

Summit Scientific

4653 Table Mountain Drive, Golden, Colorado 80403

303.277.9310

August 27, 2021

Karen Olson

PDC Energy

1775 Sherman St. STE. 3000

Denver, CO 80203

RE: DWR Permit #137465

Work Order #2108364

Enclosed are the results of analyses for samples received by Summit Scientific on 08/24/21 17:40. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, reading "Muri Premer", is displayed on a light purple rectangular background.

Muri Premer 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:
08/27/21 13:37

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EFF-082421-1042	2108364-01	Water	08/24/21 10:42	08/24/21 17:40
INF-082421-1125	2108364-02	Water	08/24/21 11:25	08/24/21 17:40

Summit Scientific

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Summit Scientific

S₂

2108364

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: Alison Dahl

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)	Dig Gas Composition (Dig Methane (Carbon) (Hydrogen)			
1	EFF-082421-1042	8-24-21	1042	3			X		X				X				4th Container for INF-082421 sample is IsoFlash (FOG2)
2	INF-082421-1125	8-24-21	1125	4			X		X				X	X	X		
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Relinquished by: <u>Alison Dahl</u>	Date/Time: <u>8/24/2021</u> <u>1600</u>	Received by: <u>Tasman</u> <u>Lock Box</u>	Date/Time: <u>8/24/2021</u> <u>1600</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: Please provide data in PDF and COGCC EDD formats. COGCC Facility No.: 765500
Relinquished by: <u>TASMAN</u> <u>LOCK BOX</u>	Date/Time: <u>8-24-21</u> <u>17:40</u>	Received by: <u>[Signature]</u>	Date/Time: <u>8-24-21</u> <u>17:40</u>	Sample Integrity: Temperature Upon Receipt: <u>4.6</u> Samples Intact: <u>Yes</u> No	
Relinquished by:	Date/Time:	Received by:	Date/Time:		

Sample Receipt Checklist

S2 Work Order

2108364

Client: PDC / TASMAN

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)

4.6

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"/>	ON ICE
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 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.

Muri P.
Custodian Printed Name or Initials

[Signature]
Signature of Custodian

8.24.21
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:
08/27/21 13:37

EFF-082421-1042
2108364-01 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/24/21 10:42**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Methane	3.4	1.0		mg/L	100	BEH0448	08/25/21	08/26/21	RSK-175 mod	
Ethane	1.0	1.0		"	"	"	"	"	"	
Propane	0.37	0.010		"	1	"	"	"	"	

Date Sampled: **08/24/21 10:42**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: Ethene		113 %		70-130		"	"	"	"	

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PDC Energy
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Denver CO, 80203

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

Reported:
08/27/21 13:37

INF-082421-1125
2108364-02 (Water)

Summit Scientific

Dissolved Gases by RSK-175

Date Sampled: **08/24/21 11:25**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Methane	12	1.0		mg/L	100	BEH0448	08/25/21	08/26/21	RSK-175 mod	
Ethane	3.9	1.0		"	"	"	"	"	"	
Propane	2.1	1.0		"	"	"	"	"	"	

Date Sampled: **08/24/21 11:25**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
		Limit								
Surrogate: Ethene		137 %		70-130		"	"	"	"	S-06

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PDC Energy
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Denver CO, 80203

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

Reported:
08/27/21 13:37

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 BEH0448 - GC

Blank (BEH0448-BLK1)

Prepared: 08/25/21 Analyzed: 08/26/21

Methane	ND	0.010	mg/L							
Ethane	ND	0.010	"							
Propane	ND	0.010	"							
Surrogate: Ethene	0.0455		"	0.0364		125	70-130			

LCS (BEH0448-BS1)

Prepared: 08/25/21 Analyzed: 08/26/21

Methane	0.033	0.010	mg/L	0.0428		76.2	70-130			
Ethane	0.084	0.010	"	0.0798		105	70-130			
Propane	0.11	0.010	"	0.139		75.7	70-130			
Surrogate: Ethene	0.0813		"	0.0728		112	70-130			

Duplicate (BEH0448-DUP1)

Source: 2108364-01

Prepared: 08/25/21 Analyzed: 08/26/21

Methane	3.4	1.0	mg/L		3.4			2.36	30	
Ethane	0.99	1.0	"		1.0			3.96	30	
Propane	0.34	0.010	"		0.37			8.25	30	
Surrogate: Ethene	0.0376		"	0.0364		103	70-130			

Matrix Spike (BEH0448-MS1)

Source: 2108364-01

Prepared: 08/25/21 Analyzed: 08/26/21

Methane	5.5	1.0	mg/L	0.0428	3.4	NR	70-130			QM-02
Ethane	2.4	1.0	"	0.0798	1.0	NR	70-130			QM-02
Propane	2.1	1.0	"	0.139	0.37	NR	70-130			QM-02
Surrogate: Ethene	0.100		"	0.0728		137	70-130			S-03

Summit Scientific

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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 #: 21086236
Lab #: DIG-026046
Client: Summit Scientific
Sample Name(s): INF-082421-1125

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.

Dolan Integration Group shall use commercially reasonable efforts to maintain the Samples it receives from Customer in the condition in which same were initially received, and shall store, free of charge, any portion(s) of the Sample(s) not consumed or altered in the course of testing and analysis for a period of 60 days after their initial receipt, after which time the Samples will be destroyed. At Customer's written request and expense, Dolan Integration Group shall return unused Samples to Customer. At Customer's written request, Dolan Integration Group will also store and maintain Customer's Samples beyond the Free Storage Period for a monthly fee in accordance with Dolan Integration Group's the current storage rates. If Customer fails to timely pay any applicable storage charges, Dolan Integration Group shall

Analytical Report



Job #: 21086236
Lab #: DIG-026046
Client: Summit Scientific
Sample Name: INF-082421-1125
Date Sampled: 08/24/21
Time Sampled: 11:25
Sample Description: Isoflask
Sampling Notes:
Date Received: 08/25/21
Date Analyzed: Gas Composition: 08/25/21 $\delta^{13}\text{C}$: 08/25/21 δD : 08/25/21
Date Reported: 08/26/21
Comments:

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N ₂)	358131	35.20	-	-	-	
Oxygen + Argon (O ₂ +Ar)	57828	5.68	-	-	-	
Carbon Dioxide (CO ₂)	1191	0.12	-	-	-	
Helium (He) ^b	810	0.08	-	-	-	
Hydrogen (H ₂)	nd	nd	-	-	-	
Methane (CH ₄)	528607	51.96	88.18	-57.7	-271	
Ethane (C ₂ H ₆)	47043	4.62	7.85		-	
Ethene (C ₂ H ₄)	nd	nd	nd		-	
Propane (C ₃ H ₈)	18248	1.79	3.04		-	
iso-Butane (C ₄ H ₁₀)	1693	0.17	0.28		-	
n-Butane (C ₄ H ₁₀)	2941	0.29	0.49		-	
iso-Pentane (C ₅ H ₁₂)	422	0.04	0.07		-	
n-Pentane (C ₅ H ₁₂)	334	0.03	0.06		-	
Hexanes + (C ₆ H ₁₄)	158	0.02	0.03		-	

Calculated Values:	
Total HCs (ppm)	599446
Gas Wetness (mol % C ₂ +C ₁ +))	11.82
C ₁ /(C ₂ +C ₃) (mol/mol)	8

^a Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

^b 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

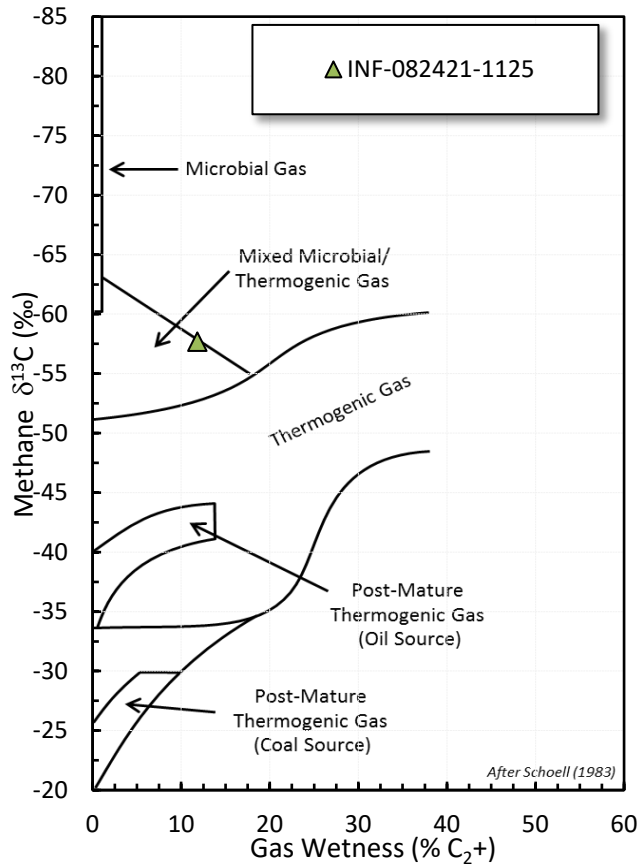
Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}\text{C}$ < 0.5 ‰

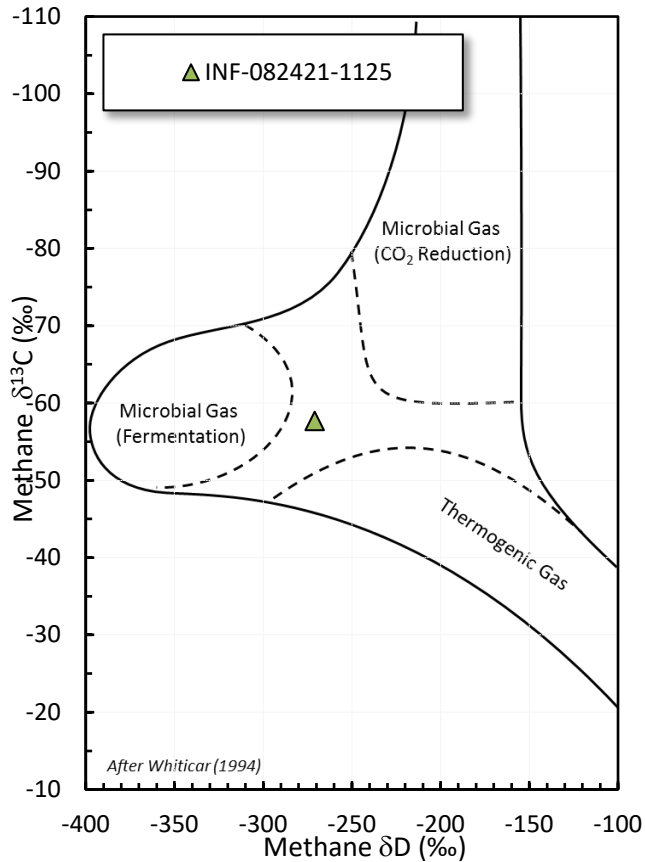
Error δD < 5.0 ‰

Stable Isotope Interpretive Plots

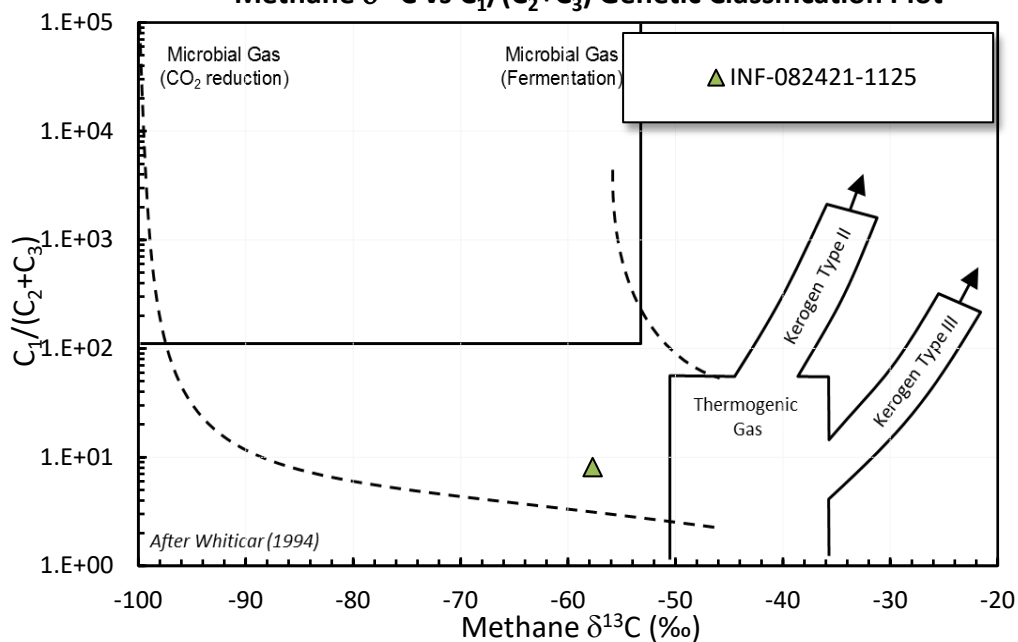
Methane vs Gas Wetness Genetic



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



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





Geochemistry
for Energy

main 303.531.2030 • info@digforenergy.com • digforenergy.com
Office and Lab 11025 Dover St • Ste 800 • Westminster, CO 80021

JOB 21086236
DIG-026046

Send Data to:	Send Invoice to (if different):	Additional Information:
Name: Muri Premer / Paul Shrewsbury	Name: Ben Shrewsbury	AFE #:
Company: Summit Scientific	Company: Summit Scientific	Project: 2108364
Address: 4653 Table Mountain Drive	Address: 4653 Table Mountain Drive	PO #:
City, State: Golden, CO 80403	City, State: Golden, CO 80403	Location:
Phone: 303-277-9310	Phone: 303-277-9310	Sampled By:
Email: mpremer@s2scientific.com / pshrewsbury@s2scientific.com	Email: bshrewsbury@s2scientific.com	API #:

Turnaround Time**:	<input type="radio"/> Standard (≤ 10 Business days)	<input type="radio"/> Rush (≤ 5 Business days)	<input checked="" type="radio"/> Expedited Rush (≤ 3 Business days)
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Container Number	Sample Identification	Date Sampled	Time	Sample Type*	Gas Composition	d13C of Methane (C1)	d13C of Ethane (C2)	d13C of Propane+ (C3+)	d13C of Carbon Dioxide (CO2)	dD of Methane (C1)	Whole Oil Gas Chromatography	d18O and dD Isotopes of Water	RSK 175 Dissolved Gas Quantification
	INF-082421-1125	8/24/21	11:25	Other	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Chain of Custody Record				Comments:			
Relinquished by Signature	Company	Date	Time	Received by Signature	Company	Date	Time
<i>Muri Premer</i>	Summit	8/25/21	1:10	<i>Ben Shrewsbury</i>	Summit	8/25/21	1:10

*Gas composition vs RSK-175 - Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L). Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030.

** Rush and Expedited Rush turnaround time analysis will incur additional costs at 2x and 3x the standard turnaround time pricing.

[illegible]



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

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

Reported:
08/27/21 13:37

Notes and Definitions

S-06	The recovery of this surrogate is outside control limits due to sample dilution required from high analyte concentration and/or matrix interferences.
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 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