Dolan Integration Group
Geochemistry for Energy
2520 55th St, Suite 101
Boulder, CO 80301
p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes
Data and Interpretation

Job #:	**16030575**
Lab #:	**DIG-009023**
Client:	**Encana**
Sample Name:	**Grenemyer Wagner 21-34**
	Corrected Report Re-issued 3/30/2016

Analytical Report

Job #:	16030575
Lab #:	DIG-009023
Client:	Encana
Sample Name:	Grenemyer Wagner 21-34
Date Sampled:	03/11/16
Time Sampled:	17:35
Sample Description:	Isoflask
Sampling Notes:	Bradenhead
Date Received:	03/14/16
Date Analyzed:	Gas Composition: 3/18/2016, $\delta^{13}C$: 3/16/2016, δD: 3/22/2016
Date Reported:	03/21/16
Comments:	

Measured Values:	Measured ppm	Analyte mol %[a]	HC mol %	$\delta^{13}C$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N_2)	786541	79.09	-	-	-	
Oxygen + Argon (O_2+Ar)	19910	2.00	-	-	-	
Carbon Dioxide (CO_2)	68	0.01	-	-	-	
Helium (He)[b]	nd	nd	-	-	-	
Hydrogen (H_2)	nd	nd	-	-	-	
Methane (CH_4)	158859	15.97	84.53	-56.4	-239	
Ethane (C_2H_6)	16858	1.70	8.97	-33.4	-	
Propane (C_3H_8)	8645	0.87	4.60	-28.7	-	
iso-Butane (C_4H_{10})	1116	0.11	0.59	-31.2	-	
n-Butane (C_4H_{10})	1869	0.19	0.99	-27.3	-	
iso-Pentane (C_5H_{12})	327	0.03	0.17	-27.6	-	
n-Pentane (C_5H_{12})	129	0.01	0.07	nd	-	
Hexanes + (C_6H_{14})	124	0.01	0.07	nd	-	

Calculated Values:	
Total HCs (ppm)	187927
Gas Wetness (mol % C_2+/C_1+)	15.47
$C_1/(C_2+C_3)$ (mol/mol)	6

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

[b] Addition of helium negates the ability to detect natice helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

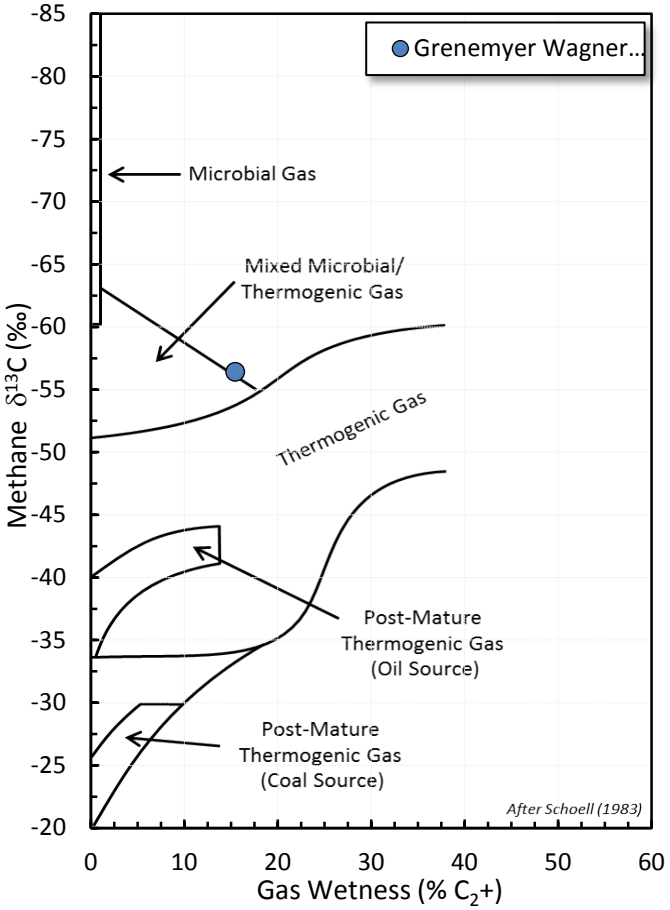
Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}C$ < 0.5 ‰

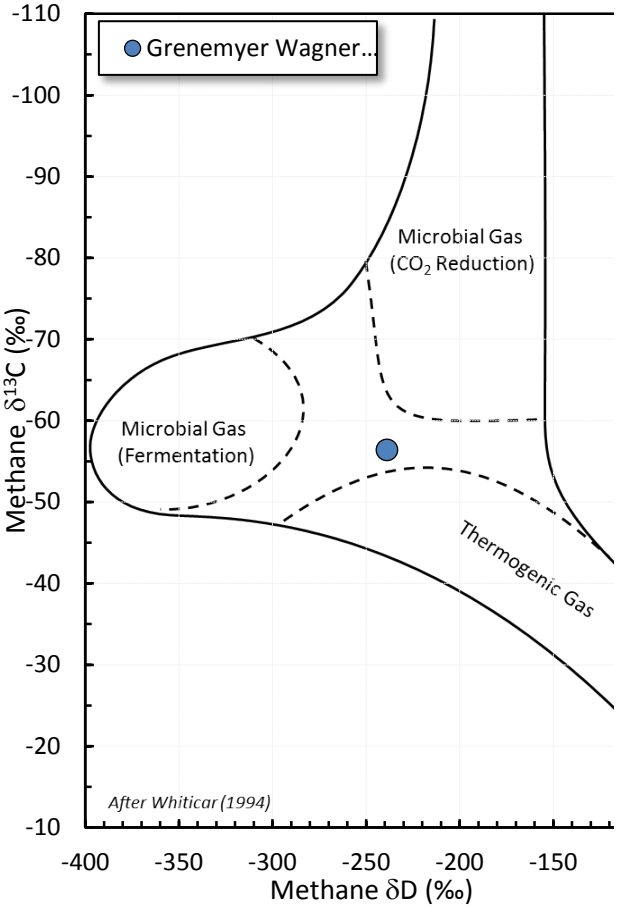
Error δD < 5.0 ‰

Stable Isotope Interpretive Plots

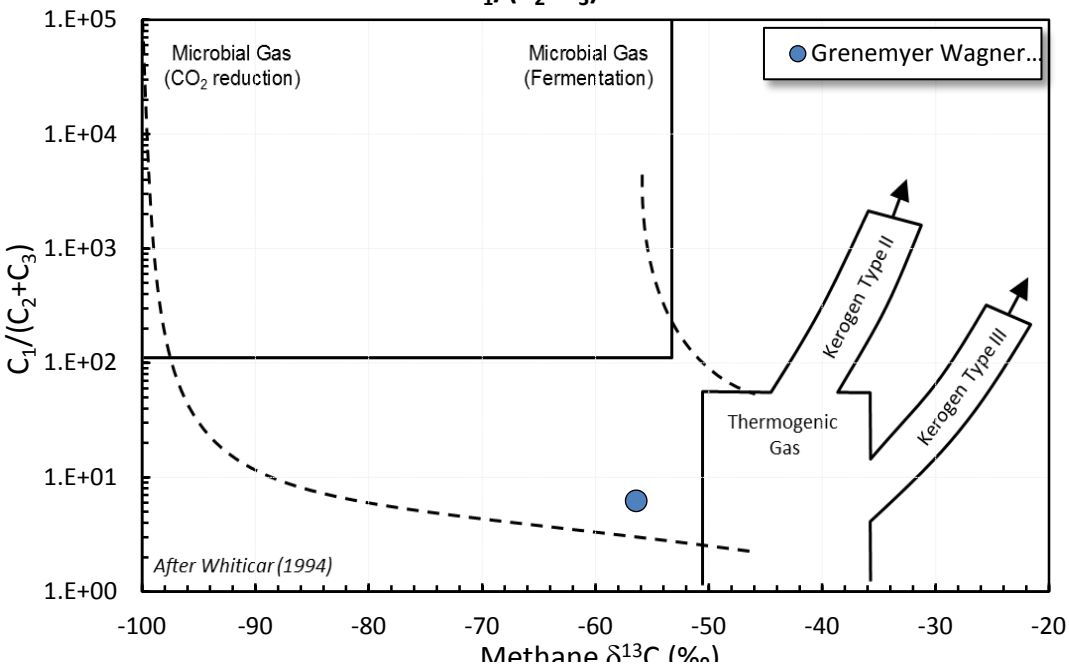
Methane vs Gas Wetness Genetic Classification



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



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



JOB 16030575
DIG - 009022 - 009023

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Send Data and Invoice to:

Name: Nathan Fons
Company: Encana
Address: 370 17th Street

Phone: 303-513-7504
Fax:
Email: nathan.fons@encana.com

AFE #: email nathan
Report Ctr:
Project: Morton Bradenhead 20160311
PO #:
Location: Seltzer 14-34 / GW 21-34
Sampled By: NF

Sample Description

Container #	Sample Identification	Date Sampled	Time	Gas Composition $N_2, O_2, CO_2, He, H_2, C_1$-$C_6$+	Gas Composition (RSK-175) $N_2, O_2, CO_2, He, H_2, C_1$-$C_6$+ with dissolved C1, C2 & C3	$\delta^{13}C$ Methane (Carbon)	δD Methane (Hydrogen)	$\delta^{13}C$ Ethane-Pentane (C_{2-5}, if present)	Comments
	Seltzer 14-34	1700	3/11/16	X		X	X	X	CO_2 if present
	Brenemyer Wyne 21-34	1735	↓	X		X	X	X	↓

Chain-of-Custody Record

	Signature	Company	Date	Time
Relinquished by	Nathan Fons	Encana	3/14/16	945
Received by	Josiah Strauss	DIG	3/14/16	945
Relinquished by				
Received by				
Relinquished by				
Received by				