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 #:	**240211351**
Lab #:	**DIG-034873**
Client:	**Olsson**
Well Name:	**SCMW022924**
API #:	

Client/Well Name: Olsson / SCMW022924
Job #: 240211351
Lab #: DIG-034873

SAMPLE INFORMATION						COMPLETE GAS ANALYSIS													HYDROCARBON GAS ANALYSIS (normalized to total HC content)								BTU CONTENT*
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	GC Date	N_2 ppm	O_2 + Ar ppm	CO_2 ppm	C_1 ppm	C_2 ppm	C_3 ppm	iC_4 ppm	nC_4 ppm	iC_5 ppm	nC_5 ppm	C_6+ ppm	C_2H_4 ppm	He ppm	H_2 ppm	C_1 mol%	C_2 mol%	C_3 mol%	iC_4 mol%	nC_4 mol%	iC_5 mol%	nC_5 mol%	C_6+ mol%	Total Gas BTU/ft^3
240211351	DIG-034873	SCMW022924 Gas	Gas	02/29/24	10:05	3/4/2024	541934	146314	2005	221739	36156	15599	2032	3827	842	601	203	nd	nd	nd	78.9	12.87	5.55	0.72	1.36	0.30	0.21	0.07	364

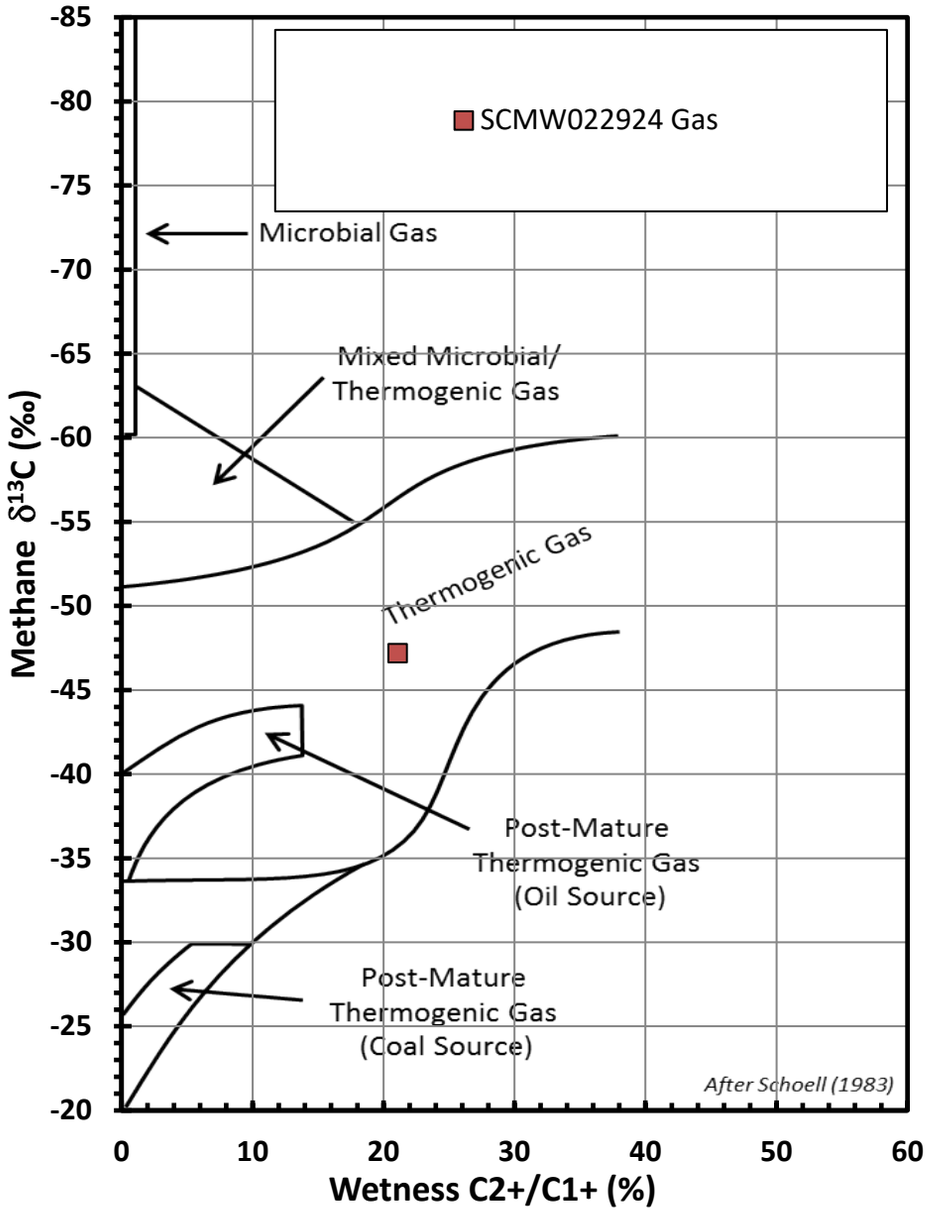
SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS											
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	Total HC ppm	Wetness % C_2 to C_6	C_1/C_2+C_3 mol/mol	Balance Ratio C_1+C_2/C_3-C_5	Mass Spec Date	$\delta^{13}C_1$ ‰ VPDB	$\delta^{13}C_2$ ‰ VPDB	$\delta^{13}C_3$ ‰ VPDB	$\delta^{13}iC_4$ ‰ VPDB	$\delta^{13}nC_4$ ‰ VPDB	$\delta^{13}iC_5$ ‰ VPDB	$\delta^{13}nC_5$ ‰ VPDB	$\delta^{13}CO_2$ ‰ VPDB	δD ‰ VSMOW	Comments
240211351	DIG-034873	SCMW022924 Gas	Gas	02/29/24	10:05	280999	21.1	4.3	11.3	3/6/2024	-47.2	-31.5	-28.0	-30.5	-27.2	-27.1	-27.4		-254	

Stable isotope results based on multi-point laboratory calibration
Values in red represent low signal; interpret with caution
Precision $\delta 13C$ < 0.5 ‰
Precision δD < 5 ‰
* As ideal gas, with gas concentrations normalized to 100%; caculations based on GPA 2145-09 physical constants.

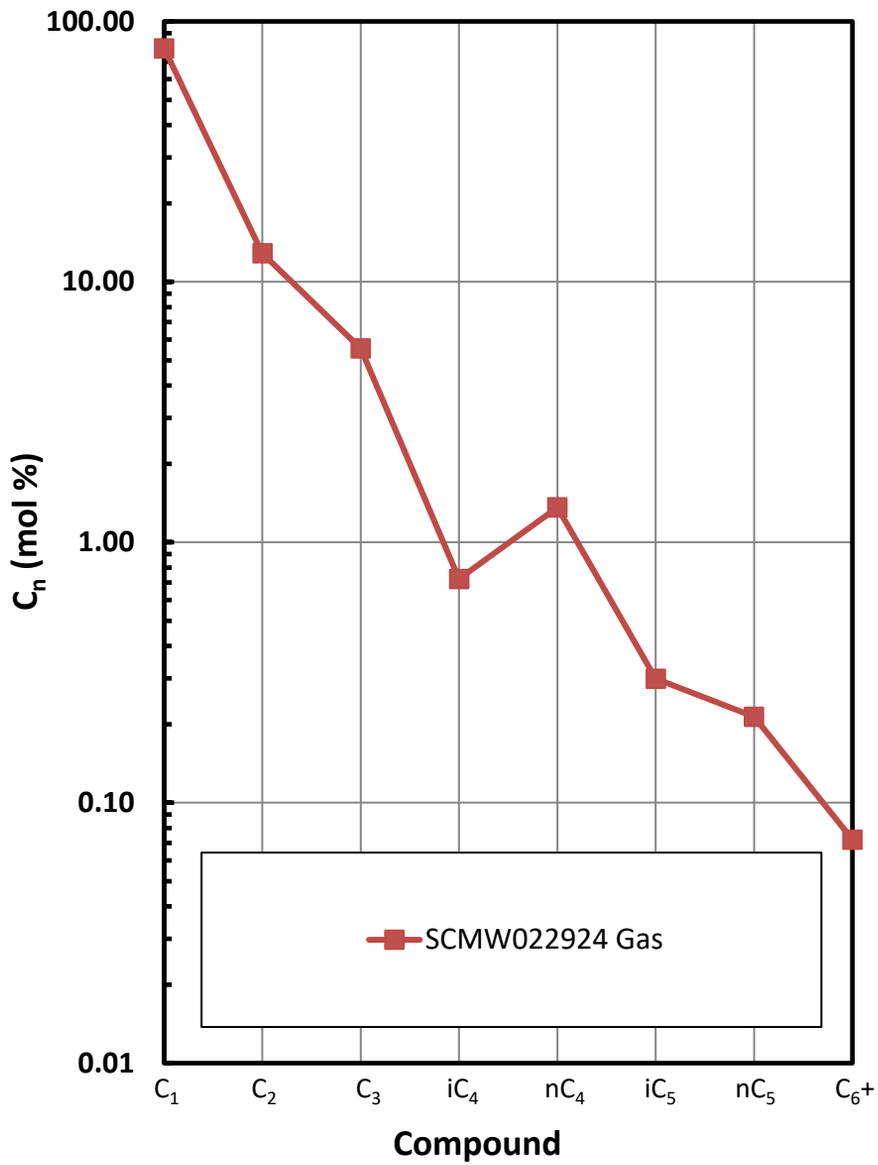
SPECIFIC GRAVITY*	
Total Gas Spec Grav	HCs only Spec Grav
0.915	0.712

INTERPRETIVE PLOTS

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

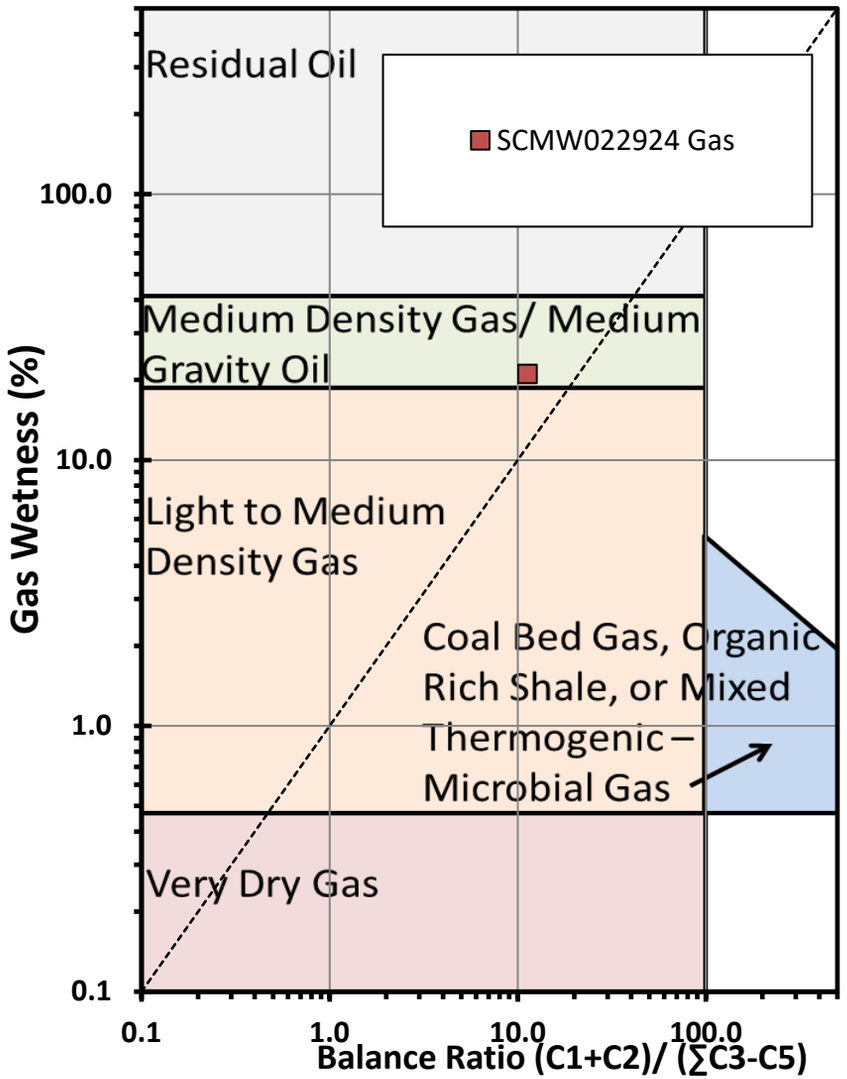


Hydrocarbon Composition Plot

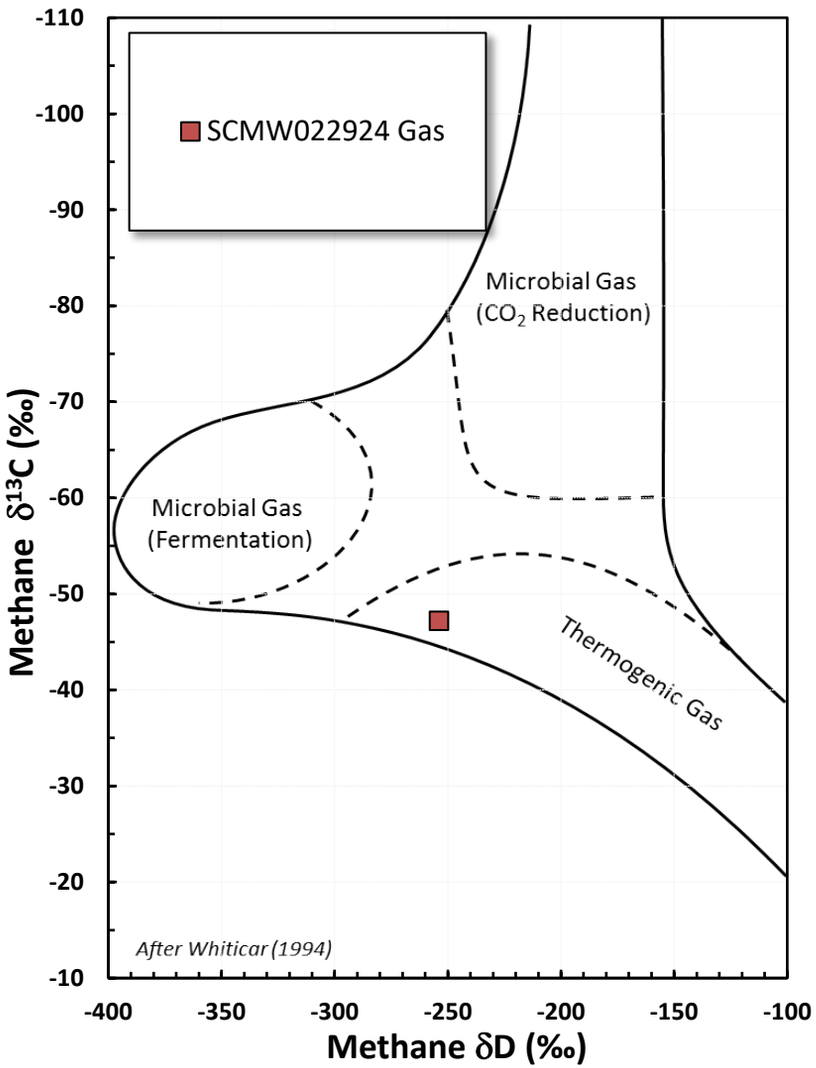


INTERPRETIVE PLOTS

Haworth Ratio Plot - Characterization of Hydrocarbon Type

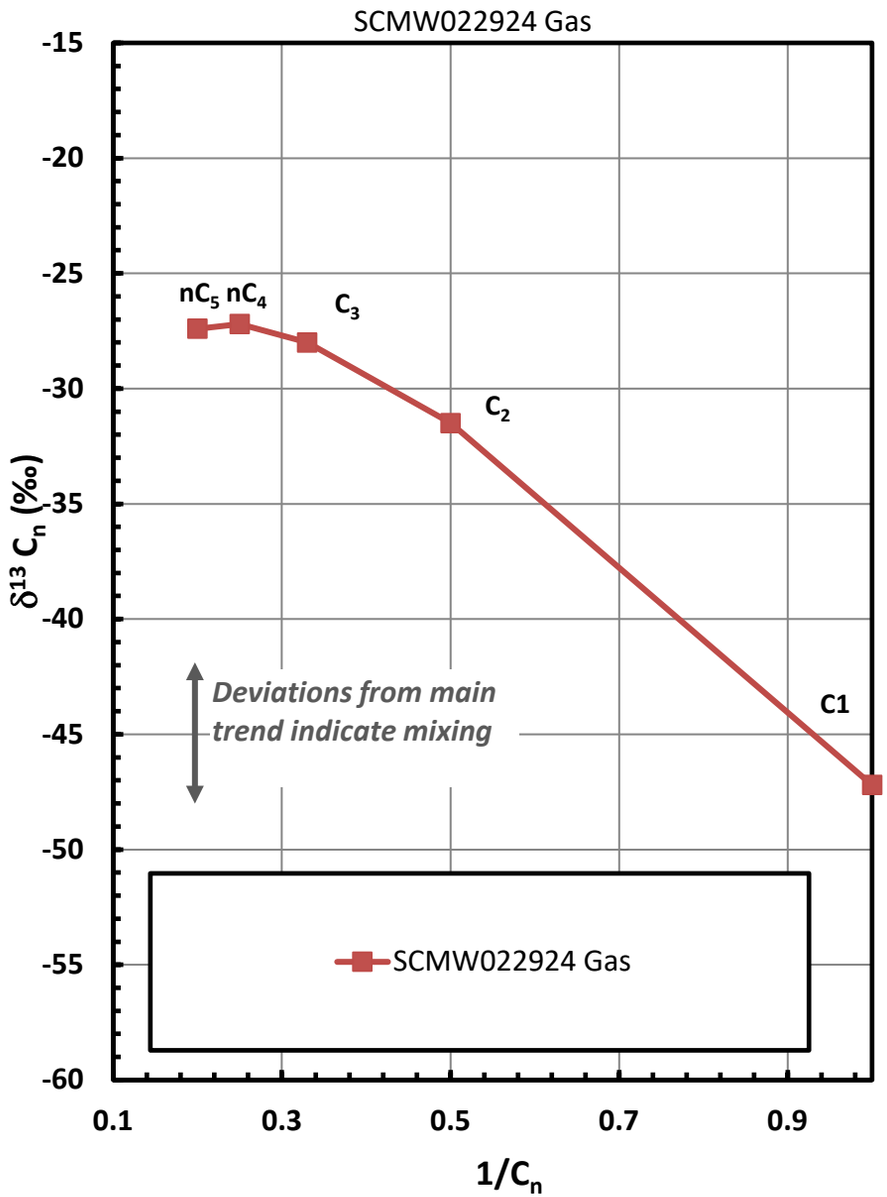


Methane $\delta^{13}C$ vs δD Genetic Classification Plot

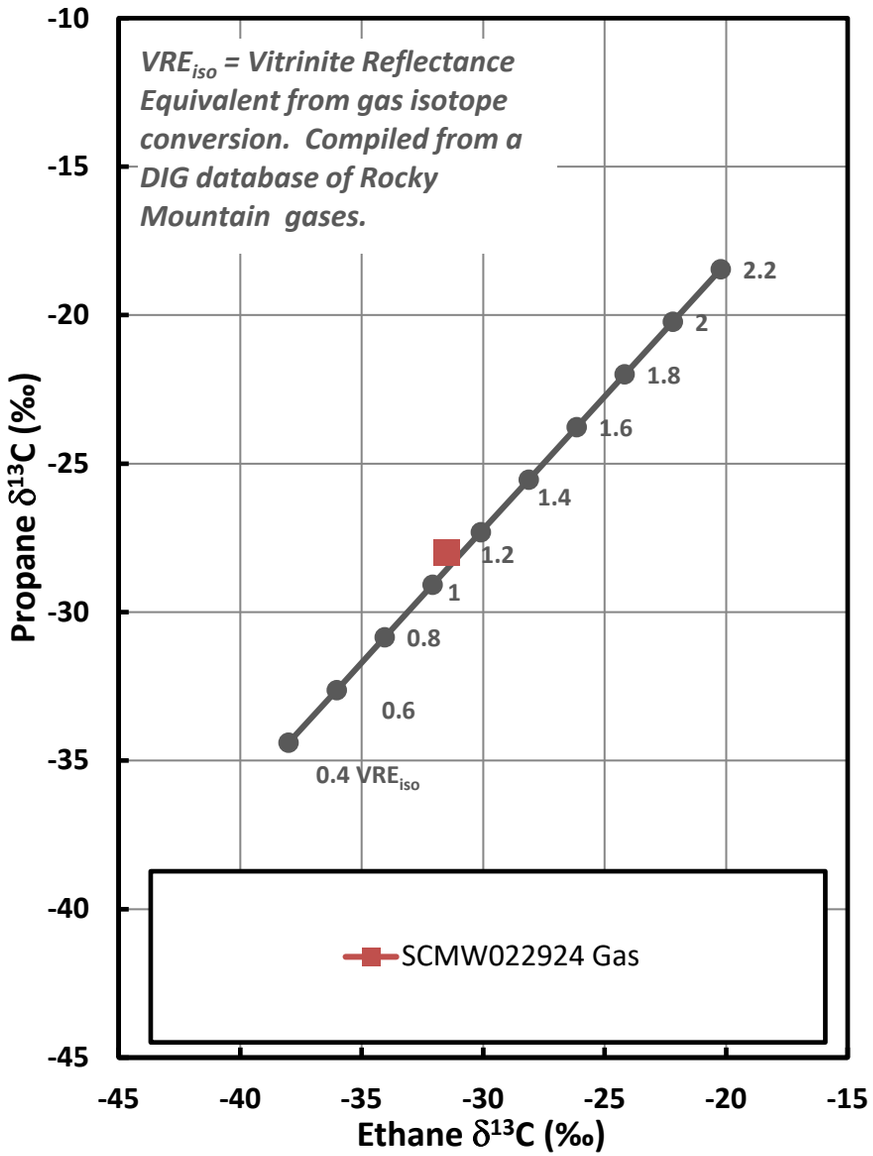


INTERPRETIVE PLOTS

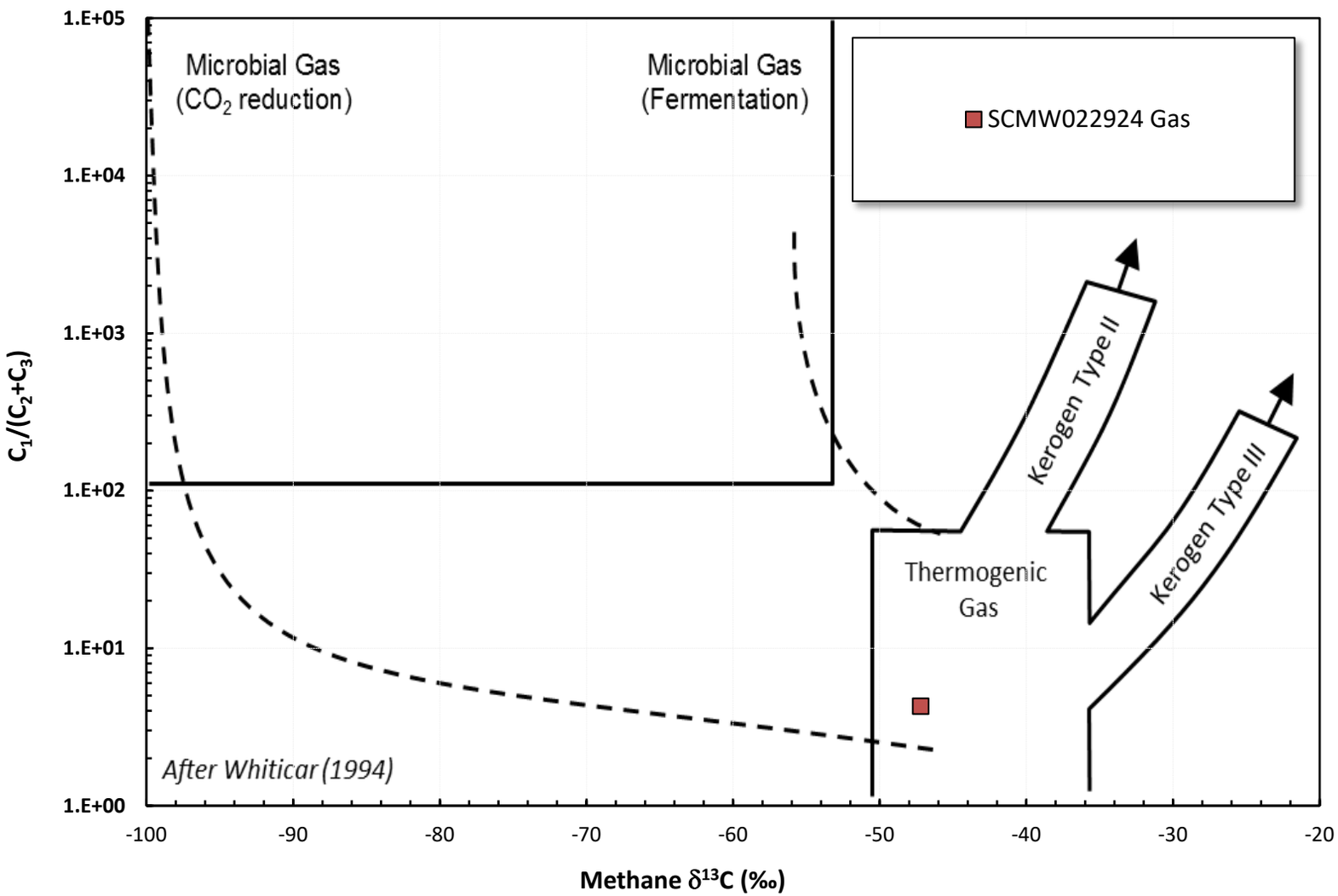
Mixing Plot



Ethane - Propane Maturity Plot



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



Organization	Reporting Organization	Reporting Organization Name	Order Number	Entity Requesting Analysis	Purpose	Project													
	10206	Dolan Integration Group		Olsson															
Sample	COGCC Facility No.	Sample Date and Time	API #	LAB Sample ID	Sample Type	Matrix	Comments	Project Number	Chain of Custody ID	Date Received by Lab									
		2/29/24 10:05		DIG-034873		GAS			SCMW022924	2/29/2024									
Batch	LabID	Lab Batch Identifier	Leach Date	Extract Date and Time	Extract Method	Start Date and Time	Conc Method	Init Vol	Final Vol	Init Vol Units	Final Vol Units	Analysis Date and Time	Report Basis	Comments	File Name	Column #			
	10206	240211351																	
Result	CAS Number	Analysis Name	Analysis Method	Analytical Method Modifier	Unit	Result Value	Qualifier	Test Type	Result Text	Data Flag	Dilution	Fraction Type	MDC	Requested MDC	Detection Limit	Instrument Detection Limit	Method Detection Limit	Comments	AnalyticalBatchID
	O2+AR	OXYGEN + ARGON	SOP		MOL %	15.065									0.005	0.005	0.005		240211351
	124-38-9	CARBON DIOXIDE	SOP		MOL %	0.206									0.005	0.005	0.005		240211351
	7727-37-9	NITROGEN (N2)	SOP		MOL %	55.797									0.005	0.005	0.005		240211351
	7440-59-7	Helium	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240211351
	1333-74-0	HYDROGEN	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240211351
	74-82-8	METHANE	SOP		MOL %	22.830									0.005	0.005	0.005		240211351
	74-84-0	ETHANE	SOP		MOL %	3.723									0.005	0.005	0.005		240211351
	74-85-1	ETHENE	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240211351
	74-98-6	PROPANE	SOP		MOL %	1.606									0.005	0.005	0.005		240211351
	75-28-5	ISOBUTANE	SOP		MOL %	0.209									0.005	0.005	0.005		240211351
	106-97-8	N-BUTANE	SOP		MOL %	0.394									0.005	0.005	0.005		240211351
	iC5	ISOPENTANE	SOP		MOL %	0.087									0.005	0.005	0.005		240211351
	109-66-0	N-PENTANE	SOP		MOL %	0.062									0.005	0.005	0.005		240211351
	92112-69-1+	C6+ (hexanes +)	SOP		MOL %	0.021									0.005	0.005	0.005		240211351
	delta13C_C1	DELTA 13C C1	SOP		per mil	-47.2													240211351
	deltaD_C1	DELTA D C1	SOP		per mil	-254													240211351
	delta13C_C2	DELTA 13C C2	SOP		per mil	-31.5													240211351
	delta13C_C3	DELTA 13C C3	SOP		per mil	-28.0													240211351
	delta13C_iC4	DELTA 13C iC4	SOP		per mil	-30.5													240211351
	delta13C_nC4	DELTA 13C nC4	SOP		per mil	-27.2													240211351
	delta13C_iC5	DELTA 13C iC5	SOP		per mil	-27.1				Low Signal									240211351
	delta13C_nC5	DELTA 13C nC5	SOP		per mil	-27.4				Low Signal									240211351
	BTU	BRITISH THERMAL UNITS	SOP		BTU/cuft	364													240211351
	SpGrav	SPECIFIC GRAVITY	SOP		No Unit	0.915													240211351

dig Geochemistry for Energy
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JOB 240211351
DIG-034873

Send Data to:	Send Invoice to (if different):	Additional Information:
Name: Trent Wathe	Name:	AFE #:
Company: Olsson	Company:	Project: Sand Creek Monitoring Well
Address: 1525 Raleigh St. #400	Address:	PO #:
City, State: Denver, CO	City, State:	Location: Greeley, CO
Phone: 303-503-5140	Phone:	Sampled By: Brock Hunt
Email: Twathe@olsson.com	Email:	API #:

Turnaround Time**: (●) Standard (≤ 10 Business days) ( ) Rush (≤ 5 Business days) ( ) Expedited Rush (≤ 3 Business days)

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
	SCMW022924	2/29	10:05	Other	☑	☑	☑	☑	☑	☑	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐
				Other	☐	☐	☐	☐	☐	☐	☐	☐	☐

Chain of Custody Record

Comments:

Relinquished by Signature	Company	Date	Time	Received by Signature	Company	Date	Time
[signature]	Olsson	2/29	16:00	[signature]	DIG	2/29/24	15:00

*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.