



dig
Dolan Integration Group

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 #: 240812372
Lab #: DIG-036815
Client: Olsson
Well Name: SCMW082724
API #:

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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 ₂ H 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	
240812372	DIG-036815	SCMW082724 Gas	Gas	08/27/24	10:30	8/28/2024	503421	138102	1401	269495	42979	18453	2482	4633	1025	753	221				79.3	12.64	5.43	0.73	1.36	0.30	0.22	0.06	434	

SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS										Comments
Job Number	Lab Number	Well Name	Sample Type	Sample Date	Sample Time	Total HC ppm	Wetness % C ₂ to C ₆	C ₂ /C ₁ +C ₃ mol/mol	Balance Ratio C ₁ +C ₂ /C ₁ -C ₂	Mass Spec Date	δ ¹³ C ₁ ‰ VPDB	δ ¹³ C ₂ ‰ VPDB	δ ¹³ C ₃ ‰ VPDB	δ ¹³ iC ₄ ‰ VPDB	δ ¹³ nC ₄ ‰ VPDB	δ ¹³ iC ₅ ‰ VPDB	δ ¹³ nC ₅ ‰ VPDB	δ ¹³ CO ₂ ‰ VPDB	δD ‰ VSMOW	
240812372	DIG-036815	SCMW082724 Gas	Gas	08/27/24	10:30	340041	20.7	4.4	11.4	9/6/2024	-46.1	-32.0	-28.2	-31.4	-28.9					-260

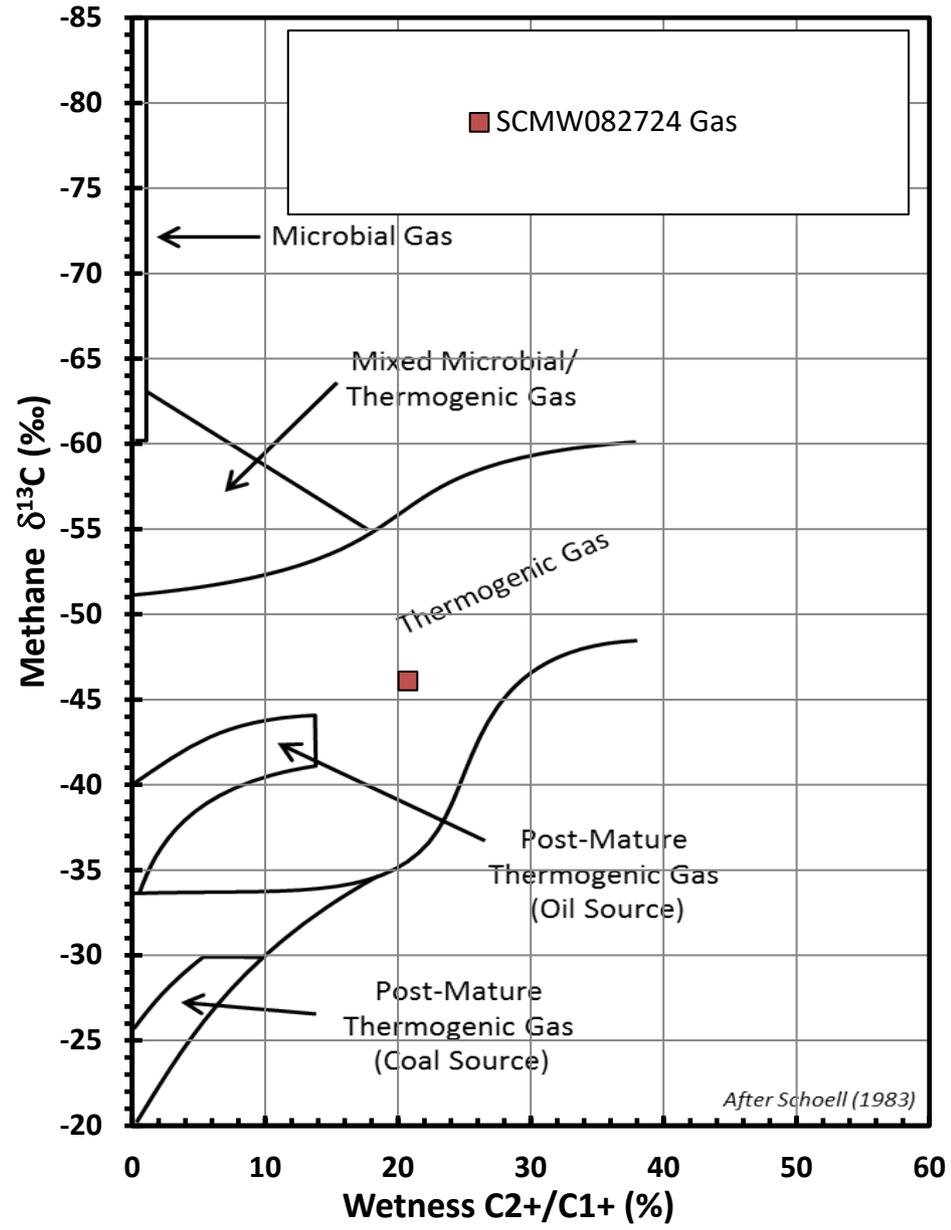
Stable isotope results based on multi-point laboratory calibration
 Values in red represent low signal; interpret with caution
 Precision δ13C < 0.5 ‰
 Precision δD < 5 ‰

SPECIFIC GRAVITY*	
Total Gas Spec Grav	HCs only Spec Grav
0.898	0.710

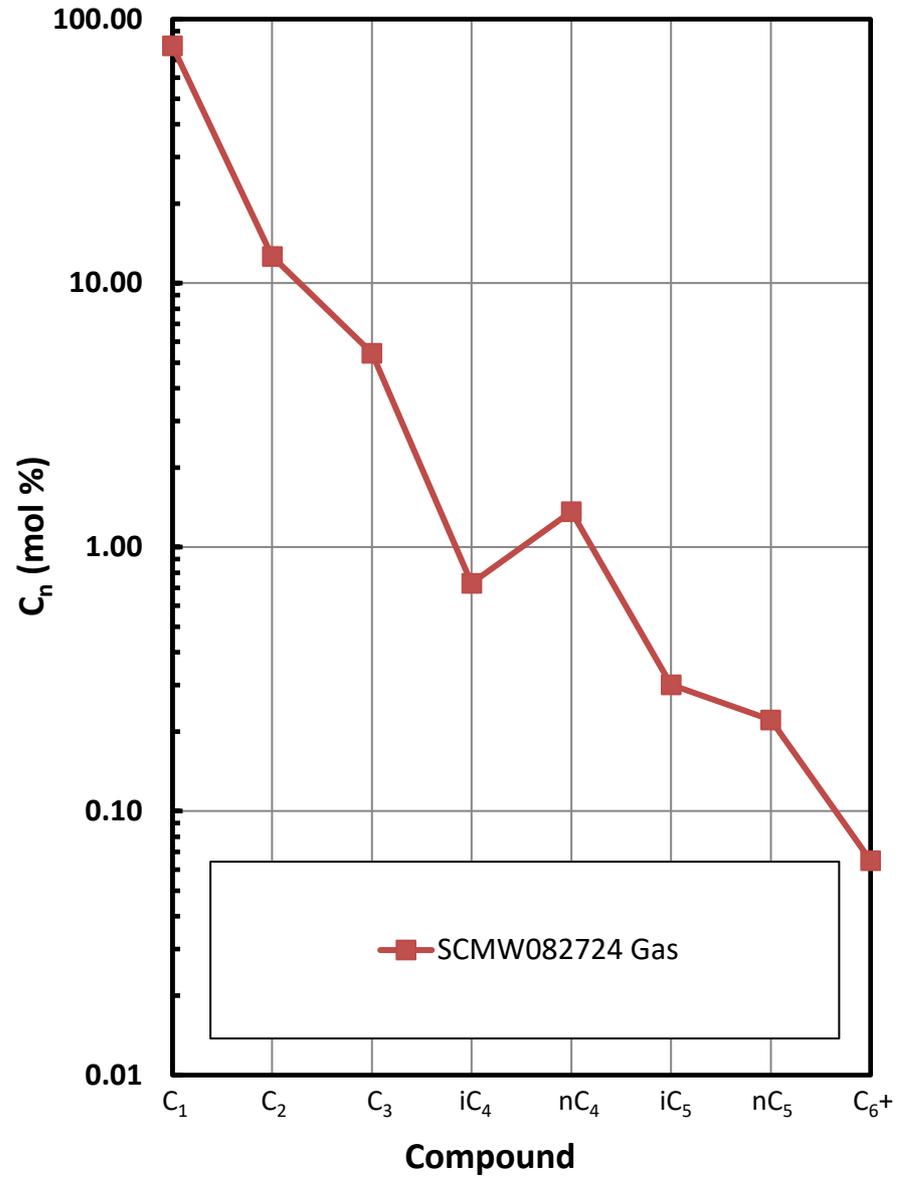
* As ideal gas, with gas concentrations normalized to 100%; calculations based on GPA 2145-09 physical constants.

INTERPRETIVE PLOTS

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

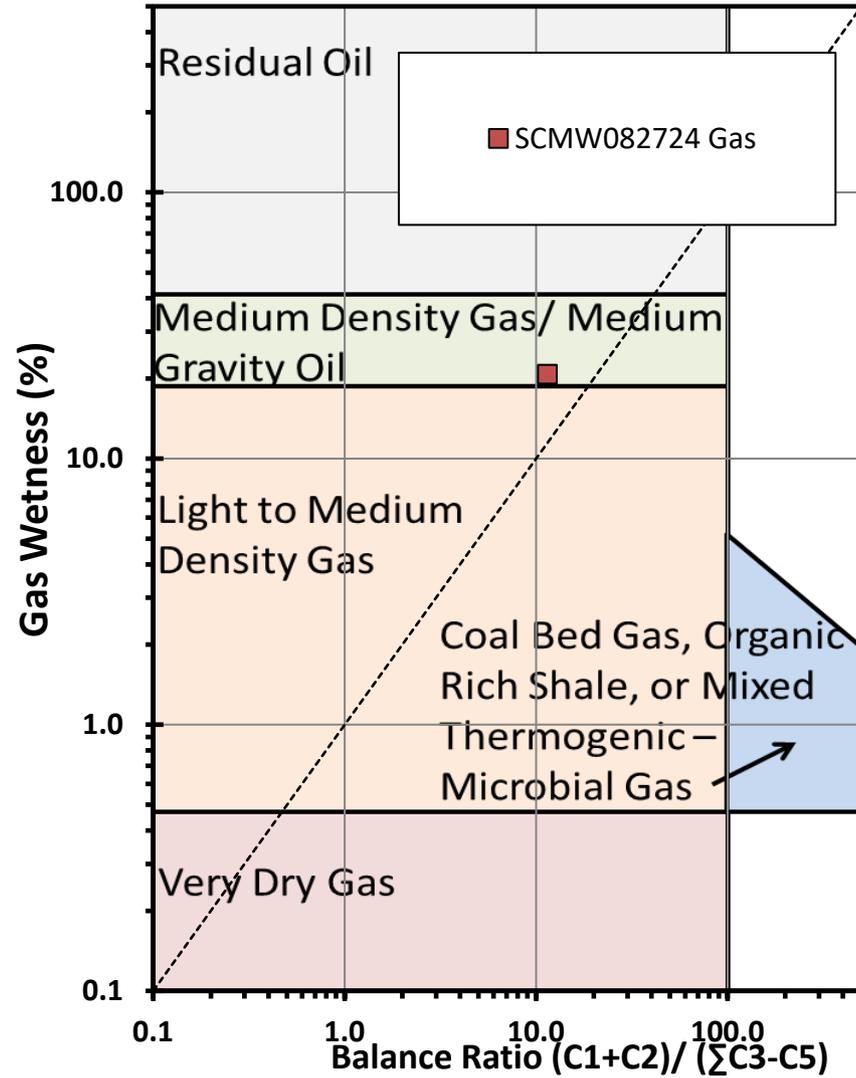


Hydrocarbon Composition Plot

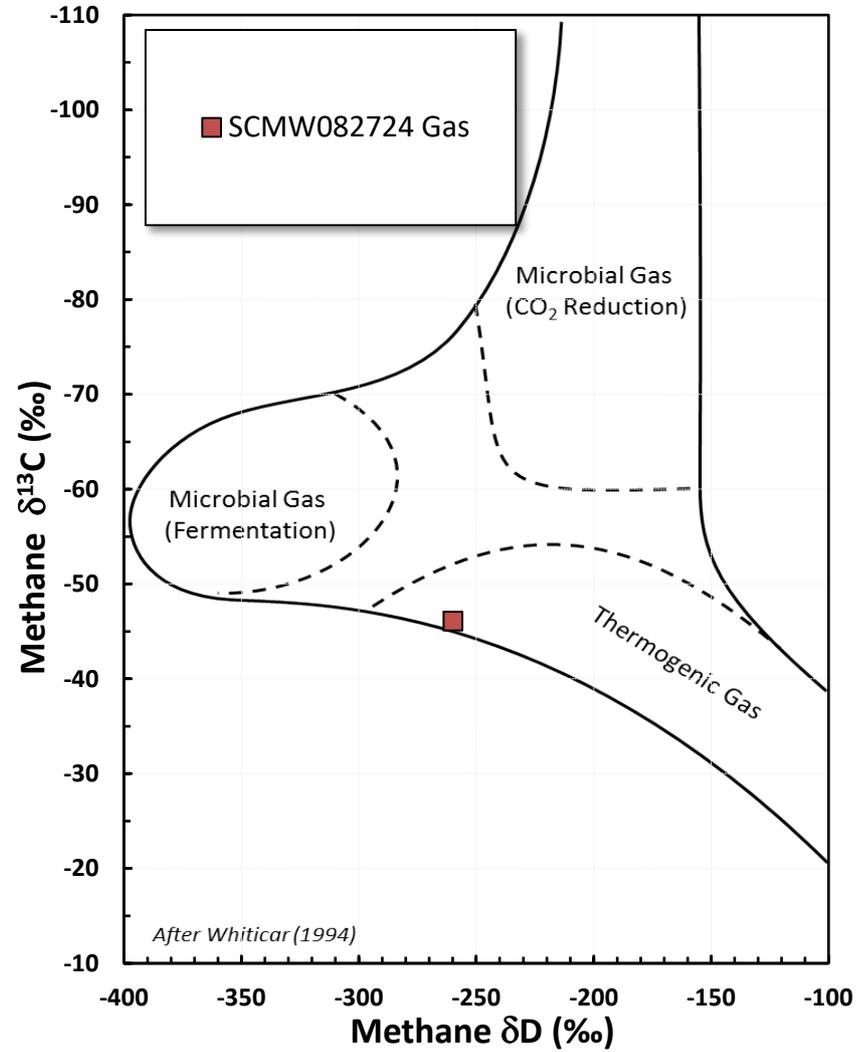


INTERPRETIVE PLOTS

Haworth Ratio Plot - Characterization of Hydrocarbon Type

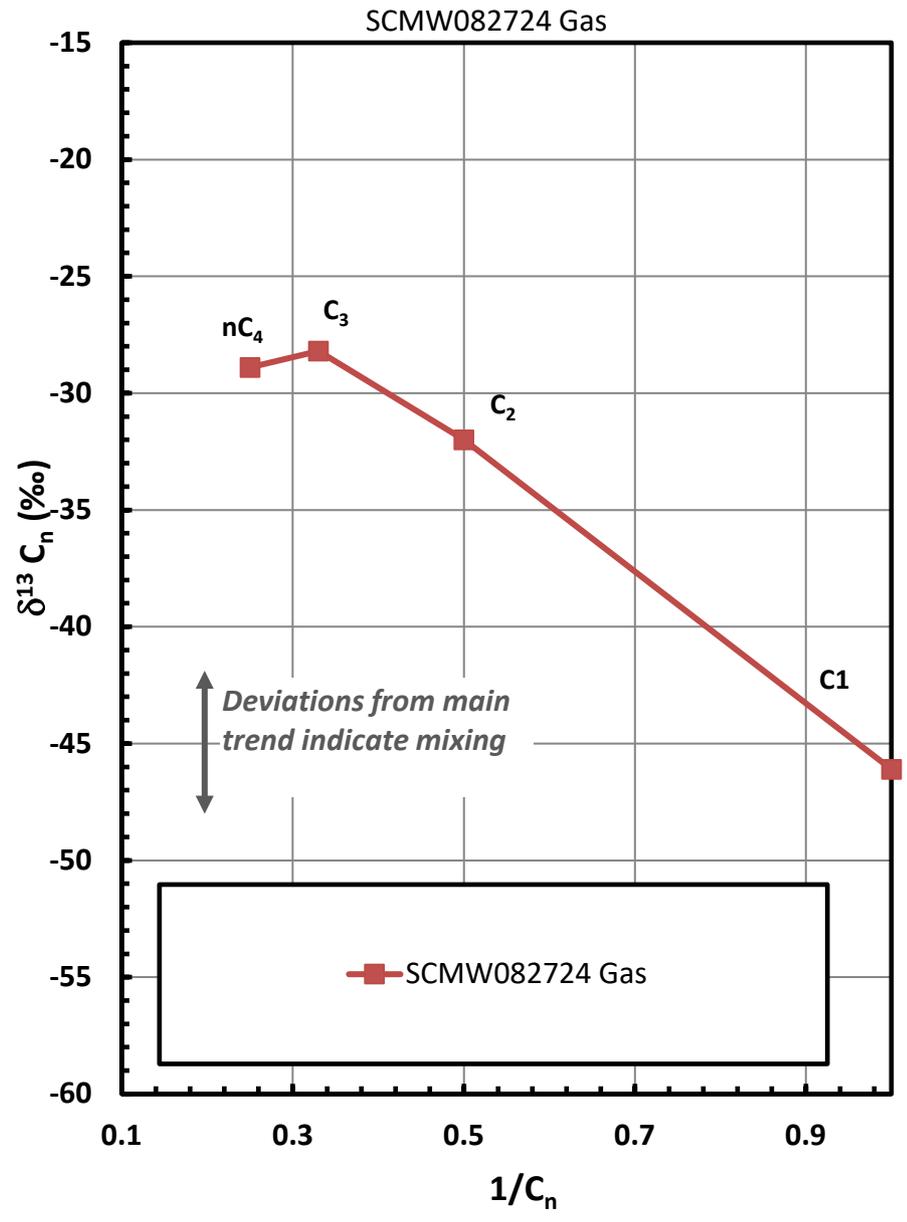


Methane $\delta^{13}C$ vs δD Genetic Classification Plot

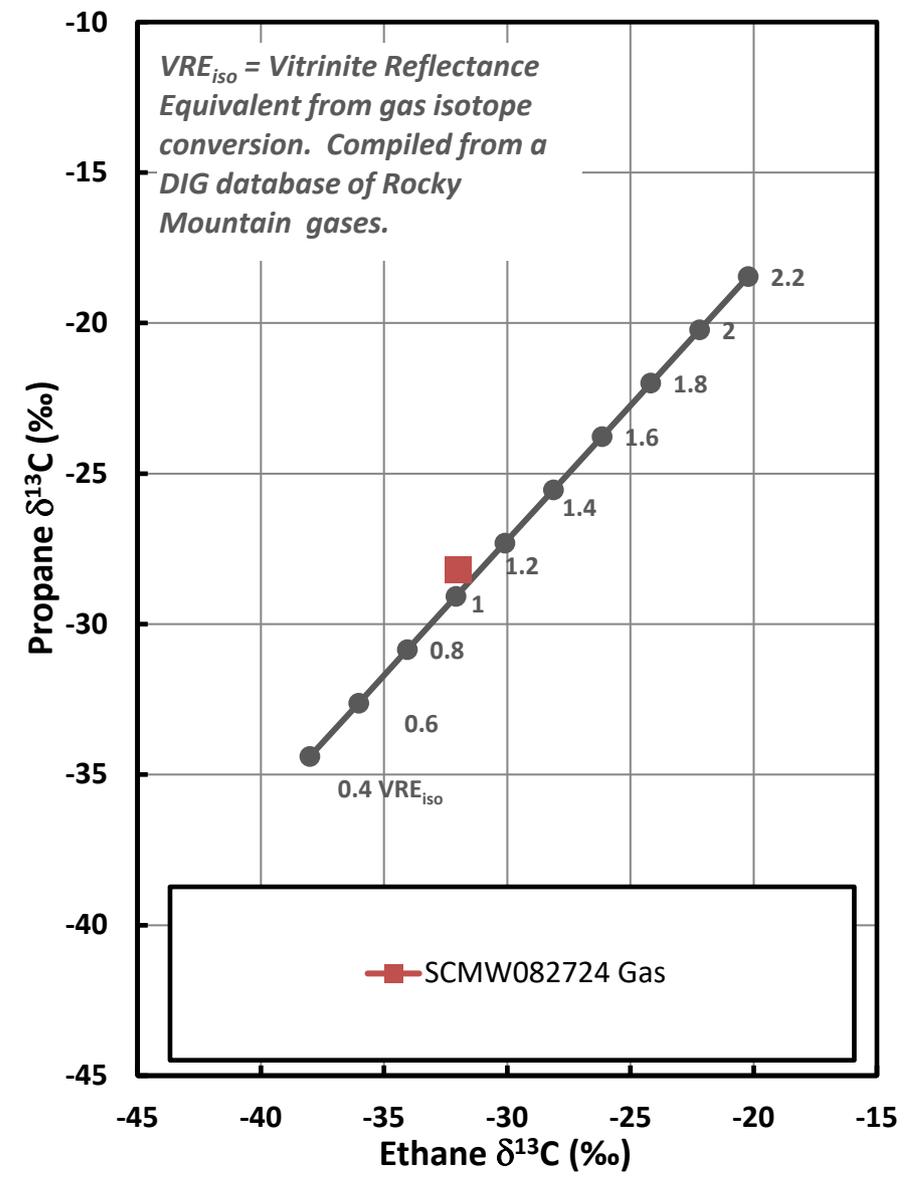


INTERPRETIVE PLOTS

Mixing Plot

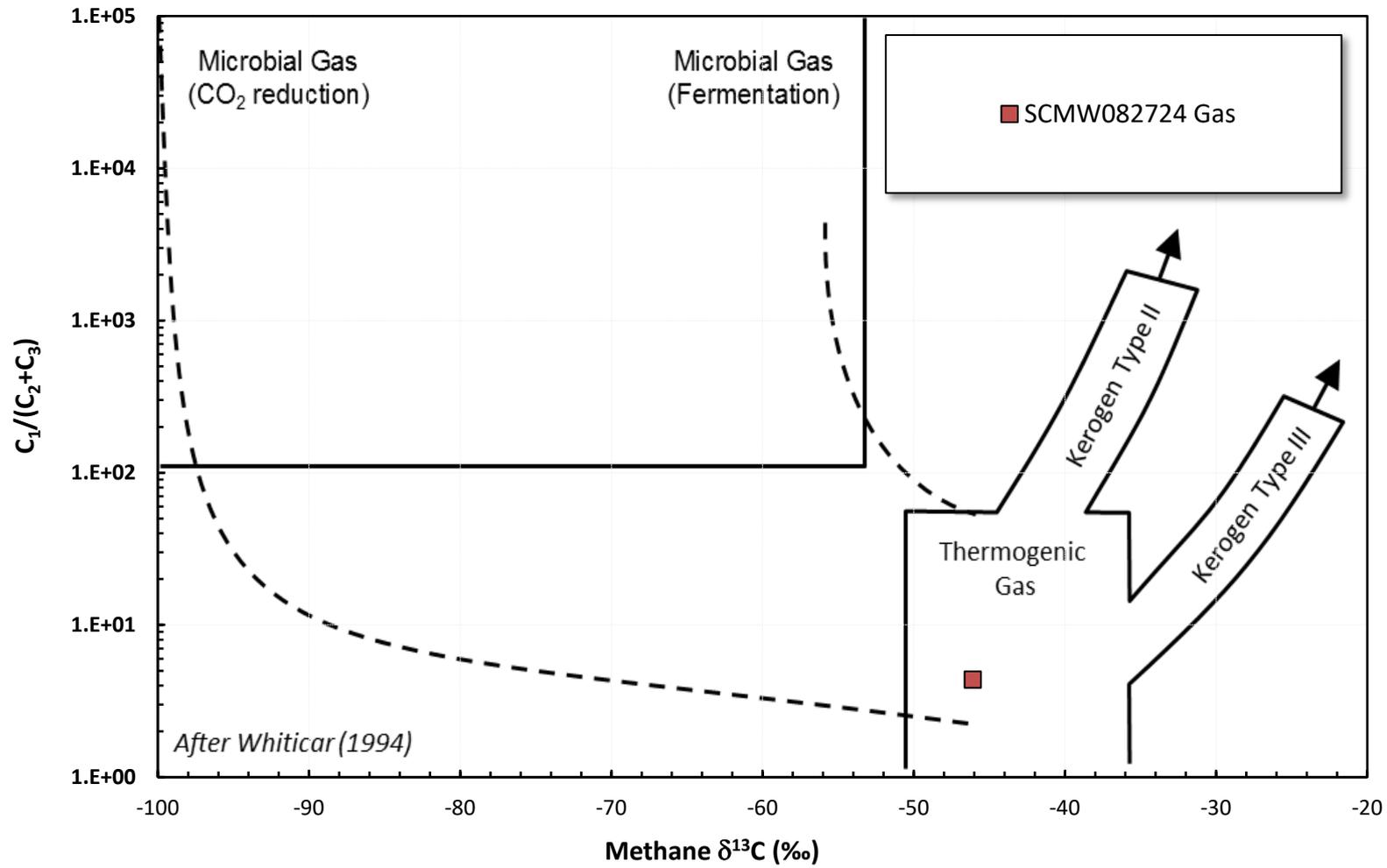


Ethane - Propane Maturity Plot



INTERPRETIVE PLOTS

Methane $\delta^{13}\text{C}$ vs $\text{C}_1/(\text{C}_2+\text{C}_3)$ Genetic Classification Plot



Organization	Reporting Organization	Reporting Organization Name	Order Number	Entity Requesting Analysis	Purpose	Project															
10206	COGCC Facility No.	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											
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		240812372																			
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 %	14.050									0.005	0.005	0.005		240812372		
	124-38-9	CARBON DIOXIDE	SOP		MOL %	0.143									0.005	0.005	0.005		240812372		
	7727-37-9	NITROGEN (N2)	SOP		MOL %	51.215									0.005	0.005	0.005		240812372		
	7440-59-7	Helium	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240812372		
	1333-74-0	HYDROGEN	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240812372		
	74-82-8	METHANE	SOP		MOL %	27.417									0.005	0.005	0.005		240812372		
	74-84-0	ETHANE	SOP		MOL %	4.372									0.005	0.005	0.005		240812372		
	74-85-1	ETHENE	SOP		MOL %	0.005	ND								0.005	0.005	0.005		240812372		
	74-98-6	PROPANE	SOP		MOL %	1.877									0.005	0.005	0.005		240812372		
	75-28-5	ISOBUTANE	SOP		MOL %	0.253									0.005	0.005	0.005		240812372		
	106-97-8	N-BUTANE	SOP		MOL %	0.471									0.005	0.005	0.005		240812372		
	ICS	ISOPENTANE	SOP		MOL %	0.104									0.005	0.005	0.005		240812372		
	109-66-0	N-PENTANE	SOP		MOL %	0.077									0.005	0.005	0.005		240812372		
	92112-69-1+	C6+ (hexanes +)	SOP		MOL %	0.022									0.005	0.005	0.005		240812372		
	delta13C_C1	DELTA 13C C1	SOP		per mil	-46.1													240812372		
	deltaD_C1	DELTA D C1	SOP		per mil	-260													240812372		
	delta13C_C2	DELTA 13C C2	SOP		per mil	-32.0													240812372		
	delta13C_C3	DELTA 13C C3	SOP		per mil	-28.2													240812372		
	delta13C_C4	DELTA 13C C4	SOP		per mil	-31.4													240812372		
	delta13C_nC4	DELTA 13C nC4	SOP		per mil	-28.9													240812372		
	BTU	BRITISH THERMAL UNITS	SOP		BTU/cuft	434													240812372		
	SpGrav	SPECIFIC GRAVITY	SOP		No Unit	0.898													240812372		

Low Signal
Low Signal



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Office and Lab 11025 Dover St • Ste 800 • Westminster, CO 80021

Send Data to:	Send Invoice to (if different):	Additional Information:
Name: Trent Watne	Name:	AFE #: RCDJ21330
Company: Olsson	Company:	Project: Sand Creek Monitoring Well
Address: 1525 Raleigh St. #400	Address:	PO #:
City, State: Denver, CO 80203	City, State:	Location: Greeley, CO
Phone: 303-503-5140	Phone:	Sampled By: Ryan H.
Email: twatne@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 (with ASTM D1250)	ASTM D1250 (API Gravity)	d18O and dD Isotopes of Water	RSK 175 Dissolved Gas Quantification	d13C of Dissolved Inorganic Carbon (DIC)	Other (Specify):
	SCMW082724	8/27	10:30	Other	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
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				Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						

Chain of Custody Record Comments:

Relinquished by Signature	Company	Date	Time	Received by Signature	Company	Date	Time
<i>[Signature]</i>	Olsson	8/27	14:10	<i>[Signature]</i>	DIG	8/27	14:10

*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.