



dig
Dolan Integration Group

Geochemistry for Energy

2520 55th St, Suite 101
Boulder, CO 80301
p: 303.531.2030

Analytical Report

Dissolved Methane, Ethane and Propane Analysis

Job #: 15120545
Lab #: DIG-008650
Client: COGCC
Sample Name: 754506+56

Analytical Report



Job #: 15120545
 Lab #: DIG-008650
 Client: COGCC
 Sample Name: 754506+56
 Date Sampled: 12/11/15
 Time Sampled: 11:41
 Sample Description: 1L bottle
 Sampling Notes:
 Date Received: 12/11/15
 Date Analyzed: Gas Composition: 12/14/2015, $\delta^{13}\text{C}$: 12/17/15, δD : 12/15/15
 Date Reported: 12/17/15
 Comments: Analysis is of gas extracted from water by headspace equilibration.
 Analysis has been corrected for helium added to create headspace.
 Helium dilution factor = 0.57

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	Total Conc mg/L ^c	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N ₂)	39158	5.94	-	1.45	-	-	
Oxygen + Argon (O ₂ +Ar)	8706	1.32	-	0.64	-	-	
Carbon Dioxide (CO ₂)	628	0.10	-	1.36	-	-	
Helium (He) ^b	na	na	-	na	-	-	Added Headspace
Hydrogen (H ₂)	nd	nd	-	nd	-	-	
Methane (CH ₄)	474912	72.00	77.72	18.71	-47.1	-260	
Ethane (C ₂ H ₆)	86900	13.18	14.22	8.34	-32.0	na	
Propane (C ₃ H ₈)	34342	5.21	5.62	3.86	-28.5	na	
iso-Butane (C ₄ H ₁₀)	3698	0.56	0.61	0.31	-31.0	na	
n-Butane (C ₄ H ₁₀)	8182	1.24	1.34	0.99	-28.0	na	
iso-Pentane (C ₅ H ₁₂)	1390	0.21	0.23	na	-27.7	na	
n-Pentane (C ₅ H ₁₂)	1139	0.17	0.19	na	-27.7	na	
Hexanes + (C ₆ H ₁₄)	505	0.08	0.08	na	na	na	

Calculated Values:	
Total HCs (ppm)	611068
Gas Wetness (mol % C ₂ +/C ₁ +))	22.28
C ₁ /(C ₂ +C ₃) (mol/mol)	4

^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.

^c Sample prep and calculations for dissolved gas analysis using a GC headspace equilibration technique, RSKSOP-175v5, 2010.

HC= Hydrocarbons

nd = not detected

na = not analyzed

Stable isotope results based on multi-point laboratory calibration

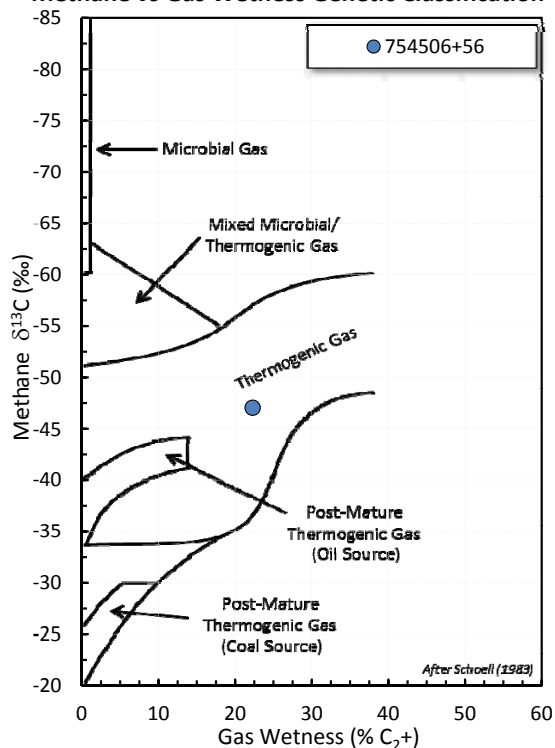
Error $\delta^{13}\text{C}$ < 0.5 ‰

Error δD < 5.0 ‰

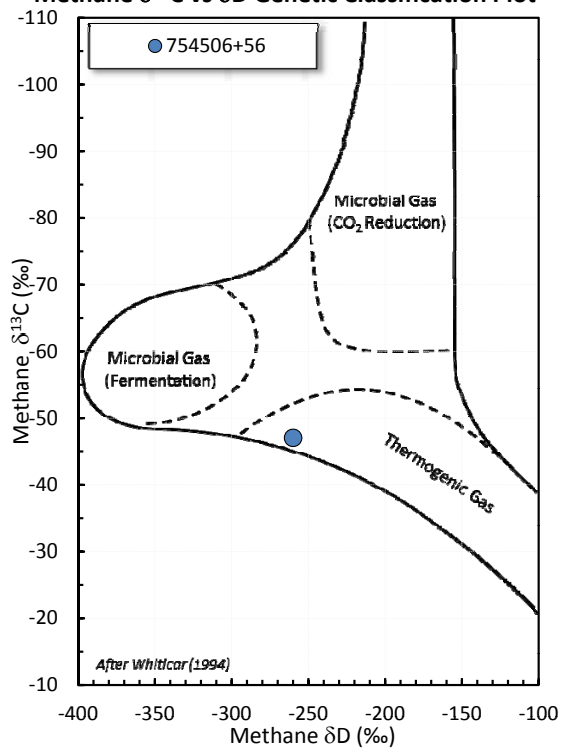
Stable Isotope Interpretive Plots



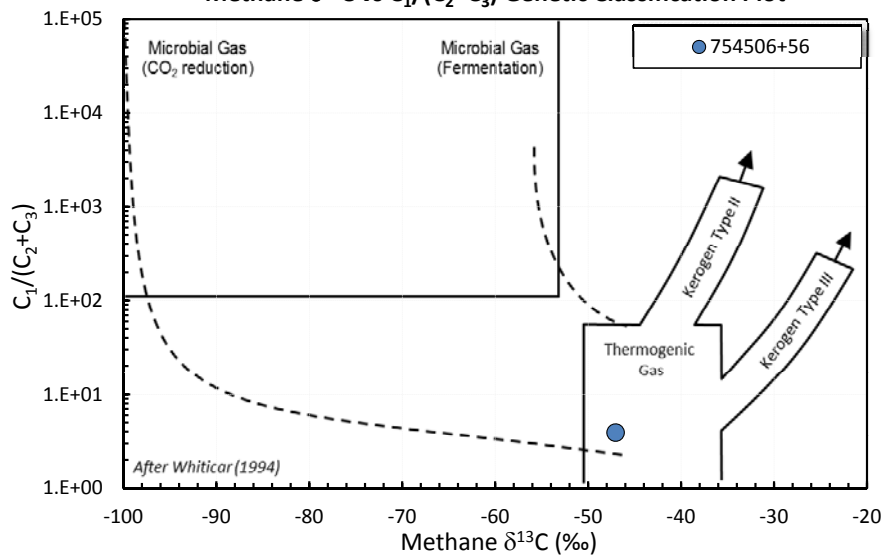
Methane vs Gas Wetness Genetic Classification



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



Chain of Custody Form



Geochemistry for Energy

1317 West 121st Ave
Westminster, CO 80234
or 303-551-2030

Send Data and Invoice to:

Name: Peter Gintautas
Company: Calo Oil & Gas Cons. Comm.
Address: 1120 Lincoln Suite 801
Denver CO 80203
Phone: 719-679-1326
Fax: _____
Email: peter.gintautas@state.co.us

AFE #: _____

Report Ctr: _____

Project: LWW

PO #: CT 2016-147

Location: Lucerne CO

Sampled By: _____

Sample Description

Sample Description											
Container #	Sample Identification	Date Sampled	Time								Comments
	754506 + 56	11 Dec 15	11:41		X	X	X	X	X	X	
	754506 + 70	11 Dec 15	11:55		X	X	X	X	X	X	
									X	X	
								</			

254H

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>COGCC</u>	<u>12/11/15</u>	<u>2:00</u>
Received by <u>[Signature]</u>	<u>DI 6</u>	<u>12/11/15</u>	<u>2:00</u>
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