Dolan Integration Group
Geochemistry for Energy
2520 55th St, Suite 101
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p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes
Data and Interpretation

Job #:	**16090705**
Lab #:	**DIG-009710**
Client:	**COGCC**
Sample Name(s):	**AFB N-01**

Analytical Report

Job #:	16090705
Lab #:	DIG-009710
Client:	COGCC
Sample Name:	AFB N-01
Date Sampled:	09/20/16
Time Sampled:	11:45
Sample Description:	Water
Sampling Notes:	
Date Received:	09/21/16
Date Analyzed:	Gas Composition: 9/22/16, d13C: 9/23/16, dD: 9/26/16
Date Reported:	10/25/16
Comments:	Headspace created with UHP Helium

Measured Values:	Measured ppm	Analyte mol %[a]	HC mol %	$\delta^{13}C$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N_2)	173981	33.43	-	-	-	
Oxygen + Argon (O_2+Ar)	42029	8.08	-	-	-	
Carbon Dioxide (CO_2)	1710	0.33	-	-	-	
Helium (He)[b]	na	na	-	-	-	Added Headspace
Hydrogen (H_2)	nd	nd	-	-	-	
Methane (CH_4)	302498	58.13	99.95	-69.2	-256	
Ethane (C_2H_6)	160	0.03	0.05	nd	-	
Propane (C_3H_8)	nd	nd	nd	nd	-	
iso-Butane (C_4H_{10})	nd	nd	nd	nd	-	
n-Butane (C_4H_{10})	nd	nd	nd	nd	-	
iso-Pentane (C_5H_{12})	nd	nd	nd	nd	-	
n-Pentane (C_5H_{12})	nd	nd	nd	nd	-	
Hexanes + (C_6H_{14})	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	302658
Gas Wetness (mol % C_2+/C_1+)	0.05
$C_1/(C_2+C_3)$ (mol/mol)	1887

[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

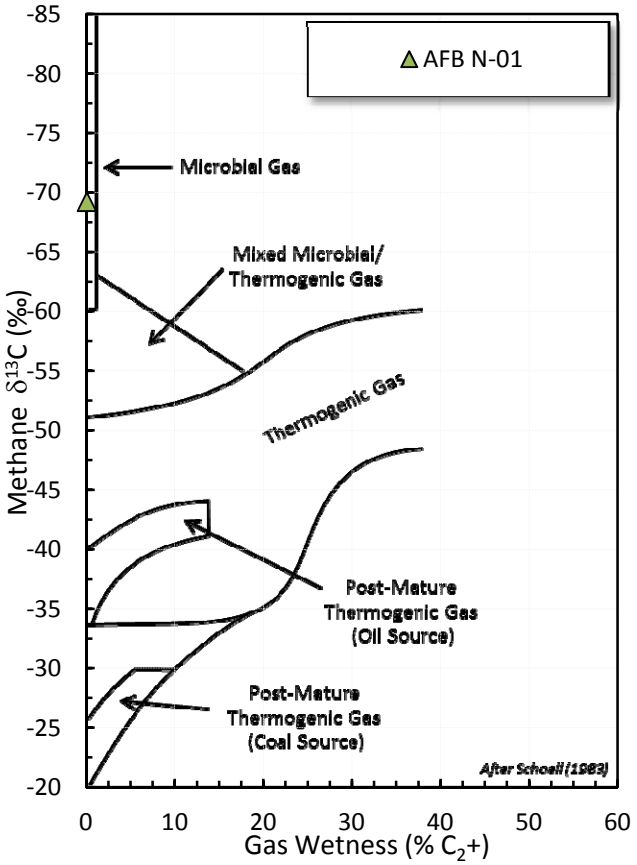
Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}C$ < 0.5 ‰

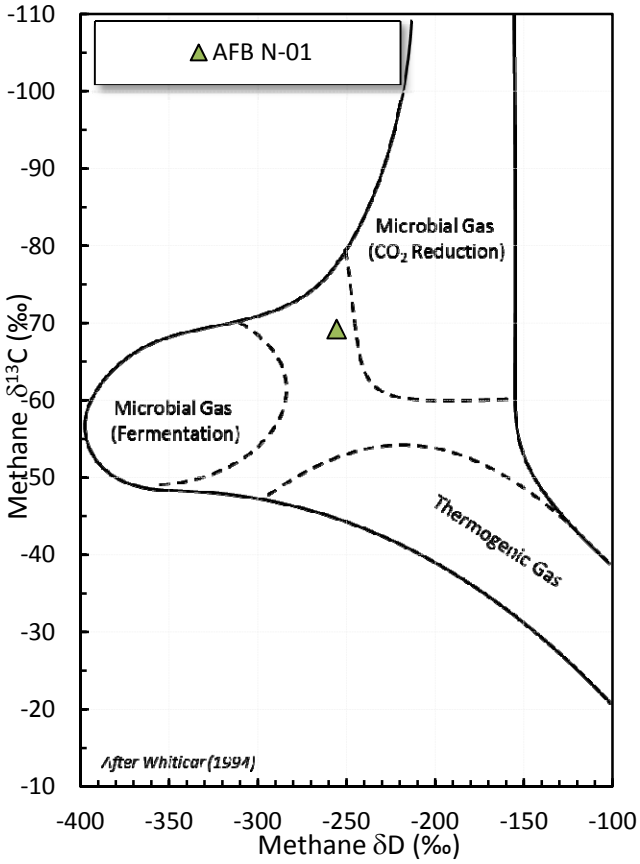
Error δD < 5.0 ‰

Stable Isotope Interpretive Plots

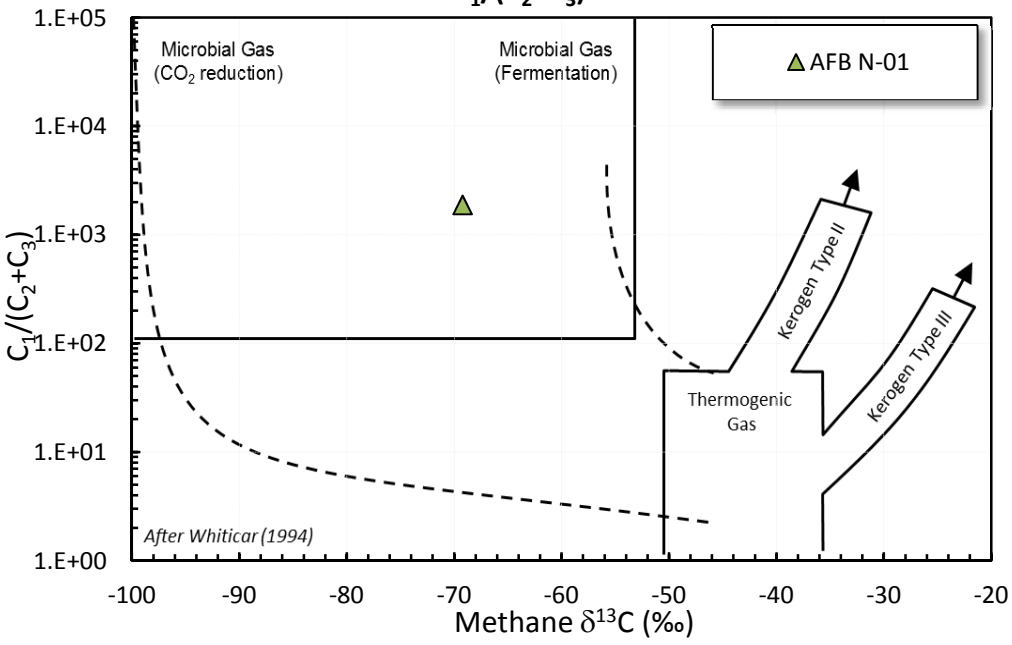
Methane vs Gas Wetness Genetic



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



Methane $\delta^{13}C$ vs $C_1/(C_2+C_3)$ Genetic Classification Plot



Chain of Custody Form

dig
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JOB 16090705
DIG - 099712
DIG - 099713
DIG - 099716

Send Data and Invoice to:

Name: Rick Allison
Company: COGCC
Address: 1120 Lincoln Street, #801
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Email: rick.allison@state.co.us

AFE #:
Report Ctr:
Project: 076 Upper Pierre WQ
PO #: CT2017-734
Location: 1164938
Sampled By: SAF

Sample Description

Container #	Sample Identification	Date Sampled	Time	Gas Composition* $N_2, O_2, CO_2, He, H_2, C_1$-$C_6$+	RSK-175* (gas composition) $N_2, O_2, CO_2, He, H_2, C_1$-$C_6$+ with dissolved C_1, C_2 & C_3	$\delta^{13}C$ Methane (Carbon)	δD Methane (Hydrogen)	$\delta^{13}C$ Ethane-Pentane (C_{2-5}, if present)	Comments
	AFB N-01	9/20/16	1145	✓		✓	✓		Stable Isotopes of Water
									dC13 of Dissolved Inorganic Carbon

Chain-of-Custody Record

	Signature	Company	Date	Time
Relinquished by		Pinyon	9/21/16	0800
Received by		DIG	9/21/16	1300
Relinquished by				
Received by				

*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