



**dig**  
Dolan Integration Group

Geochemistry for Energy

11025 Dover Street Unit 800

Westminster, CO 80021

p: 303.531.2030

**Quantitative High Resolution Whole Oil Gas Chromatography  
Analytical Results**

**Job #: 260215254**

**Lab #: DIG-042824**

**Client: Prairie Operating Company, LLC**

**Project/ Well Name: COT West T-30-25HC**

**API: 123-50405**

**Facility ID:**

**Sample Types: Bradenhead Oil**

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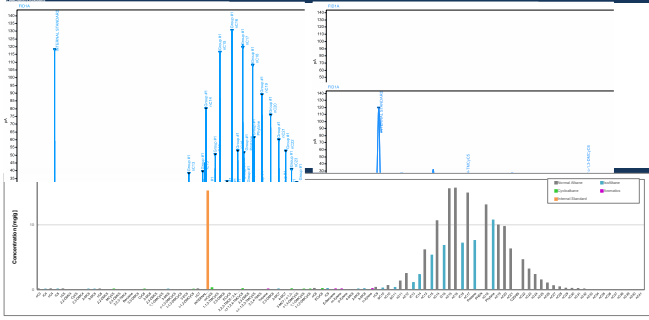
Sample ID	Sample Name	Sample Type	Sample Location	Sample Date	Sample Status	Sample Notes	Sample Comments	Sample Results	Sample Analysis	Sample Report

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m/z	Relative Intensity	Label
114.0204	100	Methionine
129.0458	100	Leucine
144.0612	100	Isoleucine
159.0866	100	Valine
174.1120	100	Leucine
189.1274	100	Isoleucine
204.1528	100	Valine
219.1682	100	Leucine
234.1936	100	Isoleucine
249.2090	100	Valine
264.2344	100	Leucine
279.2498	100	Isoleucine
294.2752	100	Valine
309.2906	100	Leucine
324.3160	100	Isoleucine
339.3314	100	Valine
354.3568	100	Leucine
369.3722	100	Isoleucine
384.3976	100	Valine
399.4130	100	Leucine
414.4384	100	Isoleucine
429.4538	100	Valine
444.4792	100	Leucine
459.4946	100	Isoleucine
474.5200	100	Valine
489.5354	100	Leucine
504.5608	100	Isoleucine
519.5762	100	Valine
534.5916	100	Leucine
549.6170	100	Isoleucine
564.6324	100	Valine
579.6478	100	Leucine
594.6732	100	Isoleucine
609.6886	100	Valine
624.7140	100	Leucine
639.7294	100	Isoleucine
654.7548	100	Valine
669.7702	100	Leucine
684.7956	100	Isoleucine
699.8110	100	Valine
714.8364	100	Leucine
729.8518	100	Isoleucine
744.8772	100	Valine
759.8926	100	Leucine
774.9180	100	Isoleucine
789.9334	100	Valine
804.9588	100	Leucine
819.9742	100	Isoleucine
834.9996	100	Valine
849.0150	100	Leucine
864.0404	100	Isoleucine
879.0558	100	Valine
894.0812	100	Leucine
909.0966	100	Isoleucine
924.1220	100	Valine
939.1374	100	Leucine
954.1628	100	Isoleucine
969.1782	100	Valine
984.2036	100	Leucine
999.2190	100	Isoleucine



**Definitions & Interpretations**

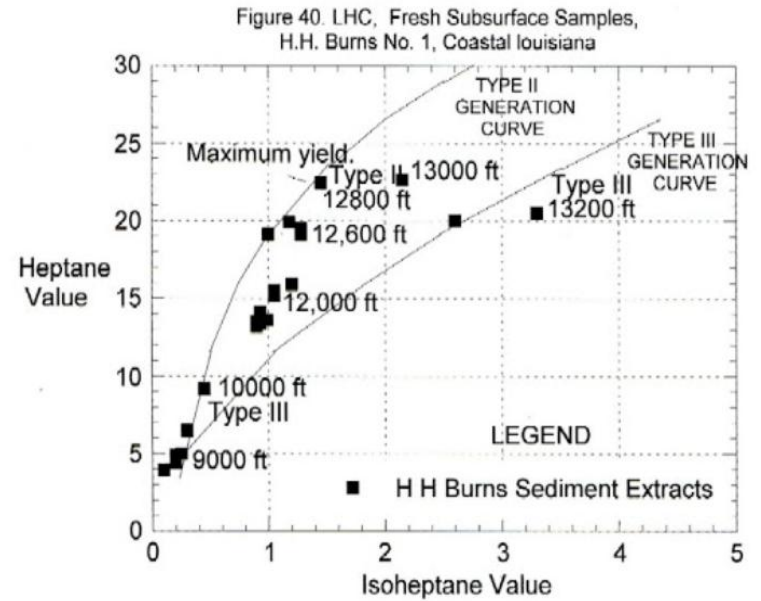
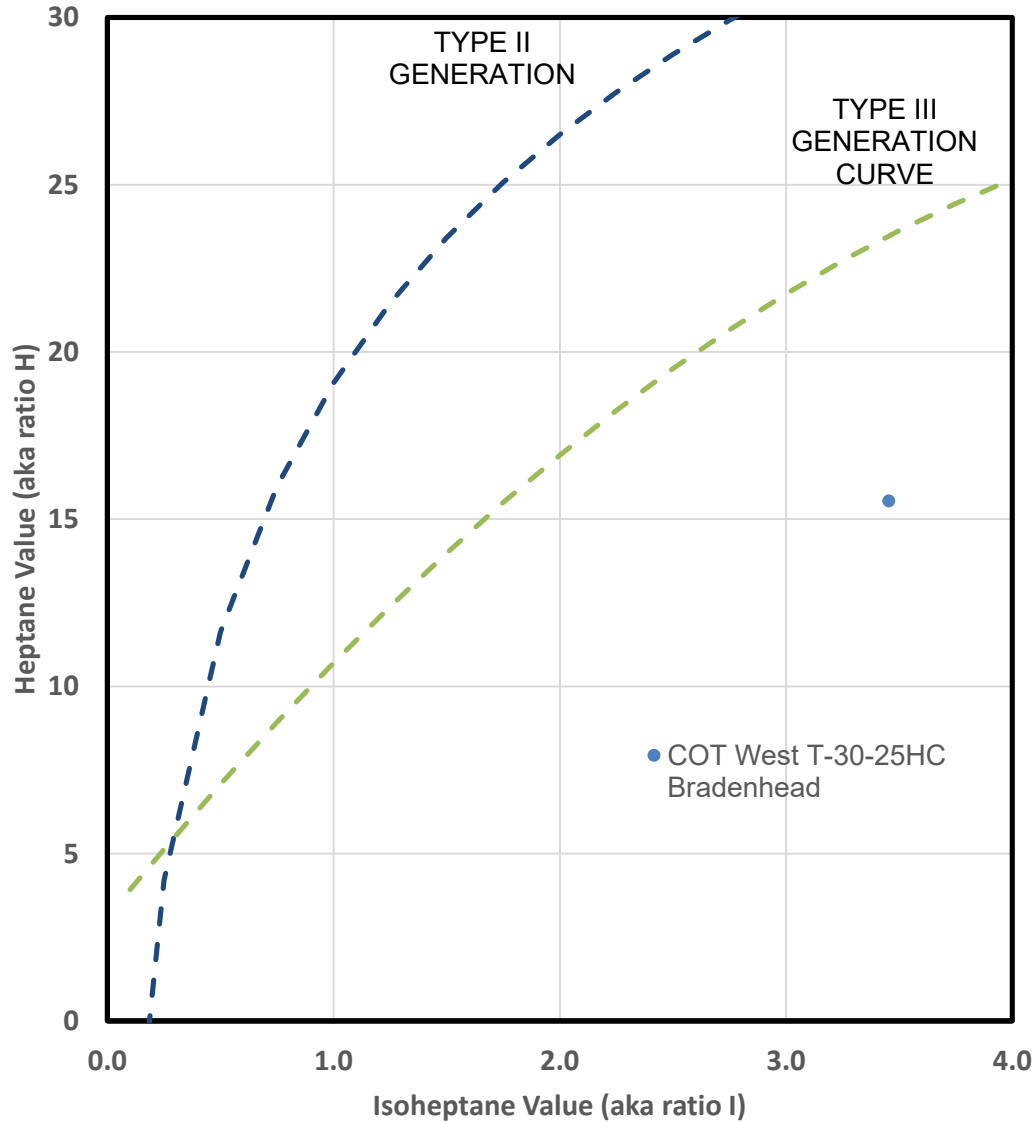
*Thompson ratios describe processes affecting light hydrocarbons (C<sub>6</sub>-C<sub>7</sub>)*

Name	Ratio	Property	Process
A	benzene / <i>n</i> -hexane	Aromaticity	Fractionation, water washing, TSR
B	toluene / <i>n</i> -heptane	Aromaticity	Fractionation, water washing, TSR
X	( <i>m</i> -xylene + <i>p</i> -xylene) / <i>n</i> -octane	Aromaticity	Fractionation, water washing, TSR
C	( <i>n</i> -hexane + <i>n</i> -heptane) / (cyclohexane + methylcyclohexane)	Paraffinicy	Maturity, biodegradation
I	(2- + 3-methylhexane) / (1 <i>c</i> 3- + 1 <i>t</i> 3- + 1 <i>t</i> 2-DMCP)	Paraffinicy	Maturity, source, biodegradation
F	<i>n</i> -heptane / methylcyclohexane	Paraffinicy	Maturity, biodegradation
H	(100* <i>n</i> -heptane)/(Σcyclohexane + ΣC <sub>7</sub> HCs)	Paraffinicy	Maturity, source, biodegradation
S	<i>n</i> -hexane / 2,2-dimethylbutane	Paraffin branching	Maturity, source, biodegradation
R	<i>n</i> -heptane / 2-methylhexane	Paraffin branching	Maturity, source, biodegradation
U	cyclohexane / methylcyclohexane	Naphthene branching	Maturity, source

DMCP, dimethylcyclopentane; H, heptane value; I, isoheptane value; Σcyclohexane, [cyclohexane + 1,1-DMCP + 1*c*3-DMCP + 1*t*3-DMCP + 1*t*2-DMCP + methylcyclohexane]; ΣC<sub>7</sub> HCs, [Σcyclohexane + 2-methylhexane + 3-methylhexane + *n*-heptane + 2,3-dimethylpentane + 3-ethylpentane]; 1*c*3, 1-*cis*-3; 1*t*3, 1-*trans*-3.

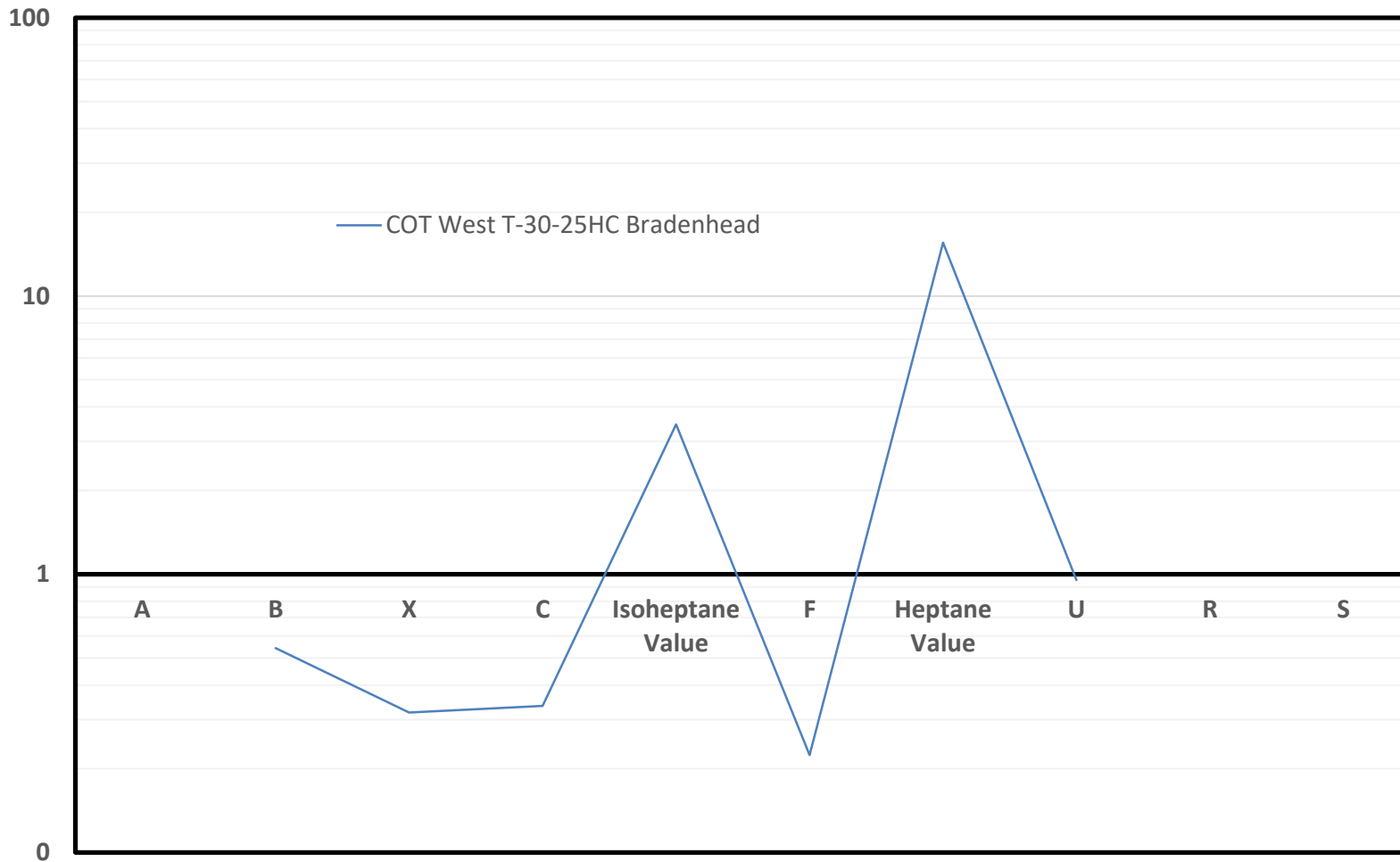
**THOMPSON PLOTS**

**Heptane Plot - Light Hydrocarbon Maturity**



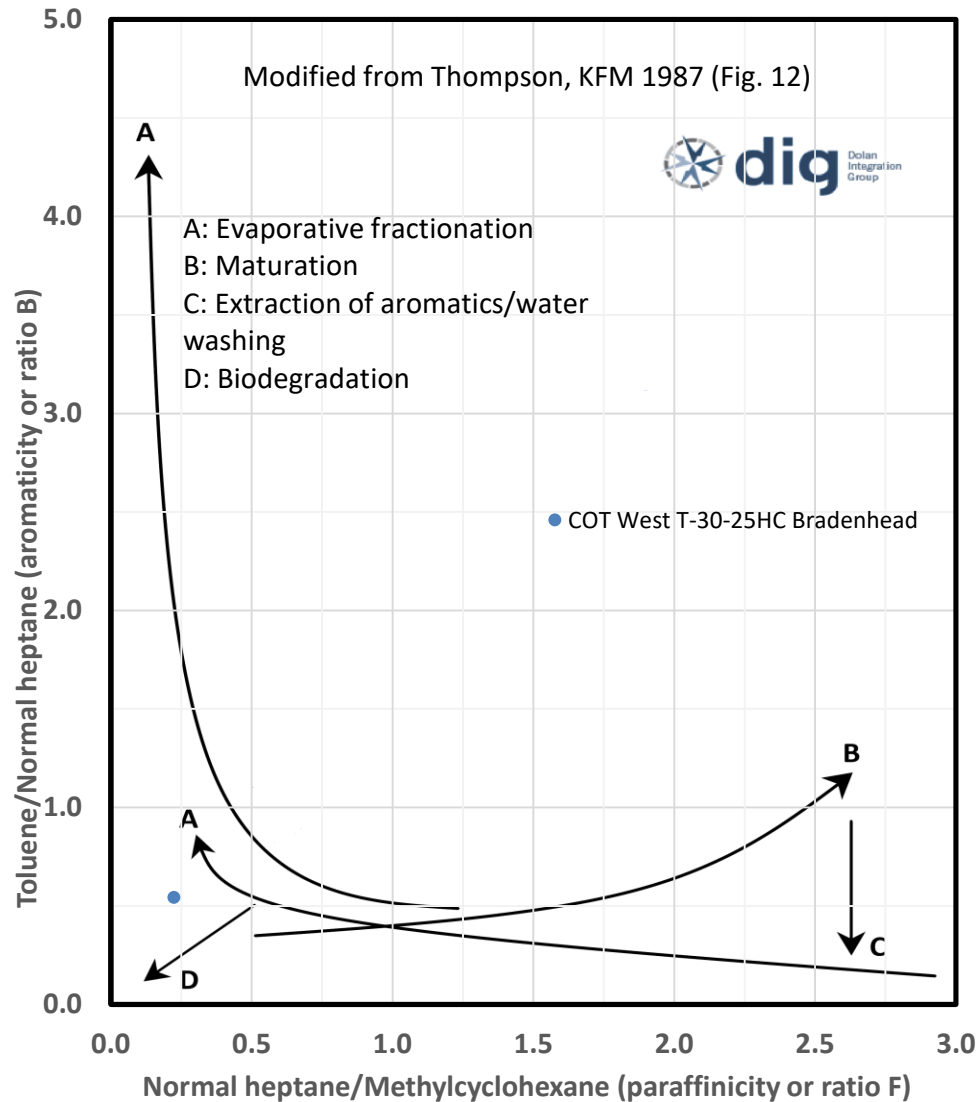
Thompson K F M. Classification and thermal history of petroleum based on light hydrocarbons. *Geochimica et Cosmochimica Acta*, 1983, 47(2): 303-316.

**Thompson Ratios**



## THOMPSON PLOTS

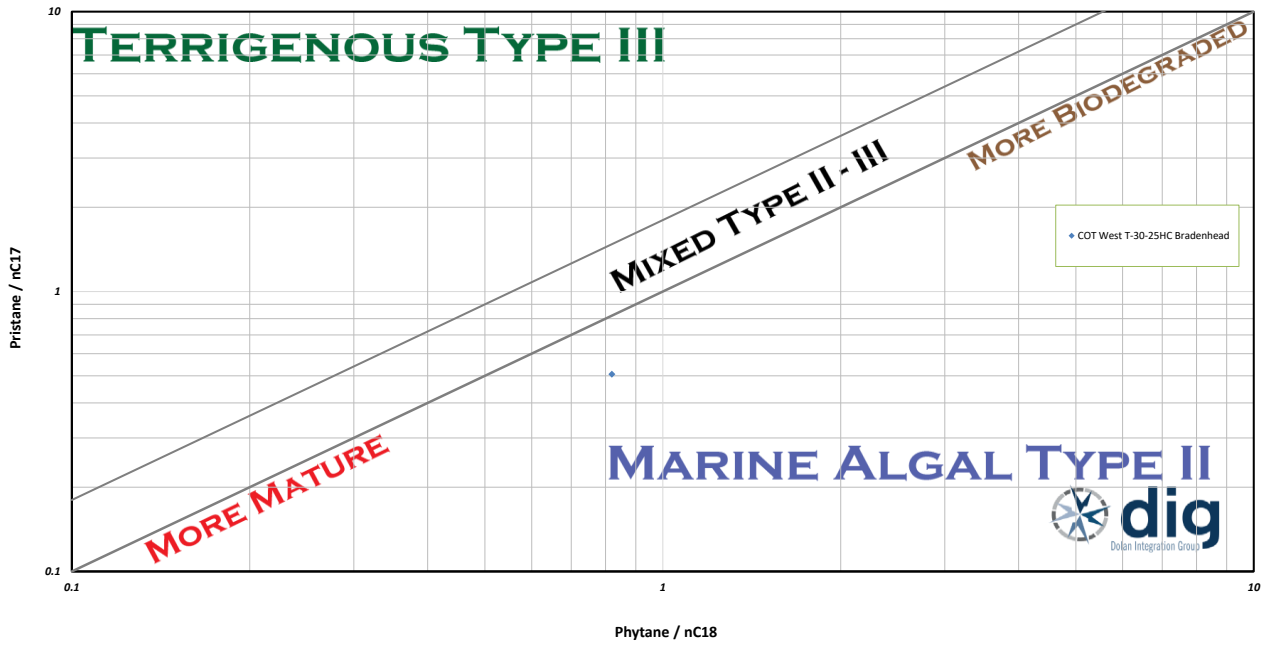
### Oil Alteration Vectors

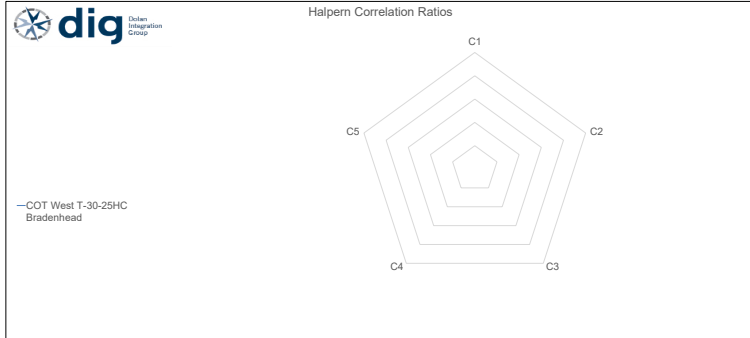
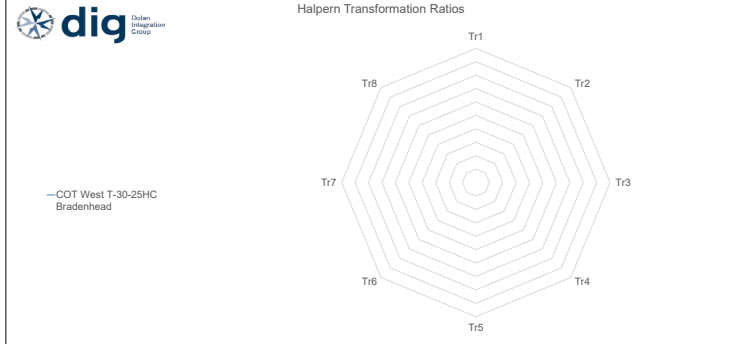


### Evaporative Fractionation

- Physical processes can also fractionate petroleum during migration.
- As petroleum migrates upward, temperature and pressure decrease. If the bubble point is reached, a single phase fractionates into liquid and gas phases that can migrate separately.
- Partitioning of petroleum between these phases depends on the vapor equilibrium constants for each component (Thompson, 1987). This can result in reservoirs filled with petroleum from a common source, but with different gross compositions.
- The effects of evaporative or phase fractionation were described based mostly on laboratory experiments (e.g. Thompson, 1987; Larter and Mills, 1991; van Graas et al., 2000).
- The process leads to oils deficient in light ends and enriched in aromatics, as exemplified by many U.S. Gulf Coast oils (Thompson, 1987, 1988).

Peters & Fowler, Organic Geochemistry 33 (2002)  
pp 5-36




 Table 7.3. Halpern (1995)  $C_7$  ratios for use in star diagrams to differentiate oils

Name	Ratio	$\Delta$ BP ( $^{\circ}$ C)	$\Delta$ Solubility (ppm)	Process
TR1	Toluene/X	22.8	496	Water washing ↑ Biodegradation ↑ Evaporation
TR2	$nC_7$ /X	10.6	-21.8	
TR3	3-Methylhexane/X	4.0	-21.4	
TR4	2-Methylhexane/X	2.2	-21.5	
TR5	P2/X	(3.2)	(-21.4)	
TR6	1- <i>trans</i> -2-Dimethylcyclopentane/X	11.7	-11.0	
TR7	1- <i>trans</i> -3-Dimethylcyclopentane/X	3.0	-4.0	
TR8	P2/P3	(6)	(-2.4)	
C1	2,2-Dimethylpentane/P3	(-5.8)	(-0.6)	Correlation ↑ ↓
C2	2,3-Dimethylpentane/P3	(4.8)	(0.3)	
C3	2,4-Dimethylpentane/P3	(-4.5)	(-0.6)	
C4	3,3-Dimethylpentane/P3	(1.1)	(0.9)	
C5	3-Ethylpentane/P3	(8.5)	(-2.0)	

X = 1,1-dimethylcyclopentane, boiling point  $87.8^{\circ}$ C, solubility 24 ppm. P2 = 2-methylhexane + 3-methylhexane, boiling point  $91^{\circ}$ C, solubility 2.6 ppm. P3 = 2,2-dimethylpentane + 2,3-dimethylpentane + 2,4-dimethylpentane + 3,3-dimethylpentane + 3-ethylpentane, boiling point  $85^{\circ}$ C, solubility 5 ppm.

$\Delta$ BP = boiling point numerator - boiling point denominator ( $^{\circ}$ C).

$\Delta$ Solubility = solubility of numerator - solubility of denominator (ppm in distilled water).

Parentheses indicate average values for mixtures.



Send Data to:	Send Invoice to (if different):	Additional Information:
Name: Dana Hanneman	Name:	AFE #:
Company: Prairie Operating Company	Company:	Project: Bradenhead Sampling
Address: 44 Cook Street Suite 1000	Address:	PO #: 09F4045003
City, State: Denver, CO 80206	City, State:	Location: COT 30-J Pad
Phone: 832.744.1484	Phone:	Sampled By: Jeff Braden
Email: dana.hanneman@prairieopco.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
F02ASK	COT West QA-30-25HN bh	2/11/26	1020	Bradenhead Gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
F023HG	COT West QA-30-25HN pr	2/11/26	1030	Production gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
F023HH	COT West T-30-25HC bh	2/11/26	1050	Bradenhead gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
F027J4	COT West T-30-25HC pr	2/11/26	1100	Production gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				Bradenhead gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				Production gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				Bradenhead gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				Production gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				Bradenhead gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
				Production gas	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Chain of Custody Record

Comments:

Relinquished by Signature	Company	Date	Time	Received by Signature	Company	Date	Time
Jeffrey D Braden <small>Digitally signed by Jeffrey D Braden Date: 2026.02.12 12:22:37 -0700</small>	Ensolum, LLC	2/12/26	1230	Katy Dang <small>Digitally signed by Katy Dang Date: 2026.02.12 14:38:10 -0700</small>	DIG	2/12/26	1430

\*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.