

# Summit Scientific

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4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

June 03, 2022

Karen Olson

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: DWR Permit #137465

Work Order #2205410

Enclosed are the results of analyses for samples received by Summit Scientific on 05/26/22 14:09. 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:**  
06/03/22 12:26

#### ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-052622-1158	2205410-01	Water	05/26/22 11:58	05/26/22 14:09
INF-052622-1252	2205410-02	Water	05/26/22 12:52	05/26/22 14:09

Summit Scientific

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2205410

# Summit Scientific

S<sub>2</sub>

4653 Table Mountain Drive ♦ Golden, Colorado 80403

303-277-9310

Page 1 of 1

Client: PDC Energy / Tasman Geosciences

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: Bryce Goldade

Project Number: AFE # EX-000335

ID	Sample Description	Date Sampled	Time Sampled	# of containers	Preservative				Matrix				Analysis Requested				Special Instructions
					HCl	HNO <sub>3</sub>	None	Other	Water	Soil	Air-Canister #	Other	RSK-175 (Dissolved Gases)	D16 Gas Composition	D16 Methane (Carbon)	D16 Methane (Hydrogen)	
1	BFF-052622-1158	05/26/22	1158	3			X		X				X				
2	INF-052622-1252	I	1252	3			X		X				X				
3	INF-052622-1252	I	1252	1				X	X					X	X	X	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Relinquished by: Date/Time:

Bryce J Goldade 5/26/22 1409

Received by: Date/Time:

Tasman Dropbox 05/26/22 1409

Relinquished by: Date/Time:

Received by: 5/26/22 1845

Relinquished by: Date/Time:

Received by: Date/Time:

Turn Around Time (Check)

Same Day \_\_\_\_\_ 72 hours \_\_\_\_\_

24 hours X Standard \_\_\_\_\_

48 hours \_\_\_\_\_

Sample Integrity: \_\_\_\_\_

Temperature Upon Receipt: \_\_\_\_\_

Samples Intact: Yes No

Notes:

Please provide data in  
PDF and COGCC EDD  
formats.COGCC Facility No.:  
765500

S<sub>2</sub>

## Sample Receipt Checklist

S2 Work Order# 2205410Client: PDC Energy Client Project ID: DWR permit 13746

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

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Matrix (Check all that apply) Air ☐ Soil/Solid ☒ Water ☐ Other ☐Temp (°C) 17.8° Thermometer # 02

	Yes	No	N/A	Comments (if any)
If samples require cooling, is the temperature < 6 °C <sup>(1)</sup> ? <b>NOTE:</b> If samples are delivered the same day of sampling, this requirement is met if there is evidence that cooling has begun.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
If custody seals are present, are they intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are samples due within 48 hours present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are water samples with short hold times present? Note the short hold analysis in the comments column - pH, Nitrate/Nitrite, Ferrous Iron (Fe <sup>2+</sup> ), Hexavalent Chromium (Cr <sup>6+</sup> , Cr VI), COD/BOD, Total Coliform, E. Coli, Total Residual Chlorine (TRC), Dissolved Oxygen	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) form present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client w/ date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace present? <b>If yes, contact client and note in narrative.</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ? Note the type of preservative in the comments column – HCl, H <sub>2</sub> SO <sub>4</sub> , NaOH, HNO <sub>3</sub> , etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
If samples are acid preserved for metals, is the pH ≤ 2 <sup>(1)</sup> ? 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):				
<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in case narrative.				

  
 Custodian Printed Name

5/26/22 <sup>1845</sup>  
 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:**  
06/03/22 12:26

**EFF-052622-1158**  
**2205410-01 (Water)**

**Summit Scientific**

**Dissolved Gases by RSK-175**

Date Sampled: **05/26/22 11:58**

Analyte	Result	Reporting		Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit	Units						
<b>Methane</b>	<b>0.79</b>	0.10	mg/L	10	BFE0676	05/28/22	05/31/22	RSK-175 mod	
<b>Ethane</b>	<b>0.22</b>	0.10	"	"	"	"	"	"	
<b>Propane</b>	<b>0.37</b>	0.10	"	"	"	"	"	"	

Date Sampled: **05/26/22 11:58**

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

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Denver CO, 80203

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

**Reported:**  
06/03/22 12:26

**INF-052622-1252**  
**2205410-02 (Water)**

**Summit Scientific**

**Dissolved Gases by RSK-175**

Date Sampled: **05/26/22 12:52**

Analyte	Result	Reporting	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit							
<b>Methane</b>	<b>7.5</b>	1.0	mg/L	100	BFE0676	05/28/22	05/31/22	RSK-175 mod	
<b>Ethane</b>	<b>1.7</b>	1.0	"	"	"	"	"	"	
<b>Propane</b>	<b>1.1</b>	1.0	"	"	"	"	"	"	

Date Sampled: **05/26/22 12:52**

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

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Project: DWR Permit #137465  
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**Reported:**  
06/03/22 12:26

**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 BFE0676 - GC**

**Blank (BFE0676-BLK1)**

Prepared: 05/28/22 Analyzed: 05/30/22

Methane	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Propane	ND	0.010	"							
Surrogate: Ethene	0.0431		"	0.0364		118	70-130			

**LCS (BFE0676-BS1)**

Prepared: 05/28/22 Analyzed: 05/30/22

Methane	0.034	0.010	mg/L	0.0428		79.5	70-130			
Ethane	0.097	0.010	"	0.0798		122	70-130			
Propane	0.14	0.010	"	0.139		101	70-130			
Surrogate: Ethene	0.0927		"	0.0728		127	70-130			

**Duplicate (BFE0676-DUP1)**

Source: 2205410-01

Prepared: 05/28/22 Analyzed: 05/31/22

Methane	0.87	0.10	mg/L		0.79			10.1	30	
Ethane	0.25	0.10	"		0.22			12.4	30	
Propane	0.46	0.10	"		0.37			21.3	30	
Surrogate: Ethene	0.0300		"	0.0364		82.4	70-130			

**Matrix Spike (BFE0676-MS1)**

Source: 2205410-01

Prepared: 05/28/22 Analyzed: 05/31/22

Methane	1.8	1.0	mg/L	0.0428	0.79	NR	70-130			QM-07
Ethane	0.60	1.0	"	0.0798	0.22	476	70-130			QM-07
Propane	0.53	1.0	"	0.139	0.37	115	70-130			
Surrogate: Ethene	0.100		"	0.0728		137	70-130			QM-07

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**dig**  
Dolan Integration Group

## Geochemistry for Energy

11025 Dover Street Unit 800  
Westminster, CO 80021  
p: 303.531.2030

### Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

**Job #:** 22057558  
**Lab #:** DIG-028077  
**Client:** Summit Scientific  
**Sample Name(s):** INF-052622-1252

The analytical results, opinions, or interpretations contained in this report are based upon information and material supplied by the client for whose exclusive and confidential use this report has been made. The analytical results, opinions, or interpretations expressed represent the best judgment of Dolan Integration Group based on its experience, but any interpretation of test or other data, and any recommendation(s) based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions which are not infallible, and with respect to which professional engineers and analysts may differ. Accordingly, Dolan Integration Group makes no warranty or representation, expressed or implied, of any type, and expressly disclaims same as to the productivity, proper operations, or profitability of any oil, gas, coal, or other mineral, property, well, or sand in connection with which such report is used or relied upon for any reason whatsoever. This report shall not be reproduced, in whole or in part, without the written approval of Dolan Integration Group.

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# Analytical Report



Job #: 22057558  
 Lab #: DIG-028077  
 Client: Summit Scientific  
 Sample Name: INF-052622-1252  
 Date Sampled: 05/26/22  
 Time Sampled: 12:52  
 Sample Description: Isoflask  
 Sampling Notes:  
 Date Received: 05/27/22  
 Date Analyzed: Gas Composition: 05/27/22  $\delta^{13}\text{C}$ : 05/31/22  $\delta\text{D}$ : 05/31/22  
 Date Reported: 06/02/22  
 Comments:

Measured Values:	Measured ppm	Analyte mol % <sup>a</sup>	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	$\delta\text{D}$ ‰ VSMOW	Comments
Nitrogen (N <sub>2</sub> )	275646	43.79	-	-	-	
Oxygen + Argon (O <sub>2</sub> +Ar)	31024	4.93	-	-	-	
Carbon Dioxide (CO <sub>2</sub> )	1047	0.17	-	-	-	
Helium (He) <sup>b</sup>	na	na	-	-	-	Helium added to create headspace.
Hydrogen (H <sub>2</sub> )	na	na	-	-	-	
Methane (CH <sub>4</sub> )	292066	46.40	90.78	-62.6	-269	
Ethane (C <sub>2</sub> H <sub>6</sub> )	18520	2.94	5.76		-	
Ethene (C <sub>2</sub> H <sub>4</sub> )	nd	nd	nd		-	
Propane (C <sub>3</sub> H <sub>8</sub> )	8180	1.30	2.54		-	
iso-Butane (C <sub>4</sub> H <sub>10</sub> )	1037	0.16	0.32		-	
n-Butane (C <sub>4</sub> H <sub>10</sub> )	1467	0.23	0.46		-	
iso-Pentane (C <sub>5</sub> H <sub>12</sub> )	257	0.04	0.08		-	
n-Pentane (C <sub>5</sub> H <sub>12</sub> )	196	0.03	0.06		-	
Hexanes + (C <sub>6</sub> H <sub>14</sub> )	nd	nd	nd		-	

Calculated Values:	
Total HCs (ppm)	321724
Gas Wetness (mol % C <sub>2</sub> +C <sub>1</sub> +) )	9.22
C <sub>1</sub> /(C <sub>2</sub> +C <sub>3</sub> ) (mol/mol)	11

<sup>a</sup> Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. % )

<sup>b</sup> Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

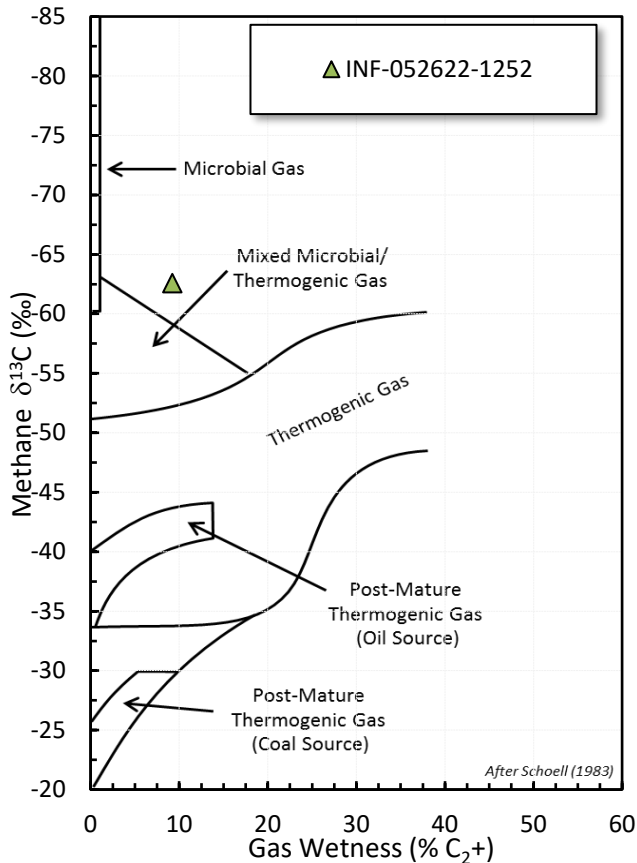
Stable isotope results based on multi-point laboratory calibration

Error  $\delta^{13}\text{C}$  < 0.5 ‰

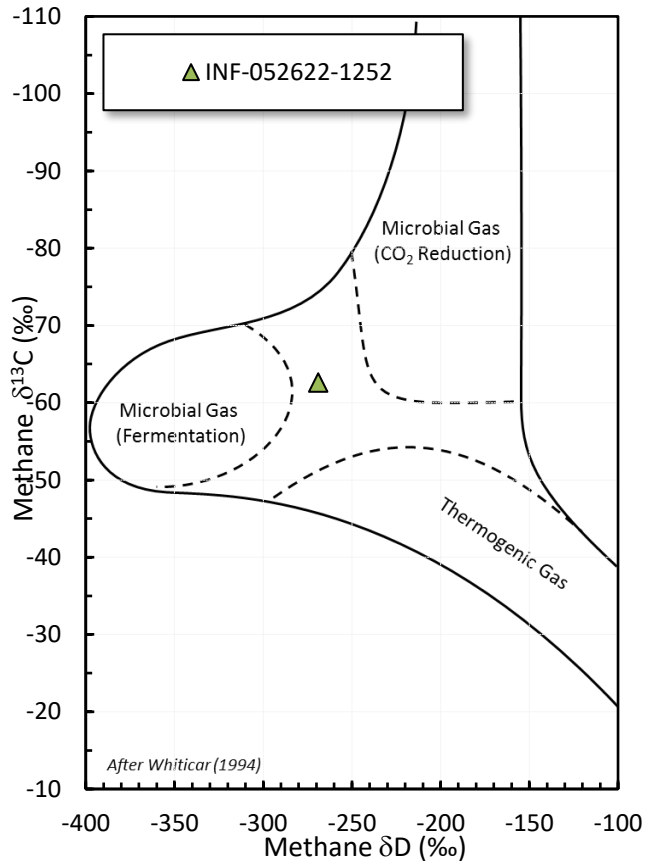
Error  $\delta\text{D}$  < 5.0 ‰

# Stable Isotope Interpretive Plots

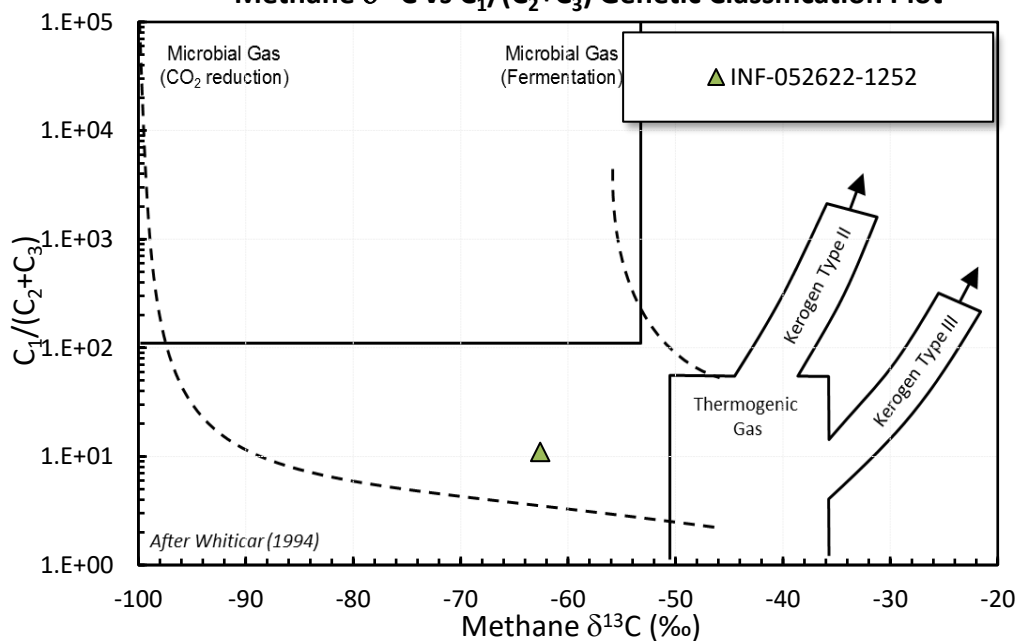
**Methane vs Gas Wetness Genetic**



**Methane  $\delta^{13}\text{C}$  vs  $\delta\text{D}$  Genetic Classification Plot**



**Methane  $\delta^{13}\text{C}$  vs  $\text{C}_1/(\text{C}_2+\text{C}_3)$  Genetic Classification Plot**





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

Project: DWR Permit #137465  
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**Reported:**  
06/03/22 12:26

### Notes and Definitions

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS/LCSD recovery.
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