



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 #: 19123198
Lab #: DIG-021246
Client: Origins Laboratory
Sample Name(s): OG WEEZER G 2 32

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 #: 19123198
 Lab #: DIG-021246
 Client: Origins Laboratory
 Sample Name: OG WEEZER G 2 32
 Date Sampled: 12/17/19
 Time Sampled: 16:15
 Sample Description: 1L DIG Bottle
 Sampling Notes:
 Date Received: 12/26/19
 Date Analyzed: Gas Composition: 12/26/19 $\delta^{13}\text{C}$: 12/28/19 δD : 12/30/19
 Date Reported: 01/03/20
 Comments:

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N_2)	558181	55.83	-	-	-	
Oxygen + Argon ($\text{O}_2 + \text{Ar}$)	136319	13.63	-	-	-	
Carbon Dioxide (CO_2)	816	0.08	-	-	-	
Helium (He) ^b	na	na	-	-	-	Helium added to create headspace.
Hydrogen (H_2)	nd	nd	-	-	-	
Methane (CH_4)	236397	23.64	77.63	-44.6	-227	
Ethane (C_2H_6)	44328	4.43	14.56	-	-	
Ethene (C_2H_4)	nd	nd	nd	-	-	
Propane (C_3H_8)	16107	1.61	5.29	-	-	
iso-Butane (C_4H_{10})	1907	0.19	0.63	-	-	
n-Butane (C_4H_{10})	3939	0.39	1.29	-	-	
iso-Pentane (C_5H_{12})	784	0.08	0.26	-	-	
n-Pentane (C_5H_{12})	629	0.06	0.21	-	-	
Hexanes + (C_6H_{14})	431	0.04	0.14	-	-	

Calculated Values:	
Total HCs (ppm)	304522
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$)	22.37
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (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.

HC= Hydrocarbons

nd = not detected

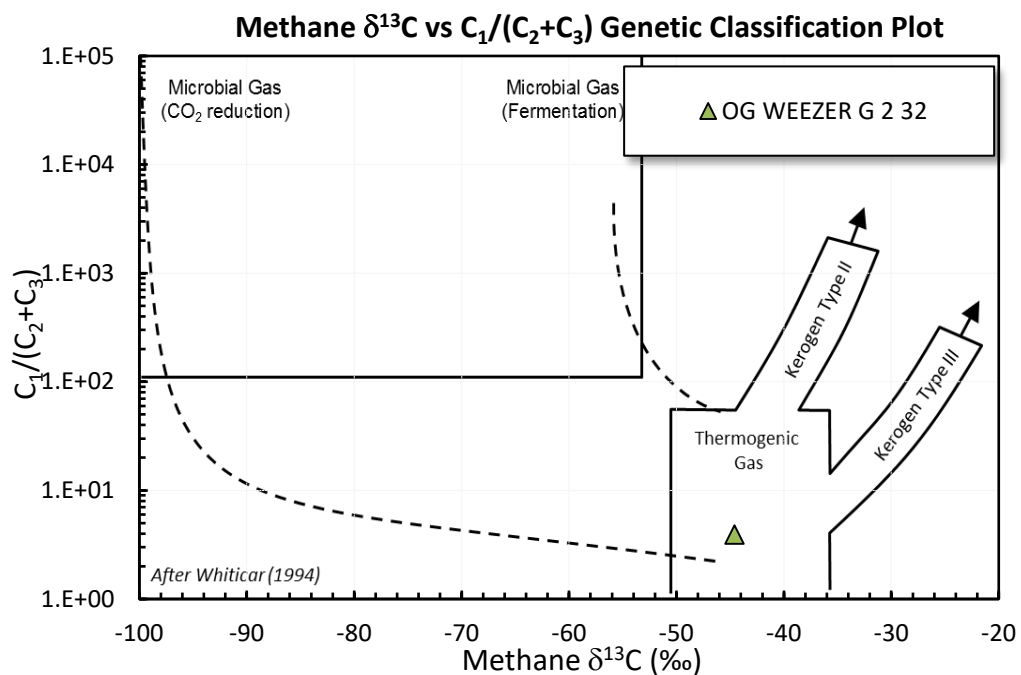
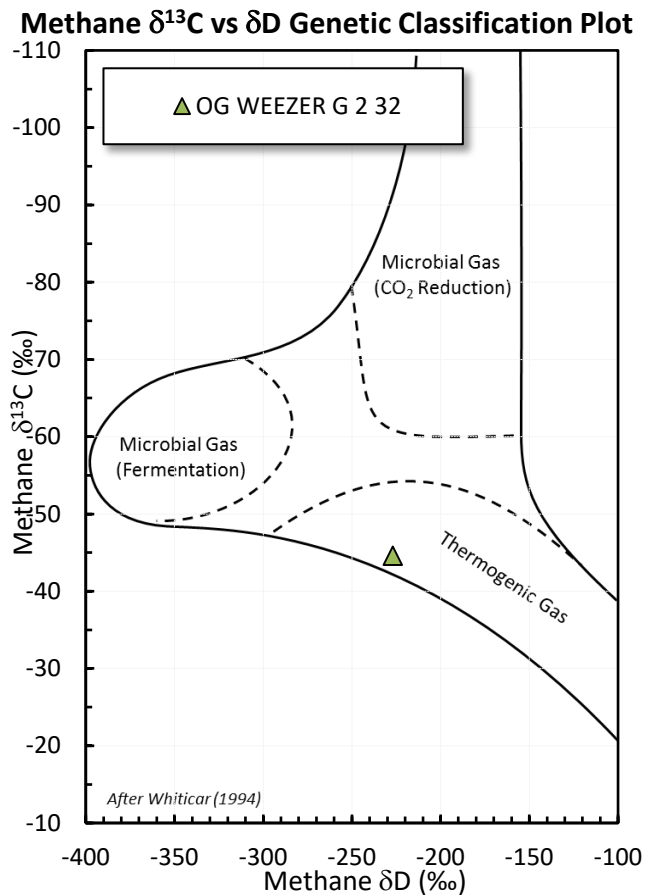
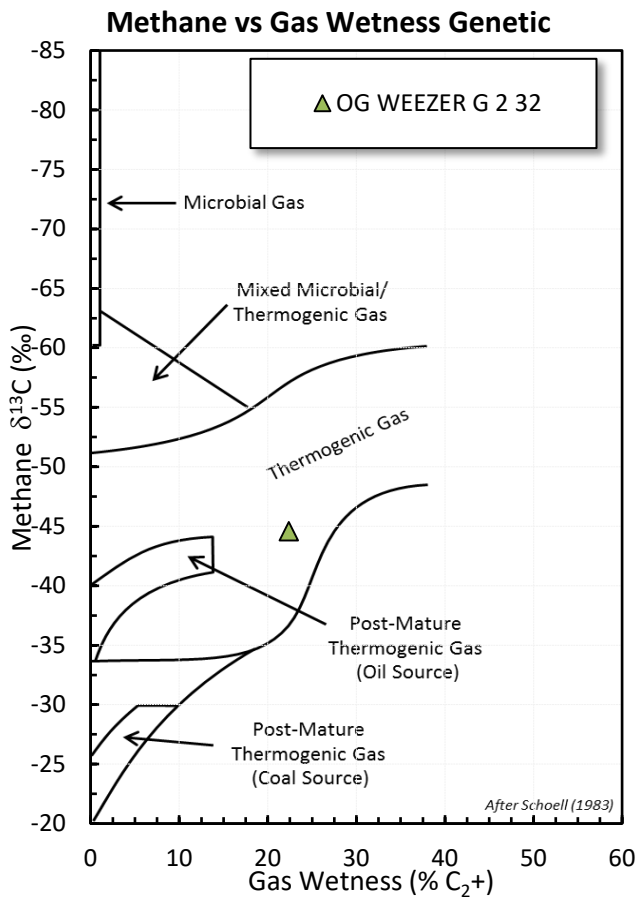
na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}\text{C}$ < 0.5 ‰

Error δD < 5.0 ‰

Stable Isotope Interpretive Plots



Chain of Custody Form



Geochemistry for Energy

1317 West 121st Ave
Westminster, CO 80234
p: 303.531.2030

Job 19123198
DIG-021246

Send Data and Invoice to:

Name: Jennifer Pellegrini
Company: Origins Laboratory
Address: 1725 W. Erie Pl
Denver, CO 80211
Phone: 303-433-1322
Fax: _____
Email: j.pellegrini@originslab.com
ndayle@originslab.com

AFE #: _____
Report Ctr: _____
Project: 412305
PO #: _____
Location: _____
Sampled By: _____

Analysis Requested					
Gas Composition*	RSK-175*	δ ¹³ C Methane (Carbon)	δD Methane (Hydrogen)	δ ¹³ C Ethane-Pentane (C ₂₋₅ if present)	
H ₂ , O ₂ , CO ₂ , He, H ₂ , C ₁ -C ₆ +	(see composition with dissolved C ₁ , C ₂ & C ₃)				

Sample Description

Container #	Sample Identification	Date Sampled	Time							Comments
412305-01	OG-Weezer G-2-32	12/17/19	1615	X		X	X			Please report by 12/31 per the email from Kelsey.

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Origins	12/26/19	1140
Received by <u>Kathy May</u>	DIG	12/26/19	11:40
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

[illegible]



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Geochemistry for Energy

11025 Dover Street Unit 800
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p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #: 19123197
Lab #: DIG-021245
Client: Origins Laboratory
Sample Name(s): OG WEEZER G 3 24

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Analytical Report



Job #: 19123197
 Lab #: DIG-021245
 Client: Origins Laboratory
 Sample Name: OG WEEZER G 3 24
 Date Sampled: 12/17/19
 Time Sampled: 16:00
 Sample Description: 1L DIG Bottle
 Sampling Notes:
 Date Received: 12/26/19
 Date Analyzed: Gas Composition: 12/26/19 $\delta^{13}\text{C}$: 12/28/19 δD : 12/30/19
 Date Reported: 01/03/20
 Comments:

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N_2)	693732	69.88	-	-	-	
Oxygen + Argon ($\text{O}_2 + \text{Ar}$)	166407	16.76	-	-	-	
Carbon Dioxide (CO_2)	1319	0.13	-	-	-	
Helium (He) ^b	na	na	-	-	-	Helium added to create headspace.
Hydrogen (H_2)	nd	nd	-	-	-	
Methane (CH_4)	115769	11.66	88.17	-43.5	-218	
Ethane (C_2H_6)	10479	1.06	7.98	-	-	
Ethene (C_2H_4)	nd	nd	nd	-	-	
Propane (C_3H_8)	3493	0.35	2.66	-	-	
iso-Butane (C_4H_{10})	455	0.05	0.35	-	-	
n-Butane (C_4H_{10})	775	0.08	0.59	-	-	
iso-Pentane (C_5H_{12})	152	0.02	0.12	-	-	
n-Pentane (C_5H_{12})	124	0.01	0.09	-	-	
Hexanes + (C_6H_{14})	50	0.01	0.04	-	-	

Calculated Values:	
Total HCs (ppm)	131297
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$)	11.83
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (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

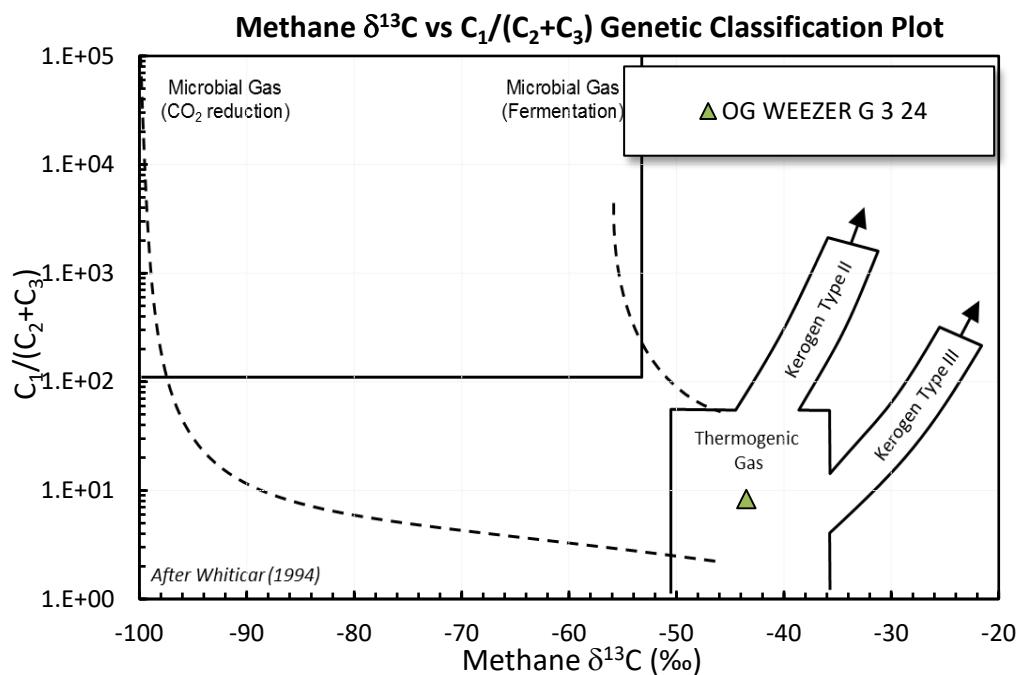
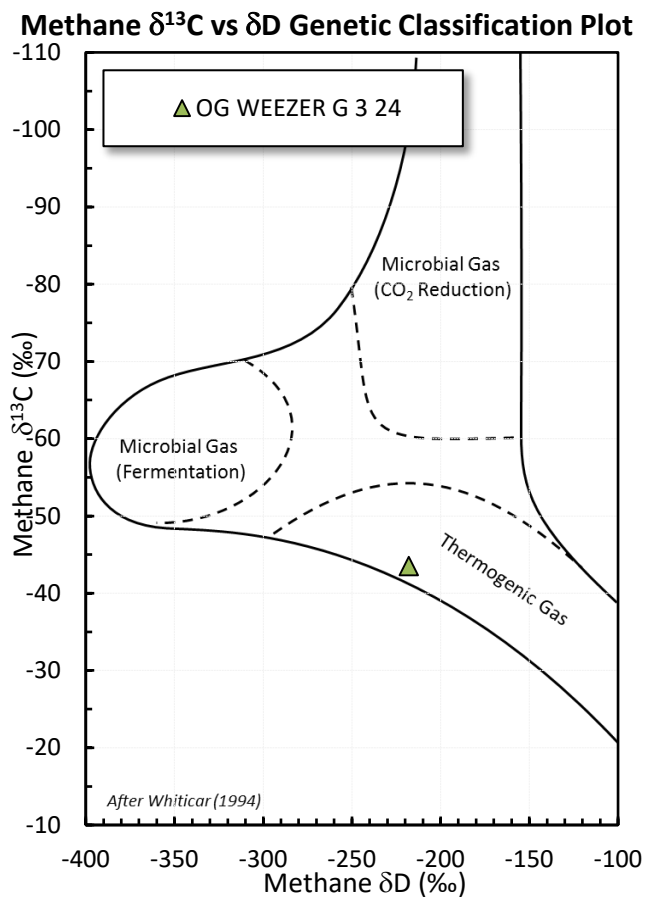
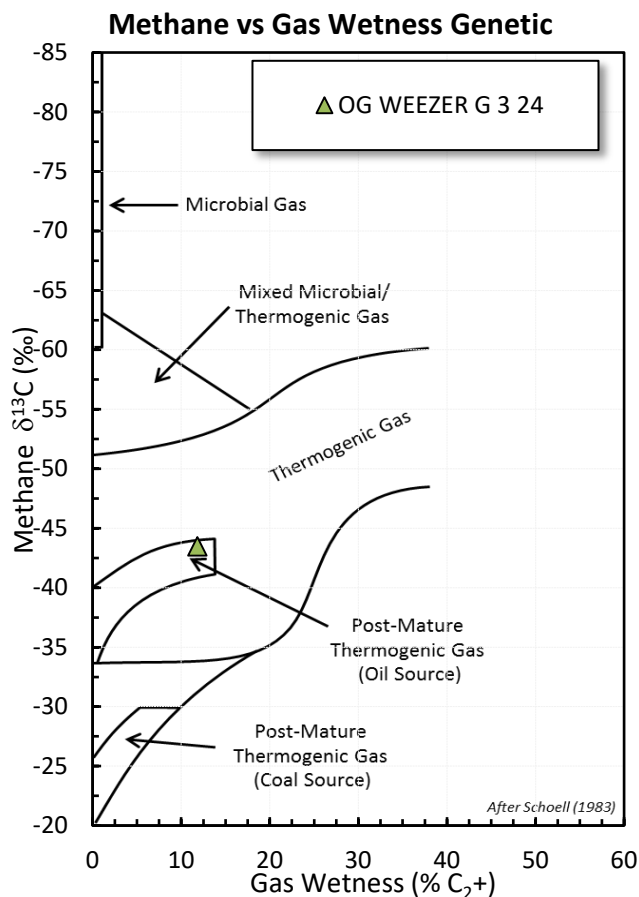
na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}\text{C}$ < 0.5 ‰

Error δD < 5.0 ‰

Stable Isotope Interpretive Plots



Chain of Custody Form



Geochemistry for Energy

1317 West 121st Ave
Westminster, CO 80234
p: 303.531.2030

Job 19123197

DIG -021245

Send Data and Invoice to:

Name: Jennifer Pellegrini
Company: Origins Laboratory
Address: 1725 W. Elk Pl
Denver, CO 80211
Phone: 303-433-1322
Fax: _____
Email: jpellegrini@originslab.com
ndayle@originslab.com

AFE #: _____

Report Ctr: _____

Project: 4912299

PO #: _____

Location: _____

Sampled By: _____

Sample Description

Container #	Sample Identification	Date Sampled	Time						Comments
4912299-01	06-Weezer-6-3-24	12/17/19	1600	X		X	X		Please report by 12/31 per the email from Kelsey

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Origins	12/26/19	1140
Received by <u>Kathy May</u>	DIG	12/26/19	11:40
Relinquished by			
Received by			

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[illegible]



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Geochemistry for Energy

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Westminster, CO 80021
p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #: 19123196
Lab #: DIG-021244
Client: Origins Laboratory
Sample Name(s): OG WEEZER G 3 33

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Analytical Report



Job #: 19123196
 Lab #: DIG-021244
 Client: Origins Laboratory
 Sample Name: OG WEEZER G 3 33
 Date Sampled: 12/17/19
 Time Sampled: 15:38
 Sample Description: 1L DIG Bottle
 Sampling Notes:
 Date Received: 12/26/19
 Date Analyzed: Gas Composition: 12/26/19 $\delta^{13}\text{C}$: 12/28/19 δD : 12/30/19
 Date Reported: 01/03/20
 Comments:

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N_2)	619219	61.93	-	-	-	
Oxygen + Argon ($\text{O}_2 + \text{Ar}$)	123361	12.34	-	-	-	
Carbon Dioxide (CO_2)	3884	0.39	-	-	-	
Helium (He) ^b	na	na	-	-	-	Helium added to create headspace.
Hydrogen (H_2)	nd	nd	-	-	-	
Methane (CH_4)	201499	20.15	79.53	-43.6	-223	
Ethane (C_2H_6)	34646	3.47	13.67	-	-	
Ethene (C_2H_4)	nd	nd	nd	-	-	
Propane (C_3H_8)	12047	1.20	4.75	-	-	
iso-Butane (C_4H_{10})	1446	0.14	0.57	-	-	
n-Butane (C_4H_{10})	2658	0.27	1.05	-	-	
iso-Pentane (C_5H_{12})	502	0.05	0.20	-	-	
n-Pentane (C_5H_{12})	353	0.04	0.14	-	-	
Hexanes + (C_6H_{14})	207	0.02	0.08	-	-	

Calculated Values:	
Total HCs (ppm)	253358
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$)	20.47
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (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.

HC= Hydrocarbons

nd = not detected

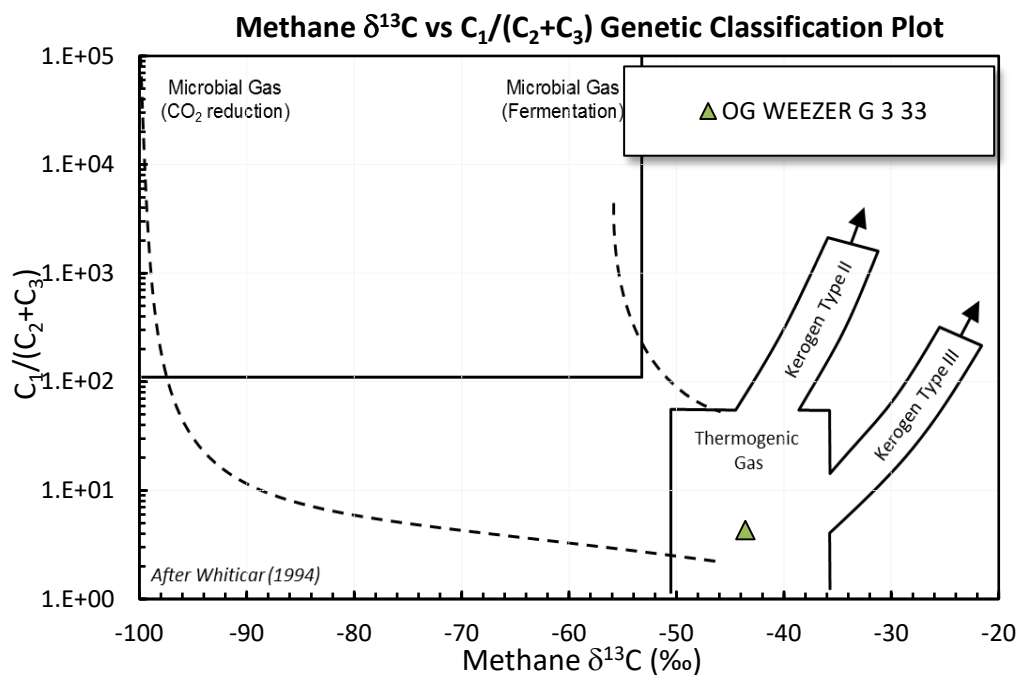
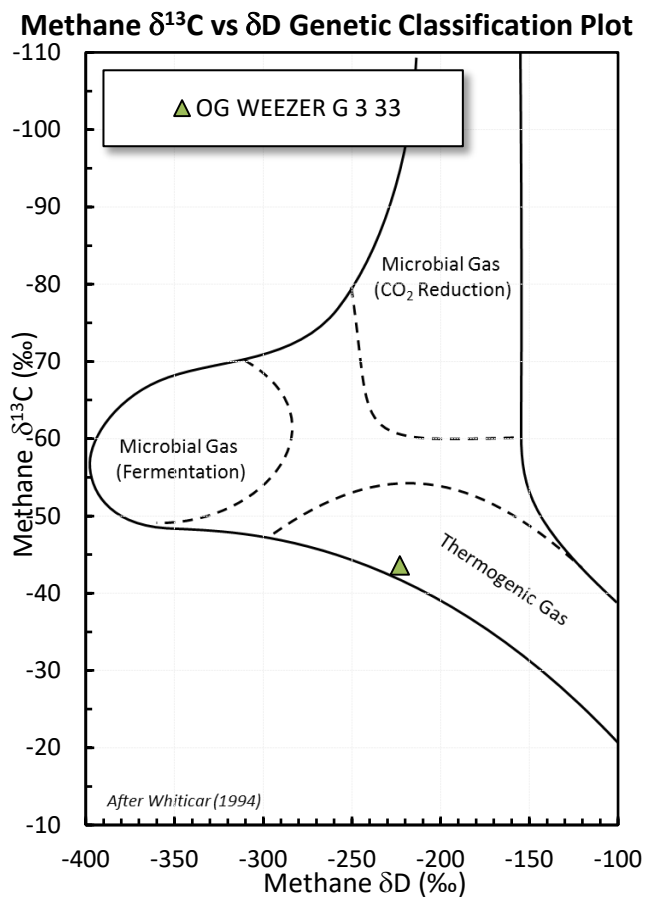
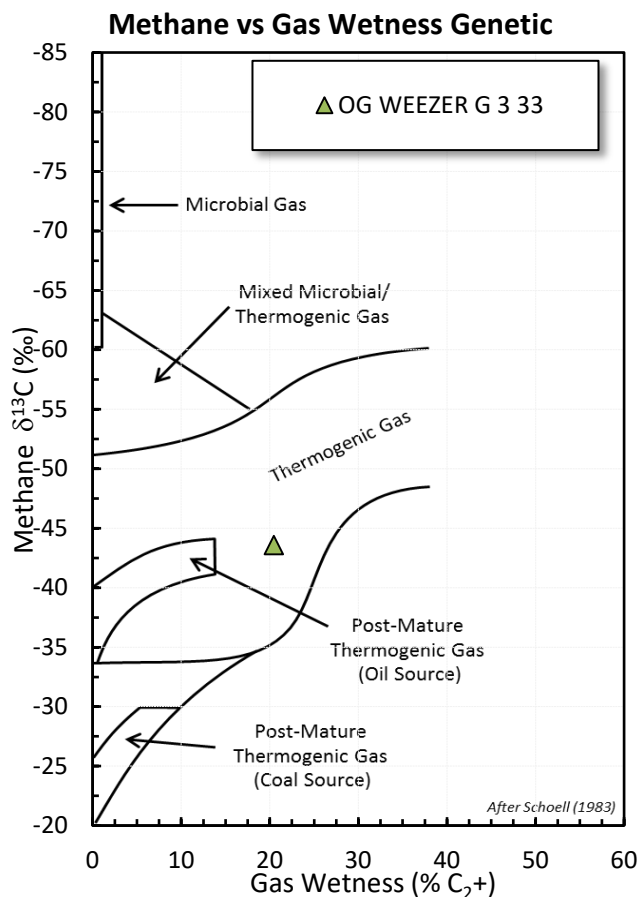
na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}\text{C}$ < 0.5 ‰

Error δD < 5.0 ‰

Stable Isotope Interpretive Plots



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1317 West 121st Ave
Westminster, CO 80234
p: 303.531.2030

Job 19123196

DIG-021244

Send Data and Invoice to:

Name: Jennifer Pellegri
Company: Origins Laboratory
Address: 1725 W. Elk Pl
Denver, CO 80211
Phone: 303-433-1322
Fax: _____
Email: jpellegri@originslab.com
ndoyle@originslab.com

AFE #: _____

Report Ctr: _____

Project: 4912296

PO #: _____

Location: _____

Sampled By: _____

Sample Description

Sample Description										
Container #	Sample Identification	Date Sampled	Time							Comments
491229600	06 - Weezer 6 - 3-33	12/17/19	1538	x			x	x		Please report by 12/31 per the email from Kelscy.
						</				

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>Origins</u>	<u>12/26/19</u>	<u>1140</u>
Received by <u>[Signature]</u>	<u>DIG</u>	<u>12/26/19</u>	<u>11:40</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

[illegible]



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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 #: 19123195
Lab #: DIG-021243
Client: Origins Laboratory
Sample Name(s): OG WEEZER G 3 21

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Analytical Report



Job #: 19123195
 Lab #: DIG-021243
 Client: Origins Laboratory
 Sample Name: OG WEEZER G 3 21
 Date Sampled: 12/17/19
 Time Sampled: 14:45
 Sample Description: 1L DIG Bottle
 Sampling Notes:
 Date Received: 12/26/19
 Date Analyzed: Gas Composition: 12/26/19 $\delta^{13}\text{C}$: 12/28/19 δD : 12/30/19
 Date Reported: 01/03/20
 Comments:

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N_2)	507592	50.52	-	-	-	
Oxygen + Argon ($\text{O}_2 + \text{Ar}$)	99760	9.93	-	-	-	
Carbon Dioxide (CO_2)	2631	0.26	-	-	-	
Helium (He) ^b	na	na	-	-	-	Helium added to create headspace.
Hydrogen (H_2)	nd	nd	-	-	-	
Methane (CH_4)	317991	31.65	80.55	-44.1	-225	
Ethane (C_2H_6)	50358	5.01	12.76	-	-	
Ethene (C_2H_4)	nd	nd	nd	-	-	
Propane (C_3H_8)	18137	1.81	4.59	-	-	
iso-Butane (C_4H_{10})	2347	0.23	0.59	-	-	
n-Butane (C_4H_{10})	4258	0.42	1.08	-	-	
iso-Pentane (C_5H_{12})	805	0.08	0.20	-	-	
n-Pentane (C_5H_{12})	572	0.06	0.14	-	-	
Hexanes + (C_6H_{14})	305	0.03	0.08	-	-	

Calculated Values:	
Total HCs (ppm)	394773
Gas Wetness (mol % $\text{C}_2 + / \text{C}_1 +$)	19.45
$\text{C}_1 / (\text{C}_2 + \text{C}_3)$ (mol/mol)	5

^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

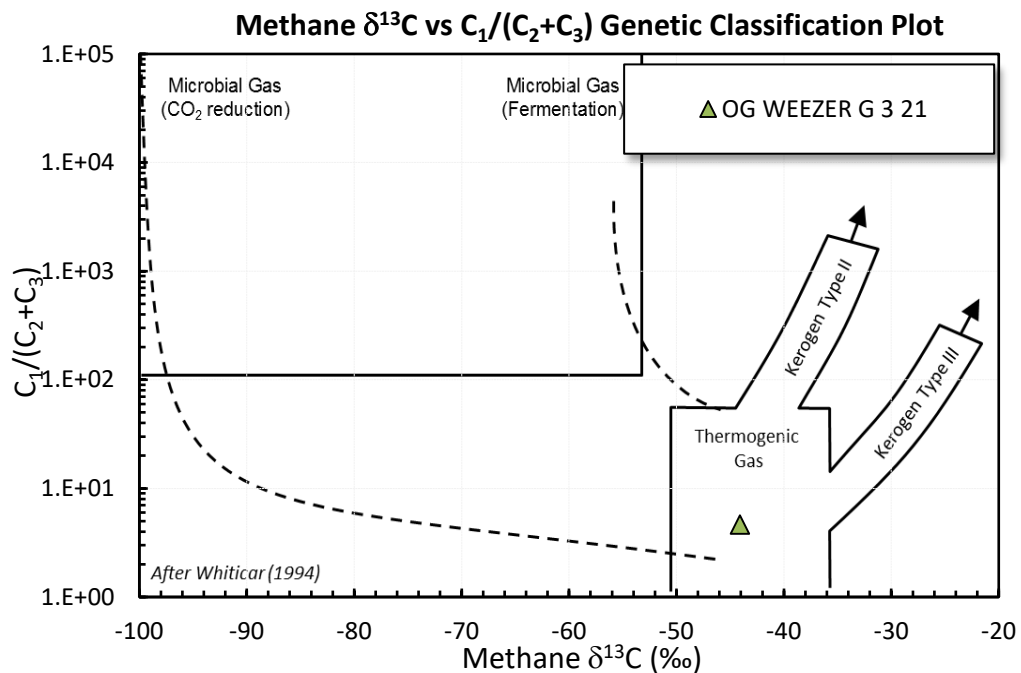
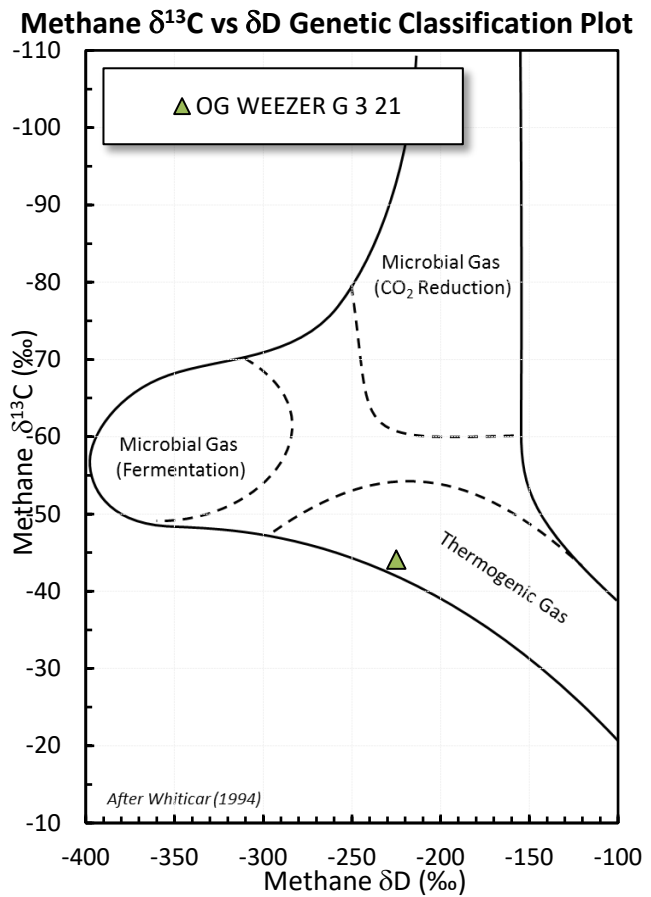
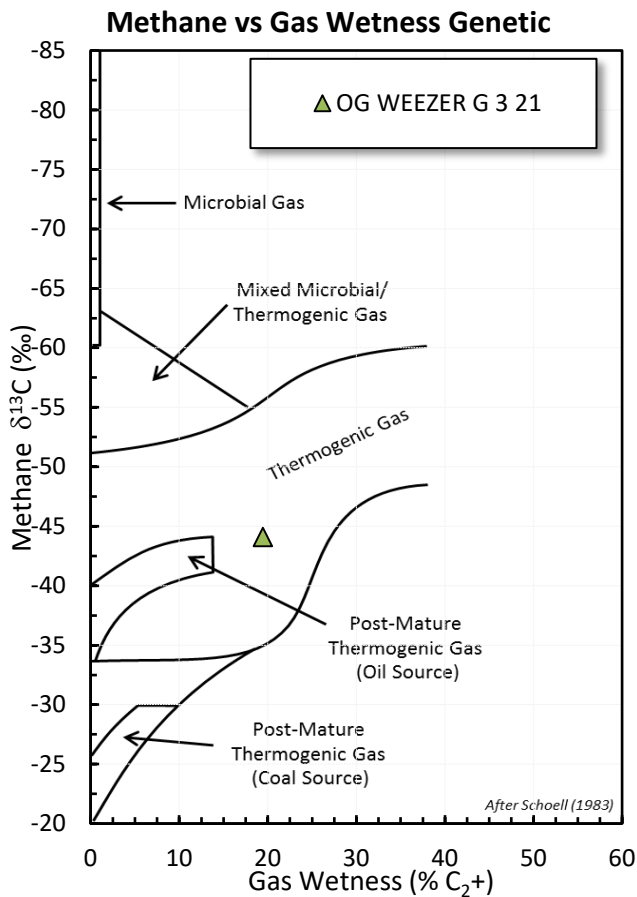
na = not analyzed

Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}\text{C}$ < 0.5 ‰

Error δD < 5.0 ‰

Stable Isotope Interpretive Plots



Chain of Custody Form



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1317 West 121st Ave
Westminster, CO 80234
p: 303.531.2030

Job 19123195

DIG - 021243

Send Data and Invoice to:

Name: Jennifer Pellegrini
Company: Origins Laboratory
Address: 1725 W. Elk Pl
Denver, CO 80211
Phone: 303-433-1322
Fax: _____
Email: j.pellegrini@originslab.com
ndoyle@originslab.com

AFE #: _____

Report Ctr: _____

Project: 4912303

PO #: _____

Location: _____

Sampled By: _____

Sample Description

Sample Description										
Container #	Sample Identification	Date Sampled	Time							Comments
4912303-01	06-wrecker 6- 3-21	12/17/19	1445	X			X	X		Please report by 12/31 per the email from Kelscy.

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Origins	12/20/19	1140
Received by <u>Kelscy May</u>	DIG	12/26/19	11:40
Relinquished by			
Received by			

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[illegible]