID	Sample Type	Collect Date/Time	Lab ID	Matrix	HCLVGS	LAB USE ONLY														
1	Y008106-01	PS	8/7/2020 11:00	10527768001	Water	1 3	X														
2	Y008106-02	PS	8/7/2020 11:45	10527768002	Water	1 3	X														
3																					
4																					
5																					
Transfers							Comments														
Released By	Date/Time	Received By	Date/Time																		
1	8/11/20 1440			RUSH due 8/14/2020																	
2																					
3			8-12-20	0845																	
Cooler Temperature on Receipt 2.1 °C		Custody Seal (Y) or N		Received on Ice (Y) or N		Samples Intact (Y) or N															

***In order to maintain client confidentiality, location/name of the sampling site, sampler's name and signature may not be provided on this COC document.
This chain of custody is considered complete as is since this information is available in the owner laboratory.

MP12
2.2-1=2.1
RAD SCREEN: <0.5 mR/hr

112191989



Document Name: **Sample Condition Upon Receipt (SCUR) - MN**
Document No.: **ENV-FRM-MIN4-0150 Rev.00**
Document Revised: **27Mar2020**
Page **1 of 1**
Pace Analytical Services - **Minneapolis**

Sample Condition Upon Receipt

Client Name: Origin

Project #: **W0# : 10527768**

PM: **LL** Due Date: **08/14/20**
CLIENT: **ORIGINS LAB**

Courier:

☒ Fed Ex ☐ UPS ☐ USPS ☐ Client
☐ Pace ☐ Speedee ☐ Commercial ☐ See Exceptions

Tracking Number: 7712 1055 3534

Custody Seal on Cooler/Box Present? ☐ Yes ☒ No

Packing Material: ☒ Bubble Wrap ☐ None ☐ Other: _____

Thermometer: ☐ T1(0461) ☒ T2(1336) ☐ T3(0459) ☐ T4(0254) ☐ T5(0489)

Did Samples Originate in West Virginia? ☐ Yes ☒ No

Temp should be above freezing to 6°C

Cooler Temp Read w/ temp blank: 2.5 °C

Correction Factor: -0.2 Cooler Temp Corrected w/ temp blank: 2.3

USDA Regulated Soil: (☒ N/A, water sample/Other: _____)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☒ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

Date/Initials of Person Examining Contents: CEG 8/18/20

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☒ No

COMMENTS:

Chain of Custody Present and Filled Out?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1.
Chain of Custody Relinquished?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2.
Sampler Name and/or Signature on COC?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	3.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	4.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5.
Rush Turn Around Time Requested?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7.
Correct Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8.
-Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10.
Field Filtered Volume Received for Dissolved Tests?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	11.
Is sufficient information available to reconcile the samples to the COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12.
Matrix: <input checked="" type="checkbox"/> Water <input type="checkbox"/> Soil <input type="checkbox"/> Oil <input type="checkbox"/> Other		13.
All containers needing acid/base preservation have been checked?	<input type="checkbox"/> Yes <input type="checkbox"/> No	14.
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO ₃ , H ₂ SO ₄ , <2pH, NaOH >9 Sulfide, NaOH >12 Cyanide)	<input type="checkbox"/> Yes <input type="checkbox"/> No	15.
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	<input type="checkbox"/> Yes <input type="checkbox"/> No	16.
Extra labels present on soil VOA or WIDRO containers? Headspace in VOA Vials (greater than 6mm)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	17.
Trip Blank Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	18.
Trip Blank Custody Seals Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	19.

Field Filtered Volume Received for Dissolved Tests?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	20.
Is sediment visible in the dissolved container?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	21.
11. If no, write ID/ Date/Time on Container Below:		22.
12. Sample #	<input type="checkbox"/> NaOH <input type="checkbox"/> HNO ₃ <input type="checkbox"/> H ₂ SO ₄ <input type="checkbox"/> Zinc Acetate	23.
Positive for Res. Chlorine?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	24.
Res. Chlorine	0-6 Roll	25.
0-6 Strip	0-14 Strip	26.
13.		27.
14.		28.

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: _____

Comments/Resolution: _____

Date/Time: _____

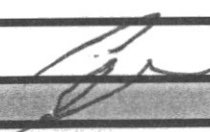
Field Data Required? ☐ Yes ☒ No

Project Manager Review: [Signature] Date: 8/10/2020

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: CEG

Pace Analytical National Center for Testing & Innovation
Cooler Receipt Form

Client: PACEMW		U249399	
Cooler Received/Opened On: 8 / 11 / 20		Temperature: 2.4	
Received By: joey brent			
Signature: 			
Receipt Check List	NP	Yes	No
COC Seal Present / Intact?		✓	
COC Signed / Accurate?		✓	
Bottles arrive intact?		✓	
Correct bottles used?		✓	
Sufficient volume sent?		✓	
If Applicable			
VOA Zero headspace?		✓	
Preservation Correct / Checked?			

TH 1320 75236893

Tasman Geosciences
6855 West 119th Avenue
Broomfield CO 80020

Christine Hamlin
Project Number: [none]
Project: PDC - Morales Methane Investigation

Notes and Definitions

Ua Sample is Non-Detect.

U Result not detected above the detection limit

~9000 ~9000

~1400 ~1400

~100 ~100

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

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.

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

August 13, 2020

Karen Olson

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: DWR Permit #137465

Work Order # 2008082

Enclosed are the results of analyses for samples received by Summit Scientific on 08/12/20 11:54. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury

President



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

Project: DWR Permit #137465

Project Number: AFE #EX-000335

Project Manager: Karen Olson

Reported:
08/13/20 12:11

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-081220-0832	2008082-01	Water	08/12/20 08:32	08/12/20 11:54
INF-081220-0927	2008082-02	Water	08/12/20 09:27	08/12/20 11:54

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.

Summit Scientific

S₂

20080822

4653 Table Mountain Drive ♦ Golden, Colorado 80403
303-277-9310

Page 1 of 1

Client: PDC Energy / Tasman

Project Manager: Karen Olson

Address: 6855 W. 119th Ave.

E-Mail: Karen.Olson@pdce.com; chamlin@tasman-geo.com

City/State/Zip: Broomfield / CO / 80020

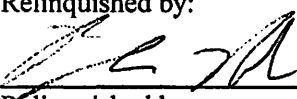
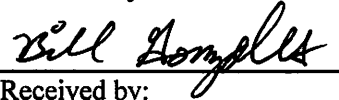
Phone: 303-487-1228

Project Name: DWR Permit # 137465

Sampler Name:

Project Number: AFE # EX-000335

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested								Special Instructions
					HCl	HNO3	None	Other	Water	Soil	Air-Canister #	Other	RSK-175 (Dissolved Gases)								
1	FFF-081220-0832	08/12/20	0832	3			X		X					X							
2	INF-081220-0927	08/12/20	0927	3			X		X					X							
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Relinquished by: 	Date/Time: 8/11/20 11:54	Received by: 	Date/Time: 8-12-20 11:54	Turn Around Time (Check) Same Day <input type="checkbox"/> 72 hours <input type="checkbox"/> 24 hours <input checked="" type="checkbox"/> Standard <input type="checkbox"/> 48 hours <input type="checkbox"/>	Notes: on 1 u
Relinquished by:	Date/Time:	Received by:	Date/Time:	Sample Integrity: Temperature Upon Receipt: 10.2 Samples Intact: <input checked="" type="radio"/> Yes <input type="radio"/> No	
Relinquished by:	Date/Time:	Received by:	Date/Time:		

Sample Receipt Checklist

S2 Work Order 2008082

DWR Permit #137465

Client: PDC Energy / Tasman Client Project ID: 2008082

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

Matrix (check all that apply): _____ Air _____ Soil/Solid _____ Water X Other: _____
(Describe)

Temp (°C)	<u>10.2</u>
-----------	-------------

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.				
Were all samples received intact ⁽¹⁾ ?	<u>X</u>			
Was adequate sample volume provided ⁽¹⁾ ?	<u>X</u>			
If custody seals are present, are they intact ⁽¹⁾ ?			<u>X</u>	
Are samples with holding times due within 48 hours sample due within 48 hours present?	<u>X</u>			<u>24 hr Turn</u>
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	<u>X</u>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<u>X</u>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<u>X</u>			
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<u>X</u>			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		<u>X</u>		
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect			<u>X</u>	
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ? Record the pH in Comments.			<u>X</u>	
If dissolved metals are requested, were samples field filtered?			<u>X</u>	

Additional Comments (if any):

⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.

BG
Custodian Printed Name or Initials

Bill Gonzales
Signature of Custodian

8-12-20 11:54
Date/Time



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

Project: DWR Permit #137465

Project Number: AFE #EX-000335

Project Manager: Karen Olson

Reported:
08/13/20 12:11

EFF-081220-0832

2008082-01 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/12/20 08:32**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Methane	3.3	1.0	mg/L	100	2008114	08/12/20	08/13/20	RSK-175 mod	
Ethane	0.95	0.10	"	10	"	"	"	"	
Propane	0.46	0.010	"	1	"	"	"	"	

Date Sampled: **08/12/20 08:32**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						

Surrogate: Ethene

111 %

70-130

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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: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/13/20 12:11

INF-081220-0927
2008082-02 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/12/20 09:27**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Methane	10	1.0	mg/L	100	2008114	08/12/20	08/13/20	RSK-175 mod	
Ethane	2.8	1.0	"	"	"	"	"	"	
Propane	2.4	0.10	"	10	"	"	"	"	

Date Sampled: **08/12/20 09:27**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
Surrogate: Ethene		126 %	70-130		"	"	"	"	

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: DWR Permit #137465

Project Number: AFE #EX-000335

Project Manager: Karen Olson

Reported:
08/13/20 12:11

Dissolved Gases by RSK-175 - Quality Control

Summit Scientific

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

Batch 2008114 - GC

Blank (2008114-BLK1)

Prepared: 08/12/20 Analyzed: 08/13/20

Methane	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Propane	ND	0.010	"							
Surrogate: Ethene	0.0436		"	0.0364	120	70-130				

LCS (2008114-BS1)

Prepared: 08/12/20 Analyzed: 08/13/20

Methane	0.037	0.010	mg/L	0.0428	85.8	70-130				
Ethane	0.10	0.010	"	0.0798	130	70-130				
Propane	0.15	0.010	"	0.139	110	70-130				
Surrogate: Ethene	0.0885		"	0.0728	122	70-130				

LCS Dup (2008114-BSD1)

Prepared: 08/12/20 Analyzed: 08/13/20

Methane	0.037	0.010	mg/L	0.0428	86.0	70-130	0.272	200		
Ethane	0.10	0.010	"	0.0798	126	70-130	3.04	200		
Propane	0.16	0.010	"	0.139	115	70-130	4.43	200		
Surrogate: Ethene	0.0928		"	0.0728	127	70-130				

Duplicate (2008114-DUP1)

Source: 2008082-01

Prepared: 08/12/20 Analyzed: 08/13/20

Methane	2.1	1.0	mg/L		3.3		46.3	30		QR-04
Ethane	0.97	0.10	"		0.95		1.87	30		
Propane	0.45	0.010	"		0.46		0.528	30		
Surrogate: Ethene	0.0412		"	0.0364	113	70-130				

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: DWR Permit #137465

Project Number: AFE #EX-000335

Project Manager: Karen Olson

Reported:
08/13/20 12:11

Notes and Definitions

QR-04	The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.
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

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

August 20, 2020

Karen Olson

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: DWR Permit #137465

Work Order #2008172

Enclosed are the results of analyses for samples received by Summit Scientific on 08/19/20 17:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Muri Premier", is displayed on a light purple rectangular background.

Muri Premier For Paul Shrewsbury
President



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

Project: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/20/20 16:00

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-081920-0855	2008172-01	Water	08/19/20 08:55	08/19/20 17:30
INF-081920-0956	2008172-02	Water	08/19/20 09:56	08/19/20 17:30

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.

2008172

Summit Scientific

S₂

4653 Table Mountain Drive ♦ Golden, Colorado 80403
303-277-9310

Page 1 of 1

Client: PDC Energy / Tasman Project Manager: Karen Olson
Address: 6855 W. 119th Ave. E-Mail: Karen.Olson@pdce.com; chamlin@tasman-geo.com
City/State/Zip: Broomfield / CO / 80020
Phone: 303-487-1228 Project Name: DWR Permit # 137465
Sampler Name: Brooks Nelson Project Number: AFE # EX-000335

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested								Special Instructions
					HCl	HNO ₃	None	Other	Water	Soil	Air-Canister #	Other	RSK-175 (Dissolved Gases)								
1	EFF-081920-0855	8/19/20	855	3			X		X					X							
2	INF-081920-0956	8/19/20	956	3			X		X					X							
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Relinquished by: <u>[Signature]</u>	Date/Time: <u>8/19/20</u> <u>11:00</u>	Received by: <u>Tasman Lock Box</u>	Date/Time: <u>8/19/20</u> <u>11:00</u>	Turn Around Time (Check) Same Day <u> </u> 72 hours <u> </u> 24 hours <u>X</u> Standard <u> </u> 48 hours <u> </u>	Notes:
Relinquished by: <u>Tasman Lock Box</u>	Date/Time: <u>08/19/2020</u> <u>1730</u>	Received by: <u>[Signature]</u>	Date/Time: <u> </u>	Sample Integrity: Temperature Upon Receipt: <u>4.8</u>	
Relinquished by: <u> </u>	Date/Time: <u> </u>	Received by: <u> </u>	Date/Time: <u> </u>	Samples Intact: <u>Yes</u> No <u> </u>	

Sample Receipt Checklist

S2 Work Order 2008172

Client: POC/TABMAN Client Project ID: DWR Permit #137465

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

☐ ☒ ☐ ☐ ☐

Matrix (check all that apply): ☐ Air ☐ Soil/Solid ☒ Water ☐ Other: _____ (Describe)

Temp (°C) 4.8

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.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If custody seals are present, are they intact ⁽¹⁾ ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples with holding times due within 48 hours sample due within 48 hours present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ? Record the pH in Comments.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If dissolved metals are requested, were samples field filtered?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Additional Comments (if any):

⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.

Custodian Printed Name or Initials TEB

Signature of Custodian [Signature]

Date/Time 08/19/2020



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

Project: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/20/20 16:00

EFF-081920-0855

2008172-01 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/19/20 08:55**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Methane	2.2	1.0		mg/L	100	2008206	08/19/20	08/20/20	RSK-175 mod	
Ethane	1.2	0.10		"	10	"	"	"	"	
Propane	0.75	0.10		"	"	"	"	"	"	

Date Sampled: **08/19/20 08:55**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								

Surrogate: Ethene

118 %

70-130

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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: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/20/20 16:00

INF-081920-0956
2008172-02 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/19/20 09:56**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Methane	12	1.0		mg/L	100	2008206	08/19/20	08/20/20	RSK-175 mod	
Ethane	3.9	1.0		"	"	"	"	"	"	
Propane	2.8	0.10		"	10	"	"	"	"	

Date Sampled: **08/19/20 09:56**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: Ethene		126 %		70-130		"	"	"	"	

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: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/20/20 16:00

Dissolved Gases by RSK-175 - Quality Control
Summit Scientific

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

Batch 2008206 - GC

Blank (2008206-BLK1)

Prepared: 08/19/20 Analyzed: 08/20/20

Methane	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Propane	ND	0.010	"							
Surrogate: Ethene	0.0468		"	0.0364	129	70-130				

LCS (2008206-BS1)

Prepared: 08/19/20 Analyzed: 08/20/20

Methane	0.036	0.010	mg/L	0.0428	83.2	70-130				
Ethane	0.10	0.010	"	0.0798	127	70-130				
Propane	0.15	0.010	"	0.139	108	70-130				
Surrogate: Ethene	0.0887		"	0.0728	122	70-130				

Duplicate (2008206-DUP1)

Source: 2008172-01

Prepared: 08/19/20 Analyzed: 08/20/20

Methane	2.3	1.0	mg/L		2.2			1.79	30	
Ethane	1.0	0.10	"		1.2			9.28	30	
Propane	0.68	0.10	"		0.75			10.0	30	
Surrogate: Ethene	0.0410		"	0.0364	113	70-130				

Matrix Spike (2008206-MS1)

Source: 2008172-01

Prepared: 08/19/20 Analyzed: 08/20/20

QM-02

Methane	2.7	1.0	mg/L	0.0428	2.2	NR	70-130			
Ethane	1.2	1.0	"	0.0798	1.2	60.1	70-130			
Propane	0.77	1.0	"	0.139	0.75	12.2	70-130			S-03
Surrogate: Ethene	0.103		"	0.0728	141	70-130				

Summit Scientific

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

Project: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/20/20 16:00

Notes and Definitions

S-03	The surrogate recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
QM-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
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

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

August 28, 2020

Karen Olson

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: DWR Permit #137465

Work Order #2008240

Enclosed are the results of analyses for samples received by Summit Scientific on 08/26/20 16:59. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. Shrewsbury', with a stylized, cursive script.

Paul Shrewsbury

President



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

Project: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/28/20 08:53

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-082620-0921	2008240-01	Water	08/26/20 09:21	08/26/20 16:59
INF-082620-1013	2008240-02	Water	08/26/20 10:13	08/26/20 16:59

CASE NARRATIVE

The sample IDs were changed per request by BN. The sample times were added to the end of the ID.

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.

Summit Scientific

S₂

2008240

4653 Table Mountain Drive ♦ Golden, Colorado 80403
303-277-9310

Page 1 of 1

Client: PDC Energy / Tasman

Project Manager: Karen Olson

Address: 6855 W. 119th Ave.

E-Mail: Karen.Olson@pdce.com; chamlin@tasman-geo.com

City/State/Zip: Broomfield / CO / 80020

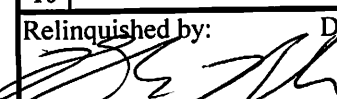
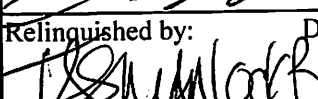

Phone: 303-487-1228

Project Name: DWR Permit # 137465

Sampler Name: Brock Nelson

Project Number: AFE # EX-000335

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested								Special Instructions
					HCl	HNO ₃	None	Other	Water	Soil	Air-Canister #	Other	RSK-175 (Dissolved Gases)								
1	EFF-082620-	8/26/20	921	3			X		X					X							
2	INF-082620-	8/26/20	1013	3			X		X					X							
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Relinquished by: 	Date/Time: 8/26/20 1240	Received by: Tasman Code Box	Date/Time: 8/26/20 1240	Turn Around Time (Check) Same Day <input type="checkbox"/> 72 hours <input type="checkbox"/> 24 hours <input checked="" type="checkbox"/> Standard <input type="checkbox"/> 48 hours <input type="checkbox"/> Sample Integrity: Temperature Upon Receipt: 3.6 Samples Intact: <input checked="" type="radio"/> Yes <input type="radio"/> No	Notes:
Relinquished by: 	Date/Time: 8/26/20 1700	Received by: 	Date/Time: 8/26/20 1700		
Relinquished by:	Date/Time:	Received by:	Date/Time:		

Sample Receipt Checklist

S2 Work Order 2008240

Client: POC / T. Brown Client Project ID: DWR Permit # 13745

Shipped Via: ☐ H.D. ☒ P.U. ☐ FedEx ☐ UPS ☐ USPS ☐ Other _____ Airbill #: _____

Matrix (check all that apply): ☐ Air ☐ Soil/Solid ☒ Water ☐ Other: _____
(Describe)

Temp (°C) 3.6

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.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If custody seals are present, are they intact ⁽¹⁾ ?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples with holding times due within 48 hours sample due within 48 hours present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24 Hour TAT
Is a chain-of-custody (COC) form present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) ⁽¹⁾ ? Note the type of preservative in the Comments column – HCl, H2SO4, NaOH, HNO3, ect	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If samples are acid preserved for metals, is the pH ≤ 2 ⁽¹⁾ ? Record the pH in Comments.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If dissolved metals are requested, were samples field filtered?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Additional Comments (if any):

⁽¹⁾ If NO, then contact the client before proceeding with analysis and note in case narrative.

76
Custodian Printed Name or Initials

[Signature]
Signature of Custodian

6/26/2020
Date/Time



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

Project: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/28/20 08:53

EFF-082620-0921

2008240-01 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/26/20 09:21**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
Methane	2.9	1.0	mg/L	100	2008270	08/26/20	08/27/20	RSK-175 mod	
Ethane	0.99	0.10	"	10	"	"	"	"	
Propane	0.65	0.10	"	"	"	"	"	"	

Date Sampled: **08/26/20 09:21**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						

Surrogate: Ethene

113 %

70-130

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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: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/28/20 08:53

INF-082620-1013
2008240-02 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/26/20 10:13**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Methane	11	1.0		mg/L	100	2008270	08/26/20	08/27/20	RSK-175 mod	
Ethane	3.7	1.0		"	"	"	"	"	"	
Propane	2.0	1.0		"	"	"	"	"	"	

Date Sampled: **08/26/20 10:13**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
<i>Surrogate: Ethene</i>		110 %		70-130		"	"	"	"	

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: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/28/20 08:53

Dissolved Gases by RSK-175 - Quality Control
Summit Scientific

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

Batch 2008270 - GC

Blank (2008270-BLK1)

Prepared: 08/26/20 Analyzed: 08/27/20

Methane	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Propane	ND	0.010	"							
Surrogate: Ethene	0.0397		"	0.0364	109		70-130			

LCS (2008270-BS1)

Prepared: 08/26/20 Analyzed: 08/27/20

Methane	0.036	0.010	mg/L	0.0428	84.4		70-130			
Ethane	0.10	0.010	"	0.0798	129		70-130			
Propane	0.15	0.010	"	0.139	109		70-130			
Surrogate: Ethene	0.0916		"	0.0728	126		70-130			

Duplicate (2008270-DUP1)

Source: 2008239-01

Prepared: 08/26/20 Analyzed: 08/27/20

Methane	10	1.0	mg/L	18		53.7	30	QR-03
Ethane	4.6	1.0	"	12		88.1	30	QR-03
Propane	2.3	1.0	"	3.1		27.8	30	
Surrogate: Ethene	0.0398		"	0.0364	109		70-130	

Matrix Spike (2008270-MS1)

Source: 2008239-01

Prepared: 08/26/20 Analyzed: 08/27/20

Methane	11	1.0	mg/L	0.0428	18	NR	70-130	QR-03
Ethane	4.9	1.0	"	0.0798	12	NR	70-130	QR-03
Propane	2.5	1.0	"	0.139	3.1	NR	70-130	QR-03
Surrogate: Ethene	0.0773		"	0.0728	106		70-130	

Summit Scientific

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

Project: DWR Permit #137465
Project Number: AFE #EX-000335
Project Manager: Karen Olson

Reported:
08/28/20 08:53

Notes and Definitions

QR-03 The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.

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

ATTACHMENT B

DWR WATER WELL PERMIT # 137465
Methane Mitigation System
Photographic Overview

Well Ventilation



Water Treatment System

