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June 18, 2020

Jim Hughes
Colorado Oil & Gas Conservation Commission
1120 Lincoln St. Suite 801
Denver, CO 80203

**RE: Soil Gas Survey Results
Bondad (OWP) #3-1 (API#: 05-067-05191)
La Plata County, Colorado**

Dear Mr. Hughes,

Cottonwood Consulting LLC (Cottonwood) is pleased to provide you with the results of a soil gas survey conducted in the vicinity of the Bondad (OWP) #3-1 (API#: 05-067-05191) dry and abandoned well in La Plata County, Colorado (Figure 1). The methodology and associated results are summarized below.

Background

The Bondad (OWP) #3-1 was drilled in 1963 by Compass Exploration, Inc. to a total depth of 2,414 feet below ground surface (bgs). The well is currently considered an “orphaned” well and managed by the Colorado Oil and Gas Conservation Commission (COGCC) Orphaned Well Program (OWP). The well was plugged by the COGCC in 1989. Following plugging, the wellhead was cut below grade, leaving no indication of the well location at the ground surface. Based on the latitude/longitude available in the COGIS database, the assumed well location is in an agricultural field to the west of an existing well pad containing four other oil and gas wells (Figure 1). The COGCC scout card for the Bondad (OWP) #3-1 is included as Attachment 1.

In 2007, a soil gas survey was conducted in the vicinity of the Bondad (OWP) #3-1 as part of the COGCC Environmental Response Fund (ERF) investigation of plugged and abandoned wells in Colorado. During the survey, methane was detected near a manure stockpile in the northeast corner of the well pad in an area used by the landowner for feeding cattle. A gas sample was collected, but there was an insufficient concentration of methane to conduct isotopic analysis.

Cottonwood was retained by the COGCC to conduct a soil gas survey in the vicinity of the Bondad (OWP) #3-1 well to determine if methane is currently seeping in the vicinity of the well. Cottonwood also collected soil gas measurements in the vicinity of the feeding troughs and manure in the northeast corner of the well pad.

Methodology

Cottonwood was on-site to conduct the soil gas survey on May 29, 2020. Prior to the soil gas survey, Cottonwood conducted a utility locate to ensure that all underground utilities within the survey area were properly marked prior to ground disturbance.

Soil gas measurements were collected at 50-foot intervals in a grid surrounding the location of the Bondad (OWP) #3-1 as identified in the COGIS database. Additional points were collected to define the horizontal extent of seepage as needed, and in the vicinity of the feeding troughs in the northeast corner of the pad.

At each measurement location, Cottonwood used a slide-hammer to advance a borehole to a total depth of approximately one to two feet bgs. Tubing connected to a GEM5000 Plus[®] Landfill Gas Meter was lowered into each borehole to collect measurements of methane, carbon dioxide, hydrogen sulfide, carbon monoxide, and oxygen. The concentration of each gas and the associated measurement location was recorded using a Trimble GeoXH[®]. Additional observations regarding vegetation and general site conditions were recorded in a field notebook.

At locations of methane seepage, Cottonwood collected soil gas samples for laboratory analysis. Gas samples were collected by flowing soil gas through the GEM5000 Plus[®] Landfill Gas Meter to confirm the presence of methane at each location. Once the presence of methane was confirmed, a gas bag was attached to the exhaust port on the gas meter and the pump in the meter was used to fill the bag. Gas bags were shipped with complete chain-of-custody to Dolan Integration Group (DIG) of Westminster, Colorado for analysis of gas composition and stable isotopes of methane.

Results

Methane was detected at five measurement locations on the western portion of the pad approximately 80 feet east of the Bondad (OWP) #3-1 well location. Methane concentrations in this area ranged from 0.4 percent (%) to 1.4% methane by volume. Methane was also detected at three measurement locations in the vicinity of the feeding troughs in the northeast corner of the pad. Manure was observed covering the ground surface in this area and methane concentrations ranged from 0.2% to 1.1% methane by volume. Methane was not detected in the immediate vicinity of the Bondad (OWP) #3-1.

One gas sample was collected from the methane seep area on the western portion of the well pad (SG01) and one gas sample was collected from the methane seep area near the feeding troughs and manure in the northeast corner of the pad (SG02). Laboratory analytical results indicated methane concentrations of 3,397 parts per million (ppm) and 6,138 parts per million (ppm), respectively, with no detectable concentrations of heavier hydrocarbons. SG01 indicated a $\delta^{13}C_1$ value of -55.2‰ and a δD value of -139‰; however, the laboratory analytical report indicated that these values should be interpreted “with caution” based on the “low signal” (low methane concentration). SG02 indicated a $\delta^{13}C_1$ value of -72.7‰ and a δD value of -349‰.

Results of the soil gas survey are presented on Figure 1; soil gas measurements are presented in Table 1; the laboratory analytical report, including interpretive plots, is included as Attachment 2; and photographic documentation of site conditions during the survey are included as Attachment 3.

Conclusions

Based on the results of the soil gas survey, it appears that methane is seeping to the ground surface in two different areas of the well pad located east of the Bondad (OWP) #3-1. One seep area is located on the western portion of the well pad in a graveled area seemingly unimpacted by the cattle feeding practices, and the other seep area is located in an area covered in manure near the feeding troughs in the northeast corner of the pad. The interpretive plots provided by DIG for the two gas samples collected from these areas appear to indicate different isotopic signatures; however, the sample collected from the western portion of the well pad should be interpreted with caution based on the low signal observed during laboratory analysis. Methane was not detected in the immediate vicinity of the Bondad (OWP) #3-1 based on the COGIS location of the well.

Should you have any questions, please do not hesitate to contact me at 970-764-7356 or ksiesser@cottonwoodconsulting.com. We appreciate the opportunity to provide services to the COGCC.

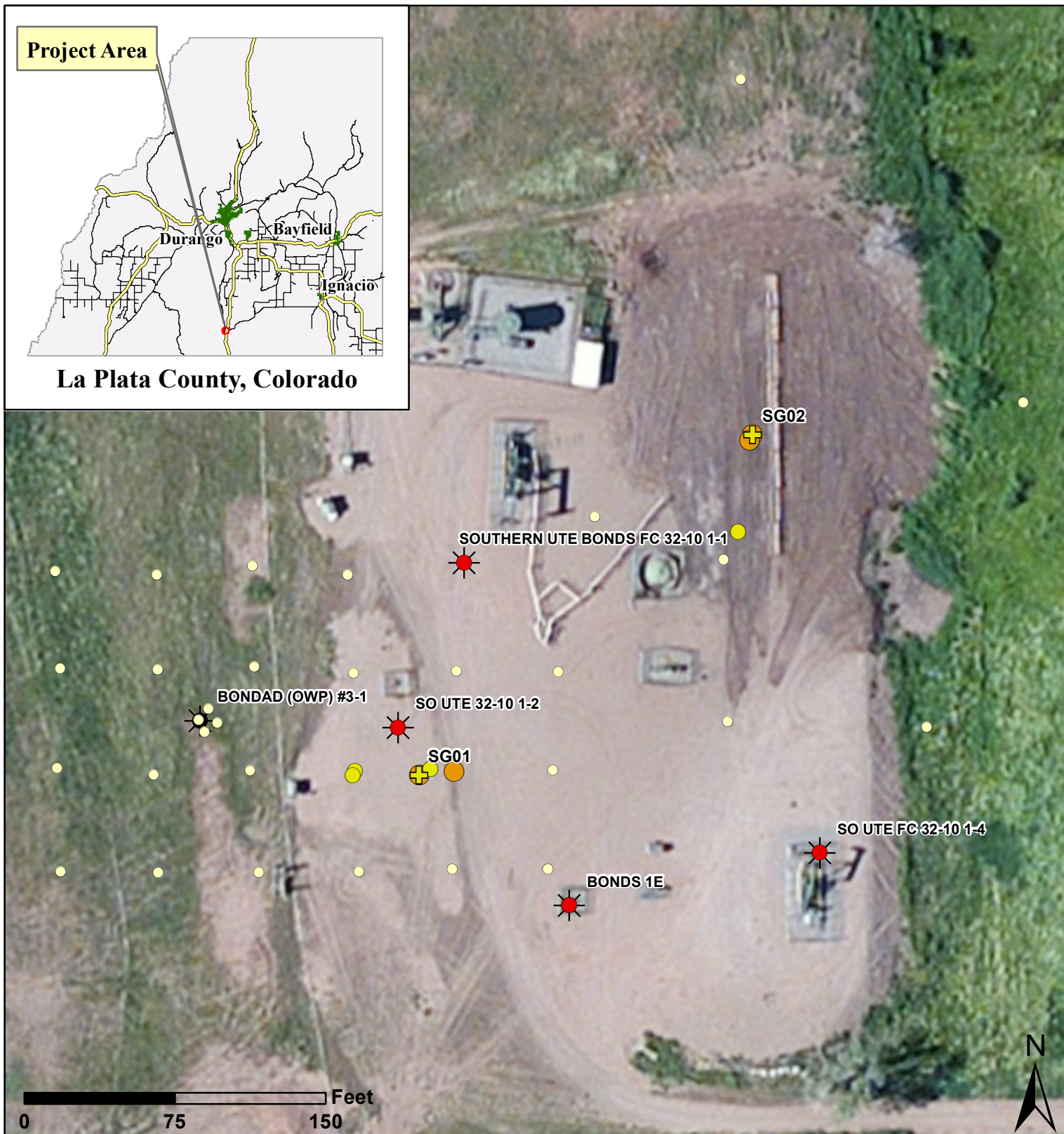
Sincerely,



Kyle G. Siesser, P.G.
Cottonwood Consulting, LLC




Attachments: Figure 1 – Soil Gas Survey Area
Table 1 – Soil Gas Survey Results
Attachment 1 – Bondad (OWP) #3-1 Scout Card
Attachment 2 – Laboratory Analytical Report and Interpretive Plots
Attachment 3 – Photographic Log

FIGURE 1






Notes: All measurements and gas samples collected 5/29/2020.

Legend

-  Oil & Gas Well
-  Dry & Abandoned Well
-  Gas Sample Location

Subsurface Methane Measurement

-  0.0%
-  0.1-0.6%
-  0.7-1.4%

Cottonwood
CONSULTING

Mapping by: E. Millar, 6/16/2020

Coordinate System:
NAD 1983 UTM Zone 13 N

Location: Sec 1 T32N R10W
& Sec 31 T33N R9W, NMPM

Figure 1
Bondad (OWP) #3-1
Soil Gas Survey Area
COGCC

TABLE

Table 1
Soil Gas Survey Results
Bondad (OWP) #3-1 (API#: 05-067-05191)
Colorado Oil and Gas Conservation Commission

Point ID	CH ₄ (%)	CO ₂ (%)	H ₂ S (ppm)	CO (ppm)	O ₂ (%)
1	0	0.4	0	0	19.9
2	0	0.3	0	1	20
3	0	0.3	0	1	19.9
4	0	0.3	1	1	19.8
5	0	0.2	1	0	19.5
6	0	0.6	0	1	19.5
7	0	0.4	0	1	19.4
8	0	0.4	0	1	19.5
9	0	0.4	1	1	19.3
10	0	1.4	1	8	17.7
11	0	0.8	1	4	18.4
12	0	0.2	0	16	19.5
13	0.6	0.4	1	10	19.1
14	0.5	0.4	0	10	19.3
15	0	2	0	2	6.4
16	0	0.6	0	12	19.6
17	0	0.3	0	0	19.8
18	0	0.5	0	1	19.6
19	0	0.8	0	1	19.6
20	0	0.6	0	1	19.7
21	0	0.2	0	16	20.1
22	0	0.2	0	11	20.2
23	1.1	0.2	0	5	20.2
24	0	0.4	0	11	19.9
25	0	0.4	0	23	20.1
26	0	0.3	0	14	20.2
27	0	0.1	0	30	20.3
28	0	0.2	0	2	20.5
29	0.2	1.4	1	8	19.8
30	1	1.9	1	6	19.2
31	0	0.2	1	8	20.5
32	0	4.2	0	1	16.9
33	0	1.1	0	4	19.6
34	0	0.1	0	5	20.7
35	0	0.1	0	7	20.7
36	0.4	0.2	1	7	20.7
37	1.4	-	-	-	-
38	1.1	1.3	0	0	19.6

Notes:

All measurements collected on May 29, 2020

CH₄ - Methane

CO₂ - Carbon Dioxide

H₂S - Hydrogen Sulfide

CO - Carbon Monoxide

O₂ - Oxygen

ppm - Parts Per Million

% - Percent

- - data unavailable

ATTACHMENT 1

COGIS - WELL Information

Scout Card

[Related](#)[Insp.](#)[MIT](#)[GIS](#)[Doc](#)[COA](#)[Wellbore](#)[Orders](#)

Surface Location Data for API # 05-067-05191

Status: DA

11/16/1989

[Well Name/No:](#) [BONDAD \(OWP\) #3-1](#) (click well name for production)

[Operator:](#) COMPASS EXPL INC - 19000

Status Date: 11/16/1989

Federal or State Lease #:

FacilityID: **213921**

LocationID:

385282

County: LA PLATA #067

Location:

SENE 1 32N10W N PM

Field: IGNACIO BLANCO - #38300

Elevation:

6,064 ft.

Planned Location 1400 FNL 1150 FEL

Lat/Long: 37.049129/-107.880078

Lat/Long Calculated From Footages

Wellbore Data for Sidetrack #00

Status: DA

3/12/1964

Spud Date: 10/18/1963

Spud Date is:

ACTUAL

Wellbore Permit

Permit #: 19630000

Expiration Date:

10/16/1964

Prop Depth/Form: 2220

Surface Mineral Owner Same:

Mineral Owner: FEE

Surface Owner:

Unit:

Unit Number:

Formation and Spacing: Code: FRLD , Formation: FRUITLAND , Order: 0 , Unit Acreage: 320, Drill Unit: E2

Wellbore Completed

Completion Date: 10/26/1963

Measured TD: 2414

Measured PB depth:

True Vertical TD:

True Vertical PB depth:

Casing: String Type: SURF , Hole Size: , Size: 8.625, Top: 0, Depth: 255, Weight: 32

Cement: Sacks: 150, Top: 0, Bottom: , Determination Method:

Casing: String Type: 1ST , Hole Size: , Size: 4.5, Top: 0, Depth: 2191, Weight: 10.3

Cement: Sacks: 107, Top: 0, Bottom: , Determination Method:

Formation

Log Top

Log Bottom

Cored

DSTs

No additional interval records were found for sidetrack 00.

ATTACHMENT 2



dig
Dolan Integration Group

Geochemistry for Energy

11 025 Dover Street Unit 400
Westminster, CO 80021
ph 303.531.2030

**Hydrocarbon Gas Composition and Stable Isotopes
Data and Interpretation**

Job #: 20064053
Lab #: DIG-022937 - DIG-022938
Client: Cottonwood Consulting
Well Name: Bondad #3-1 SG01 & Bondad #3-1 SG02

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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Client/Well Name: Cottonwood Consulting / Bondad #3-1 SG01 & Bondad #3-1 SG02
Job #: 20064053
Lab #: DIG-022937 - DIG-022938

SAMPLE INFORMATION						COMPLETE GAS ANALYSIS														HYDROCARBON GAS ANALYSIS (normalized to total HC content)										BTU CONTENT*
Job Number	Lab	Well	Sample	Sample	Sample	GC	N ₂	O ₂ + Ar	CO ₂	C ₁	C ₂	C ₃	iC ₄	nC ₄	iC ₅	nC ₅	C ₆ +	C ₃ H ₈	He	H ₂	C ₁	C ₂	C ₃	iC ₄	nC ₄	iC ₅	nC ₅	C ₆ +	Total Gas	
Number	Number	Name	Type	Date	Time	Date	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	mol%	mol%	mol%	mol%	mol%	mol%	mol%	mol%	BTU/ft ³	
20064053	DIG-022937	Bondad #3-1 SG01 Gas	Gas	05/29/20	11:45	6/2/2020	784428	203301	3364	3397											100.0								4	
20064053	DIG-022938	Bondad #3-1 SG02 Gas	Gas	05/29/20	12:00	6/2/2020	768327	204253	33780	6138											100.0								7	

SAMPLE INFORMATION						HYDROCARBON RATIOS				STABLE ISOTOPE ANALYSIS											Comments	
Job Number	Lab	Well	Sample	Sample	Sample	Total HC	Wetness	C ₄ /C ₁ +C ₅	Balance Ratio	Mass Spec	δ ¹³ C ₁	δ ¹³ C ₂	δ ¹³ C ₃	δ ¹³ C ₄	δ ¹³ C ₅	δ ¹³ C ₆	δ ¹³ C _{CO₂}	δD				
Number	Number	Name	Type	Date	Time	ppm	% C ₂ to C ₅	mol/mol	C ₁ +C ₂ /C ₃ -C ₅	Date	‰ VPDB	‰ VPDB	‰ VPDB	‰ VPDB	‰ VPDB	‰ VPDB	‰ VPDB	‰ VSMOW				
20064053	DIG-022937	Bondad #3-1 SG01 Gas	Gas	05/29/20	11:45	3397	0.0	7.4		6/9/2020	-55.2							-1.89				
20064053	DIG-022938	Bondad #3-1 SG02 Gas	Gas	05/29/20	12:00	6138	0.0	5.6		6/9/2020	-72.7							-3.69				

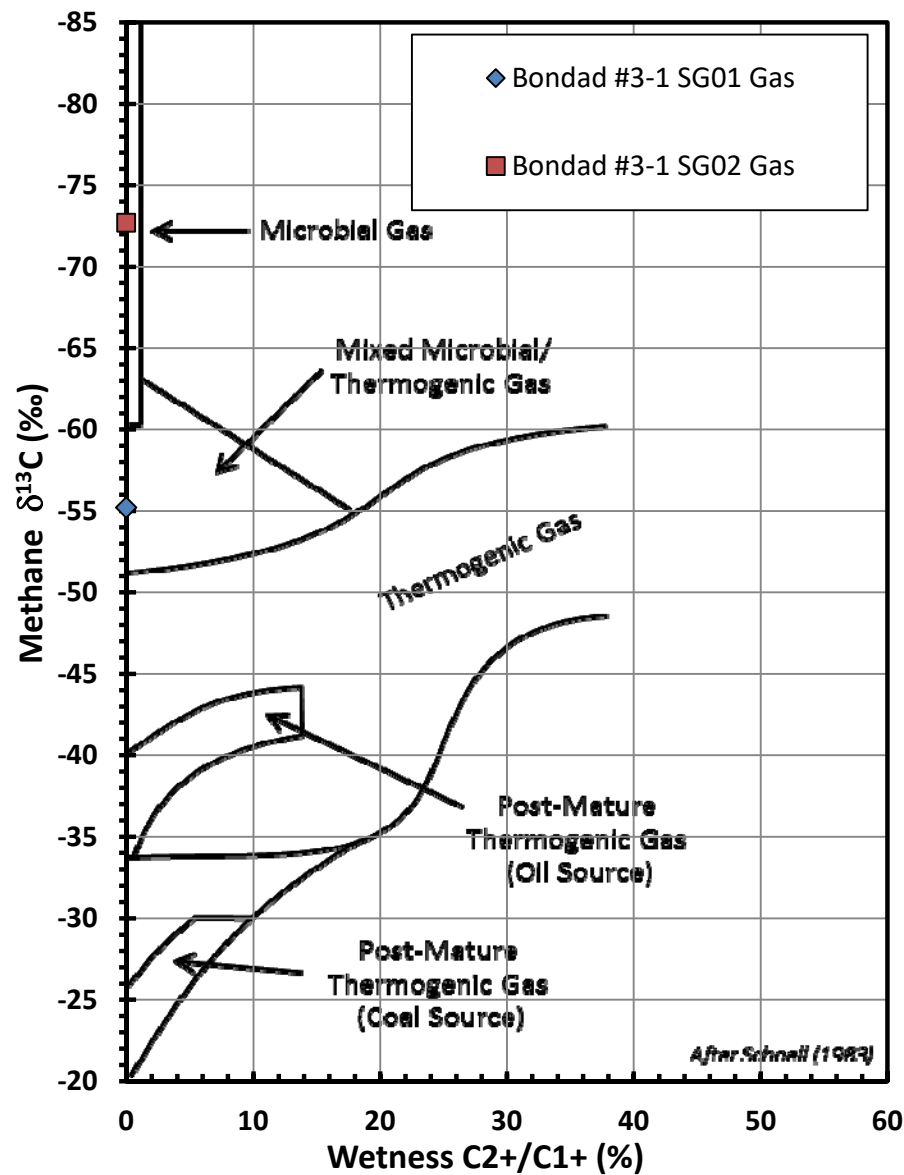
Stable isotope results based on multi-point laboratory calibration
low signal; interpret with caution
Precision δ¹³C <0.5 ‰
Precision δD < 5 ‰

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

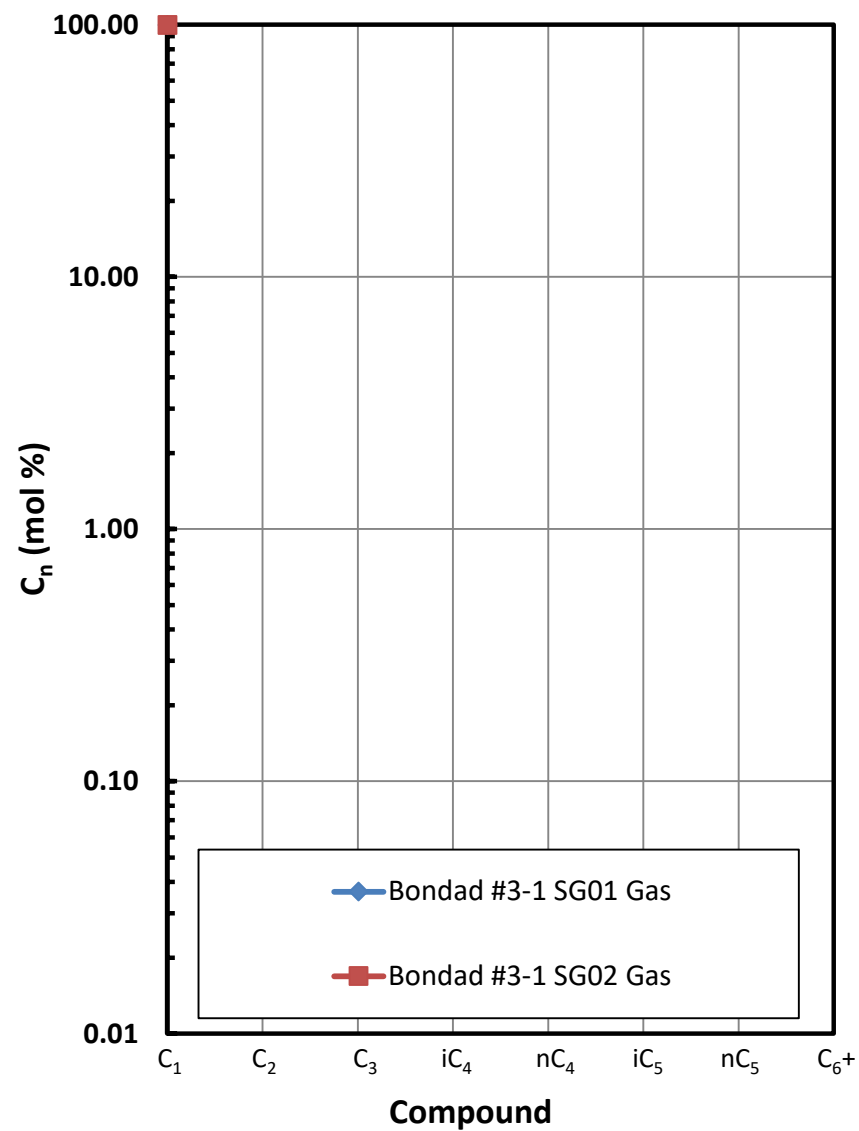
SPECIFIC GRAVITY*	
Total Gas Spec Grav	HCs only Spec Grav
0.997	0.554
1.004	0.554

INTERPRETIVE PLOTS

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

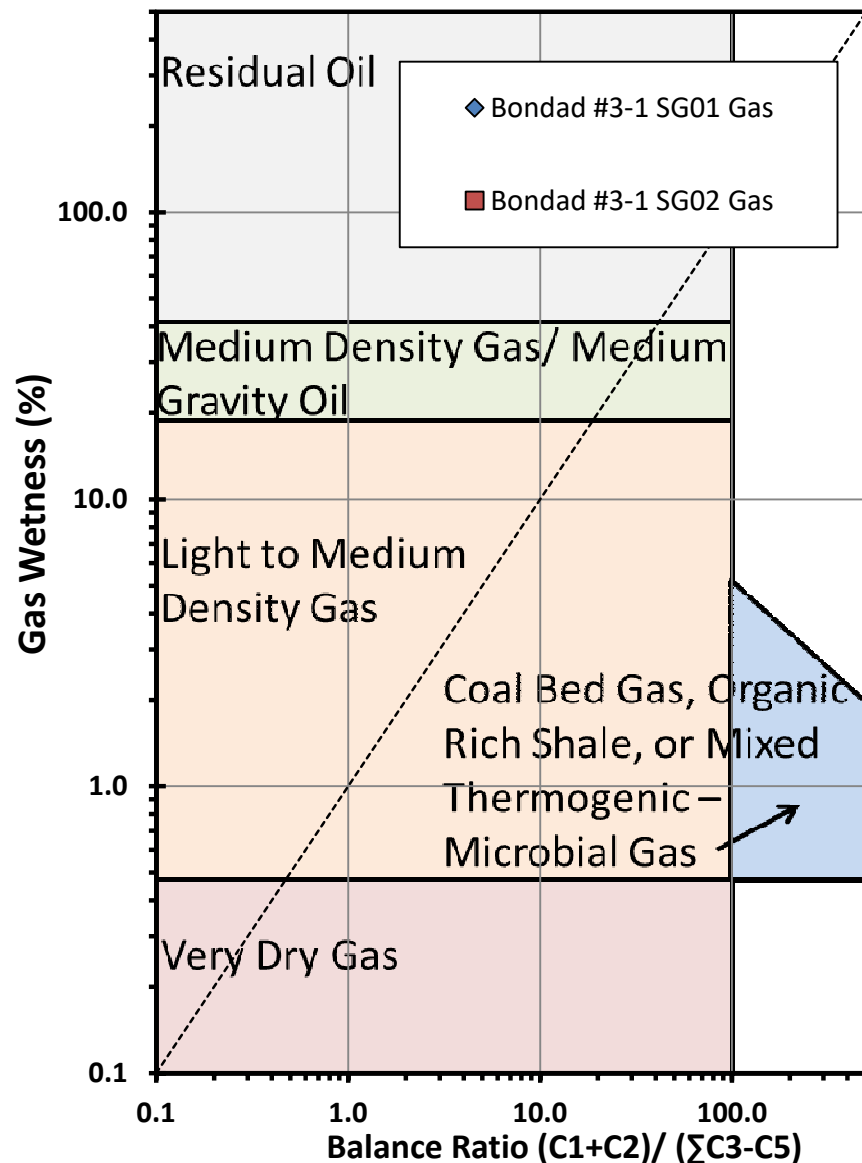


Hydrocarbon Composition Plot

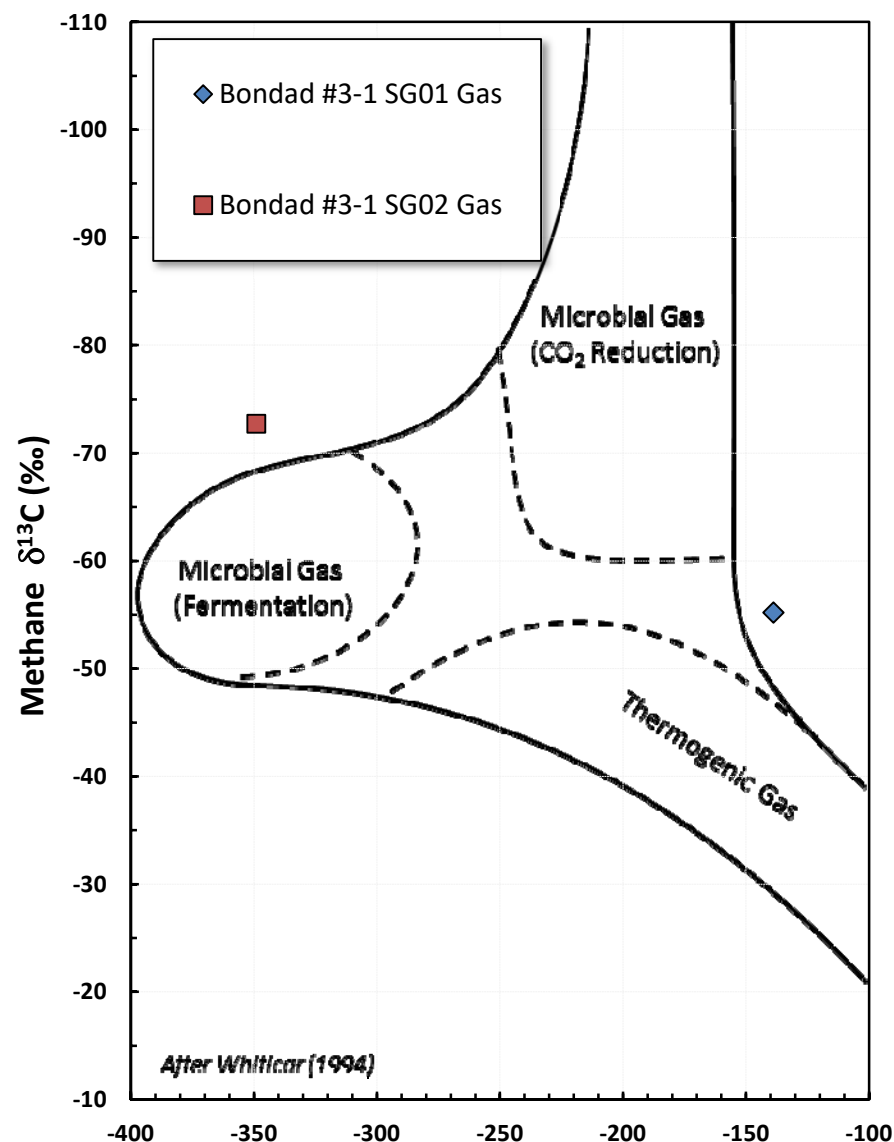


INTERPRETIVE PLOTS

Haworth Ratio Plot - Characterization of Hydrocarbon Type

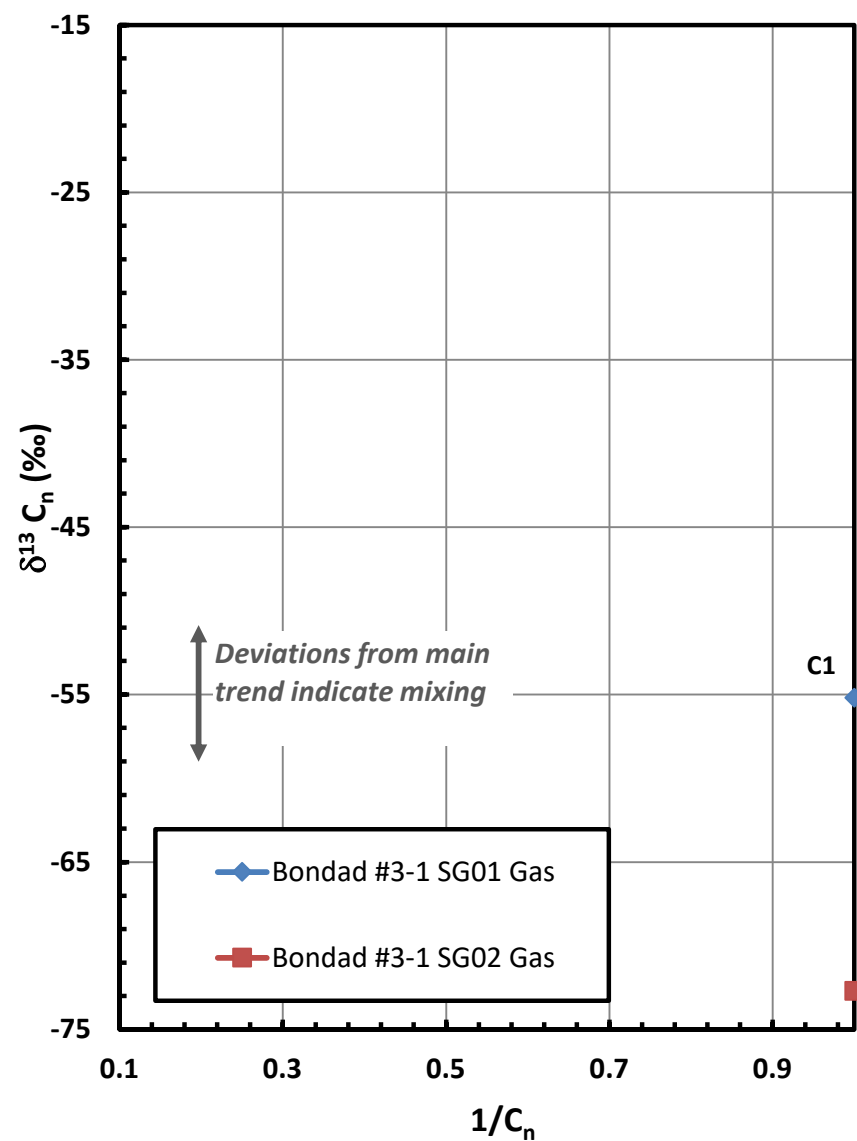


Methane $\delta^{13}C$ vs δD Genetic Classification Plot

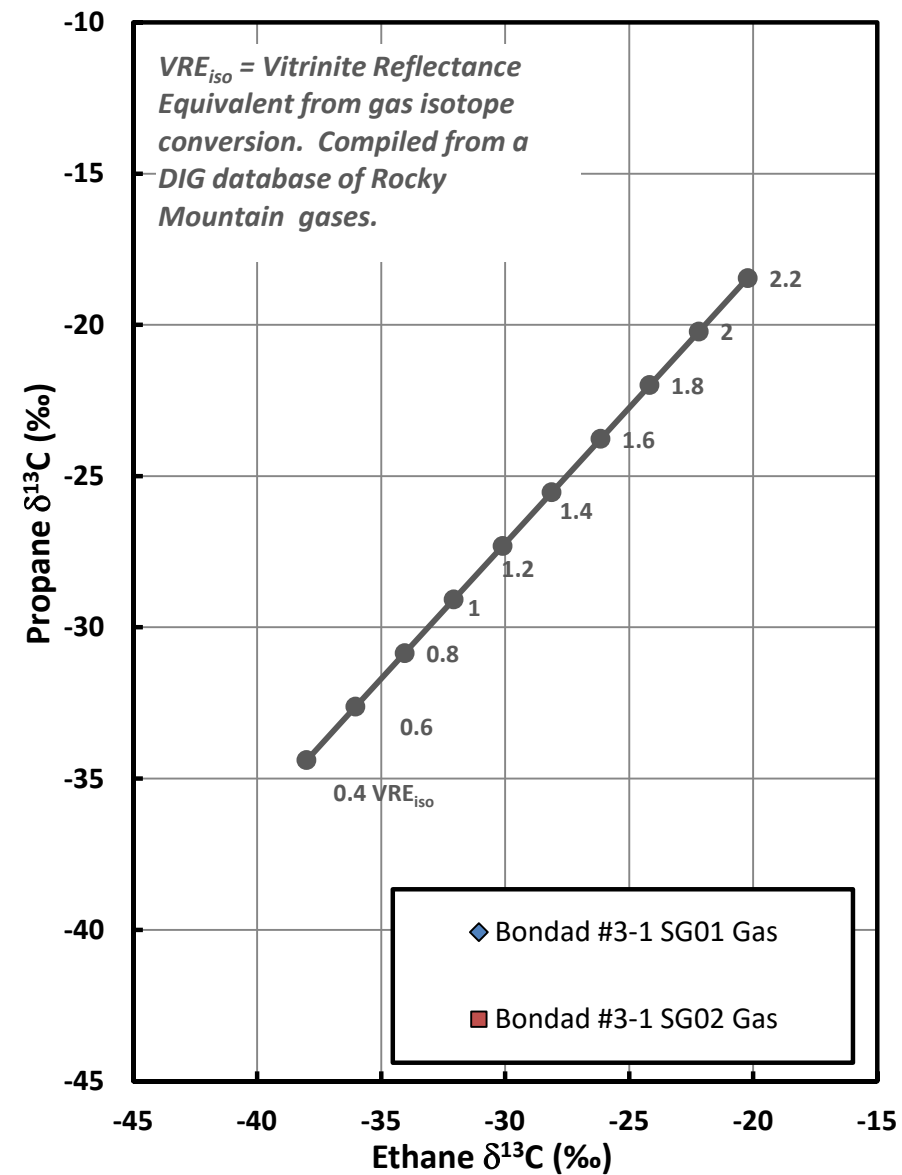


INTERPRETIVE PLOTS

Mixing Plot

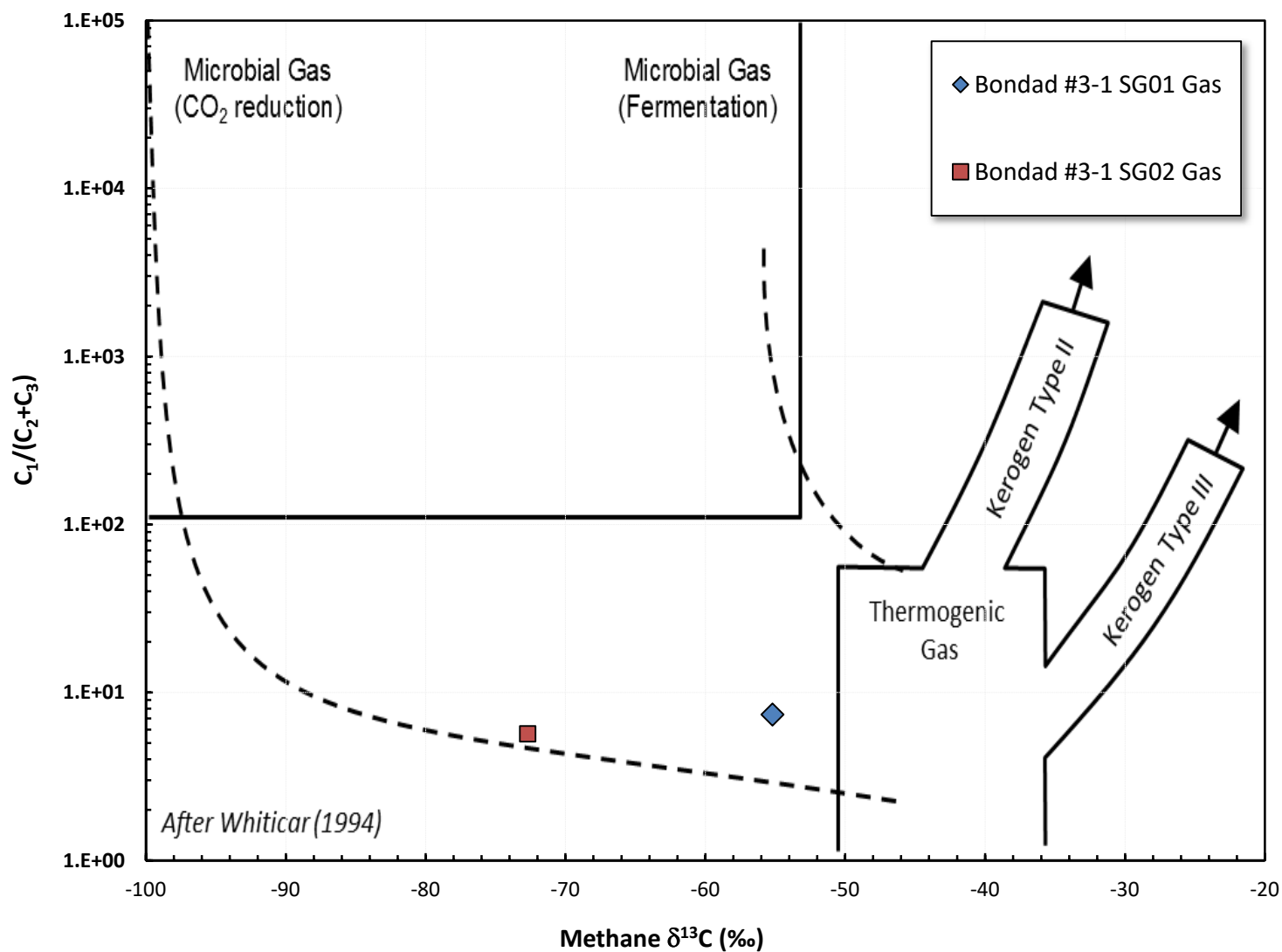


Ethane - Propane Maturity Plot



INTERPRETIVE PLOTS

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



ATTACHMENT 3



Photo 1: Assumed Bondad (OWP) #3-1 well location (cut below grade), based on COGIS database 5/29/2020.

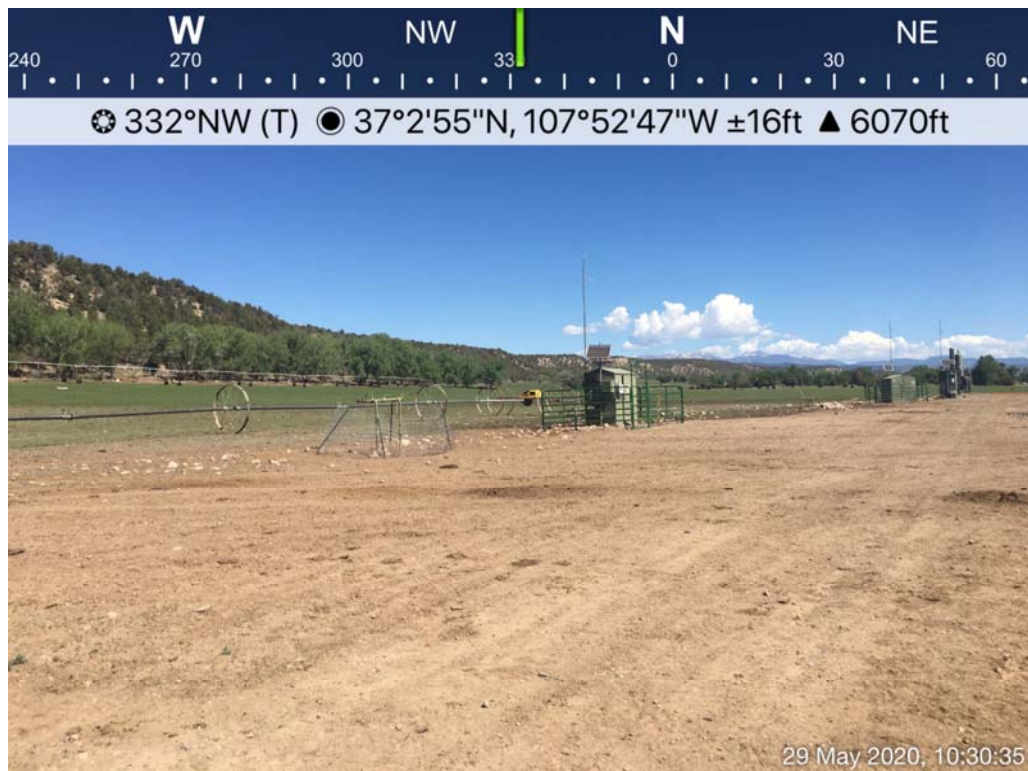


Photo 2: Methane seep area on western portion of graveled pad. Location of Bondad (OWP) #3-1 in background west of pad, 5/29/20.



Photo 3: Methane seep area near feeding trough and manure on northeast portion of pad, 5/29/20.



Photo 4: General well pad layout east of Bondad (OWP) #3-1, 5/29/20.