

TO: Randy Pancheco, APWS; Jim Griswold, NMOCD

FROM: Curtis Shuck, Chairman

DATE: January 2, 2023

RE: Fowler Hair #001 (30-025-11103) Orphan Well Post-Plugging Methane Monitoring

### TECHNICAL MEMORANDUM

The Well Done Foundation, Inc. (WDF) performing contract professional services methane monitoring for A-Plus Well Services, Inc. (APWS) for the State of New Mexico Energy, Minerals and Natural Resources Department – Oil Conservation Division (OCD) under Purchase Order #52100-000007292 for Orphan Oil & Gas Wells in Lea County, NM.

The site conditions found at Fowler Hair #001 by the WDF Measure 1 Field Team on December 14, 2022, at 5:15 P.M. revealed a cement plugged orphan well with an open wellbore. The WDF Measure 1 Team took site photographs, performed field gas measurements and collected a gas sample for immediate laboratory analysis.

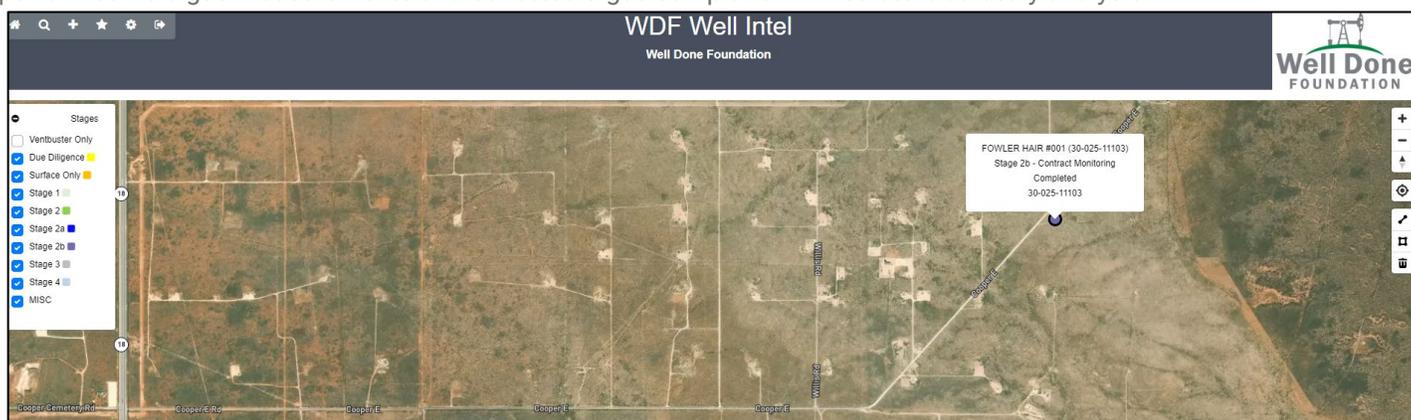


Image 1.1 – Fowler Hair #001 (30-025-11103) Orphan Well near the City of Jal in Lea County, NM

The Pre-Plugging Methane Flow Monitoring Test on November 12, 2022, using Ventbuster™ Instruments VB100-056 Ultra-Low Flow Meter with GPS, resulted in 0.82 cubic meters per day of total measured wellhead emissions. A composite gas sample collected at the wellhead by WDF during the flow test established a methane gas concentration level measured at 336,330 ppm, pursuant to Test ID 2022060200 performed by Laboratory Services of Hobbs, NM. Therefore, the adjusted average methane gas emission measured at this wellhead is calculated at **6.37 grams per hour (g/hour)**.<sup>1</sup>

The State of New Mexico used the methane flow data collected by WDF to prioritize the Fowler Hair #001 orphan well plugging under the IJA Program and began mobilizing a contractor to location on December 5, 2022. A-Plus Well Service, Inc. of Farmington, NM was awarded the plugging contract. A-Plus completed the orphan well plugging on Monday December 12, 2022 and recorded cement to the surface.

WDF arrived at the Fowler Hair #001 location on December 14, 2022 to perform post-plugging orphan well methane testing and sampling on behalf of the State of New Mexico. **WDF post plugging field gas tests revealed 0.00% of methane or H<sub>2</sub>s gasses. The post plugging collected gas samples, analyzed by Laboratory Services, Inc. confirmed 0.00 ppm or methane gas and 0.00 ppm of H<sub>2</sub>s gas. THEREFORE, the total Methane Gas Emissions Reduction is: 6.37 g/hour.**

<sup>1</sup> Methane Calculation: 554 grams CH<sub>4</sub> per cubic meter (554 x 1.60 = 886.40 g/day total /24 = 36.93 g/hour x 0.556580 (methane concentration) = **20.56 g/hour CH<sub>4</sub>**). **Methane, gas** weighs 0.000554 gram per cubic centimeter or 0.554 kilogram per cubic meter, i.e. density of methane, gas is equal to 0.554 kg/m<sup>3</sup>; at 0°C (32°F or 273.15K) at standard atmospheric pressure. In Imperial or US customary measurement system, the density is equal to 0.0346 pound per cubic foot [lb/ft<sup>3</sup>], or 0.0003202 ounce per cubic inch [oz/inch<sup>3</sup>].

This orphan well did exceed the >1 g/hour federal program reporting requirements for methane emissions reductions as described in Section 40601 (Orphaned well site plugging, remediation, and restoration) of Title V (Methane Reduction Infrastructure) of the 2021 Bipartisan Infrastructure Law (BIL; Public Law 117-58)<sup>2</sup>.

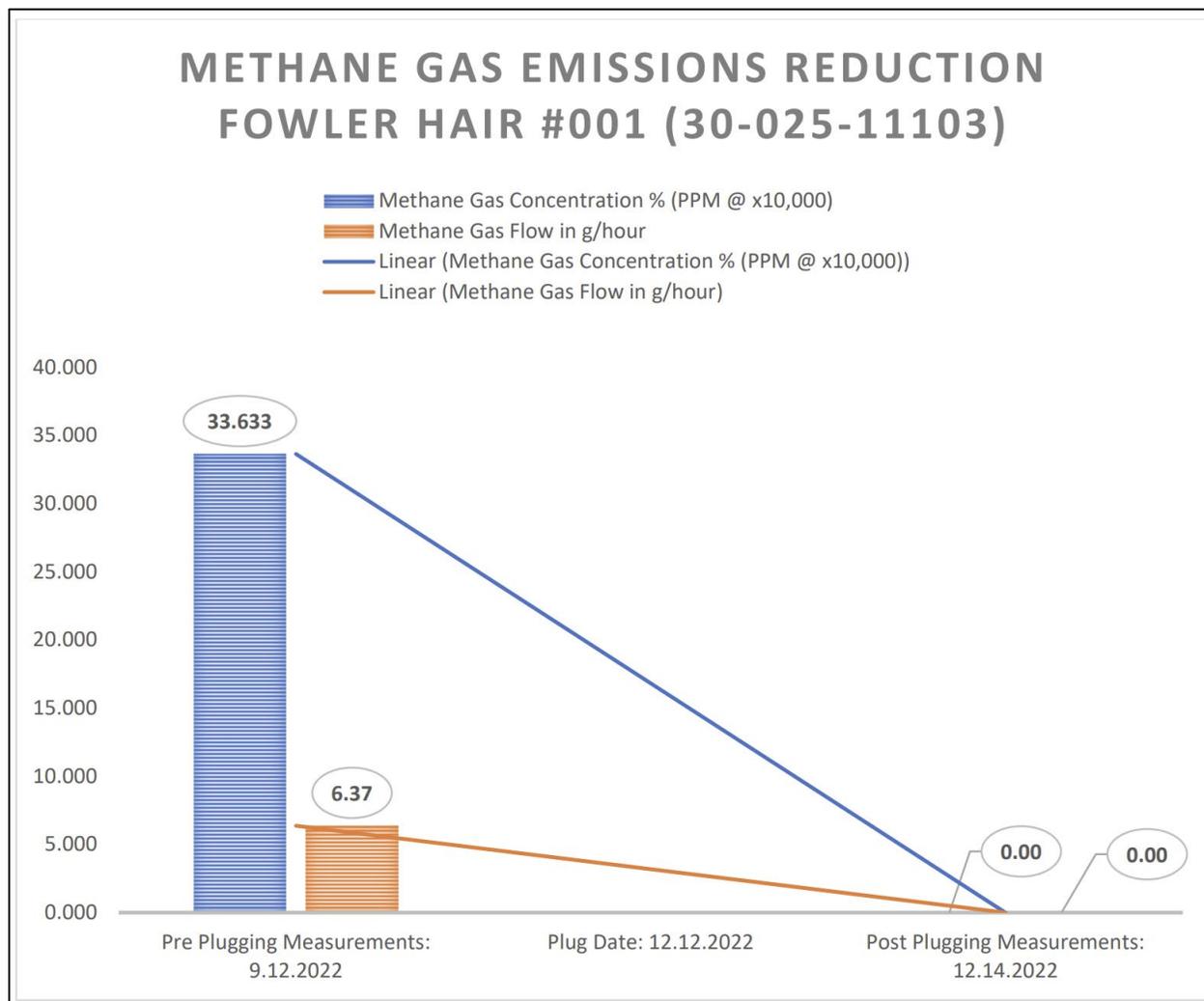


Image 2.1 – Fowler Hair #001 (30-025-11103) Methane Gas Emissions Reduction Pre Plugging to Post Plugging

### BACKGROUND

The Fowler Hair #001 (30-025-11103) Orphan Well is located near the City of Jal in Lea County, NM at Latitude 32.21926327332137, Longitude -103.14013450416097 was measured and monitored by the WDF Measure 1 Field Team on 11/12/2022 following a Safety Briefing. Per the WDF protocol, the well was photographed from four (4) compass point aspects and closeups capturing the wellhead, field gas analysis results and gas sampling and uploaded to the WDF Well Intel™ IoT site. A Field Gas Analysis was conducted to detect Methane and H2s gas presence and concentration levels using a Honeywell BW Quattro Multi Gas Meter, serial number: QA121-012211.

The WDF Measure 1 Field Team collected Gas Sample #1 using a 1 Liter Tedlar/TO-Plus Gas Sampling Bag from the 2-3/8" production tubing which was flowing gas past the valve and at the 4" casing port at the beginning of the Flow Test at approximately 12:58 P.M. MDT on 11.12.2022 as the well was being prepared for the Flow Measurement. Gas Sample #2 was collected in the same 1 Liter Tedlar Bag on 11.13.2022 before the Flow Test was concluded 10:08 A.M. MDT.

<sup>2</sup> These April 11, 2022 Guidelines were developed to meet the federal program reporting requirements for methane emissions reductions as described in Section 40601 (Orphaned well site plugging, remediation, and restoration) of Title V (Methane Reduction Infrastructure) of the 2021 Bipartisan Infrastructure Law (BIL; Public Law 117-58).

WDF rigged up the Ventbuster™ Instruments VB100-056 Continuous Ultra-Low Flow Meter with GPS for testing site confirmation for a minimum 12-Hour Methane Emission Test and began Test ID: e743d6e4, verifying a cellular signal, cloud link and GPS coordinates. WDF collected Gas Sample #2 in the same Tedlar/TO Plus Gas Sample Bag prior to the VB Test being concluded 21.2.1-hours later on 11.13.2022 to ensure the Methane Emission Flow was normalized. The collected Gas Sample was secured and placed in a storage cooler for transport to Laboratory Services, Inc. in Hobbs, NM.

WDF performed a 21.6-hour continuous flow methane monitoring test using VB100-056 to closely monitor the Pre-Plugging Methane Emission Flow Test. At the completion of the test, the WDF Team rigged the VB100-056 unit down and secured the wellhead as best as possible. A "Green Ribbon" was placed at the Wellhead indicating that WDF had concluded the Pre-Plugging Methane Flow testing.

The State of New Mexico reviewed the WDF provided Methane gas flow and concentration data and prioritized the Fowler Hair #001 plugging as part of their IJJA Orphan Well Program of Projects. A-Plus Well Services, Inc. of Farmington, NM was dispatched to plug the prioritized orphan well on December 2, 2022 and the orphan well plugging was completed, with cement to the surface on December 12, 2022.

The WDF Measure 1 Team arrived back on location on December 14, 2022 to measure Methane gas concentration and emissions. WDF found the cement to be -12.0" below the surface collar of the production casing. WDF performed field gas tests that established 0.00% Methane and collected a gas sample for laboratory analysis. Laboratory Services, Inc. of Hobbs, NM rushed the analysis of the collected gas sample, using Test ID: #2022061541 and the findings concluded on December 19, 2022 were **0.00 ppm Methane Gas** and **0.00 ppm H2s Gas**.

### TECHNICAL FINDINGS

Fowler Hair #001 (30-025-11103):

- **Total C1 through C6 Gas Concentration: 582,170 ppm**
- **Total Measured Wellhead Gas Emissions: 0.82 m3/day**
- **Methane Gas Concentration: 336,330 ppm**
- **Calculated Average Wellhead Methane Gas Emissions: 6.37 g/hour**
- **Peak Methane Flow Measured at: 20.96 g/hour**
- **Post Plugging Methane Gas Concentration: 0.00 ppm**
- **Post Plugging Methane Flow: 0.00 g/hour**

### CONCLUSIONS

- The Fowler Hair #001 (30-025-11103) was emitting Methane gas pre-plugging at the average rate of 6.37 g/hour, which was above the Federal minimum threshold for reporting described in Section 40601 (Orphaned well site plugging, remediation, and restoration) of Title V (Methane Reduction Infrastructure) of the 2021 Bipartisan Infrastructure Law (BIL; Public Law 117-58) which is >1g/hour.
- Post Plugging, the Fowler Hair #001 (30-025-11103) presented 0.00 ppm of Methane gas emissions from field gas tests and laboratory analysis of WDF collected gas samples.

### FIELD NOTES

The screenshot shows the 'Well Site' interface for Fowler Hair #001. At the top left is the 'Well Done FOUNDATION' logo. The page title is 'Well Site'. Below the title is a navigation menu with tabs: Info, Well File, Images, Well Data, Regulatory, Field Notes (selected), Live Data View, Access, and Remove Well. Below the menu is a form for adding a new note, with a 'Date' field set to '01/02/2023' and a 'New Note' text area. A green 'Add' button is positioned below the text area, with a red 'Required' label above it. Below the form is a table of existing field notes.

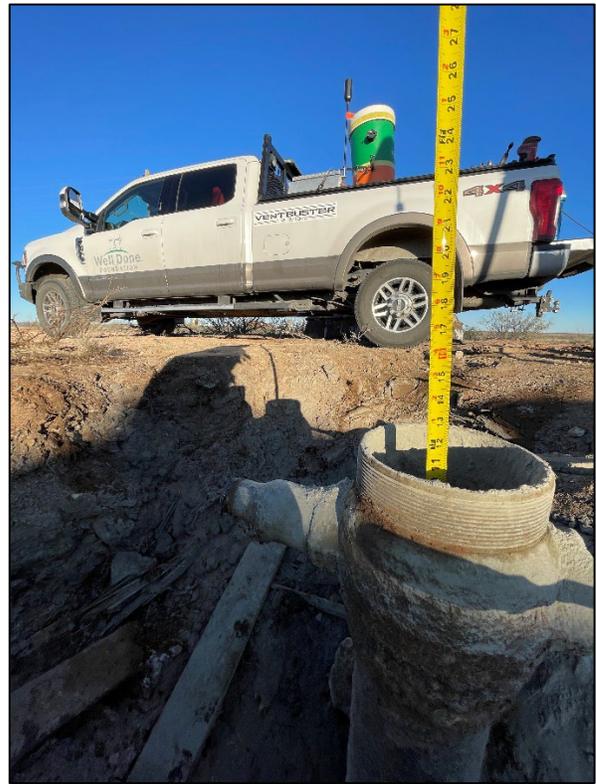
#	Date	Note
1	2022-11-12	ces: On location with the WDF Measure 1 Team and Rob Layher, owner of VBI. Performed a location Safety Meeting and a visual hazard inspection. Photos following the EDF protocol. Field Gas tests produced elevated levels of methane at the casing vent. Collect gas sample for Lab analysis. Rig up VB100-056 to the 2" casing port for 12-hour Methane Flow Test. Secure location.
2	2022-11-13	FV: Returned to location to collect gas sample #2 and rig down VB100-056. Good Test. Secure well site and place green ribbon @ wellhead.
3	2022-12-12	ces: APES notified WDF that they would be finishing up with cement to surface and expected to be moved off location on 12/13.
4	2022-12-14	ces: WDF Measure1 back on location to perform post plugging Methane Monitoring and Sampling. Document site with photos. Found cement in the wellbore to be -12.0" from the top of casing with a good bond to the casing wall. Collect post plug sample in a tedlar Bag for analysis at the Hobbs, NM Laboratory Services Lab. Secure location. WILDCAT OUT!

Image 4.2 – Fowler Hair #001 (30-025-11103) Field Notes from WDF Well Intel™ Orphan Well Project Management IoT

### Appendix A – Post Plugging Site Photos for Fowler Hair #001 (30-025-11103)



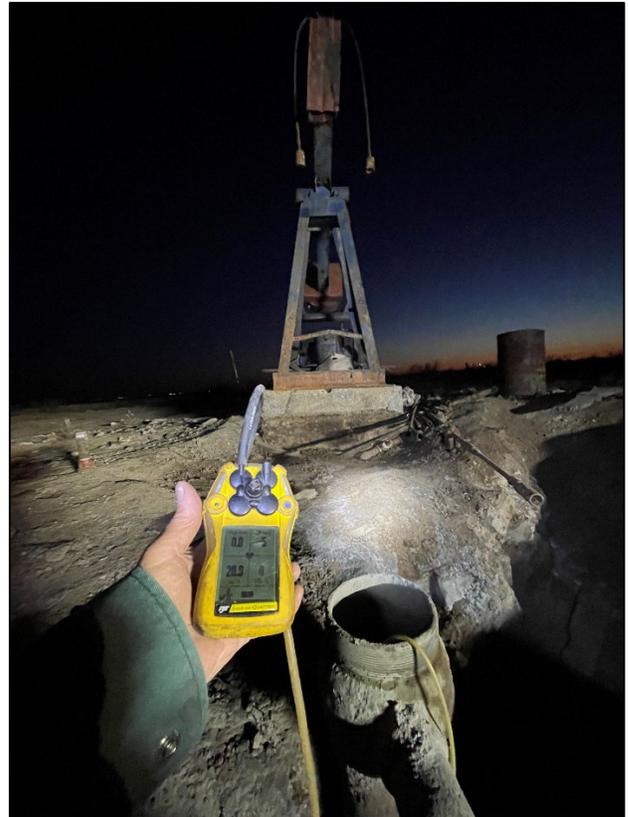
1) Fowler Hair #001 (30-025-11103) – South Facing Post Plug



2) Fowler Hair #001 (30-025-11103) – Cement Depth from Surface



3) Fowler Hair #001 (30-025-11103) – Post Plug Gas Sample



4) Fowler Hair #001 (30-025-11103) – Post Plug Field Gas Analysis



<b>15514G</b>	<b>Fowler Hair #1 Post Closure</b>	<b>Fowler Hair #1 Post Closure</b>	
Sample Point Code	Sample Point Name	Sample Point Location	
<b>Laboratory Services</b>	<b>2022061541</b>	<b>Tedlar Bag</b>	<b>Curtis - Spot</b>
Source Laboratory	Lab File No	Container Identity	Sampler
<b>USA</b>	<b>USA</b>	<b>USA</b>	<b>New Mexico</b>
District	Area Name	Field Name	Facility Name
<b>Dec 14, 2022 17:30</b>	<b>Dec 14, 2022 17:30</b>	<b>Dec 16, 2022 10:47</b>	<b>Dec 16, 2022</b>
Date Sampled	Date Effective	Date Received	Date Reported
<b>Torrance</b>			
Ambient Temp (°F)	Flow Rate (Mcf)	Analyst	Press PSI @ Temp °F Source Conditions
<b>Well Done Foundation</b>		<b>NG</b>	
Operator		Lab Source Description	

Component	Normalized Mol %	Un-Normalized Mol %	GPM
H2S (H2S)	0.0000	0	
Nitrogen (N2)	99.8610	99.86136	
CO2 (CO2)	0.0350	0.03466	
Methane (C1)	0.0000	0	
Ethane (C2)	0.0000	0	0.0000
Propane (C3)	0.0000	0	0.0000
I-Butane (IC4)	0.0000	0	0.0000
N-Butane (NC4)	0.0000	0	0.0000
I-Pentane (IC5)	0.0000	0	0.0000
N-Pentane (NC5)	0.0000	0	0.0000
Hexanes Plus (C6+)	0.1040	0.10398	0.0450
<b>TOTAL</b>	<b>100.0000</b>	<b>100.0000</b>	<b>0.0450</b>

Gross Heating Values (Real, BTU/ft <sup>3</sup> )			
14.696 PSI @ 60.00 Å°F		14.73 PSI @ 60.00 Å°F	
Dry	Saturated	Dry	Saturated
5.3	6.1	5.3	6.1

Calculated Total Sample Properties	
GPA2145-16 *Calculated at Contract Conditions	
Relative Density Real	Relative Density Ideal
0.9696	0.9697
Molecular Weight	
28.0868	

C6+ Group Properties		
Assumed Composition		
C6 - 60.000%	C7 - 30.000%	C8 - 10.000%

**PROTREND STATUS:** Passed By Validator on Dec 19, 2022  
**DATA SOURCE:** Imported

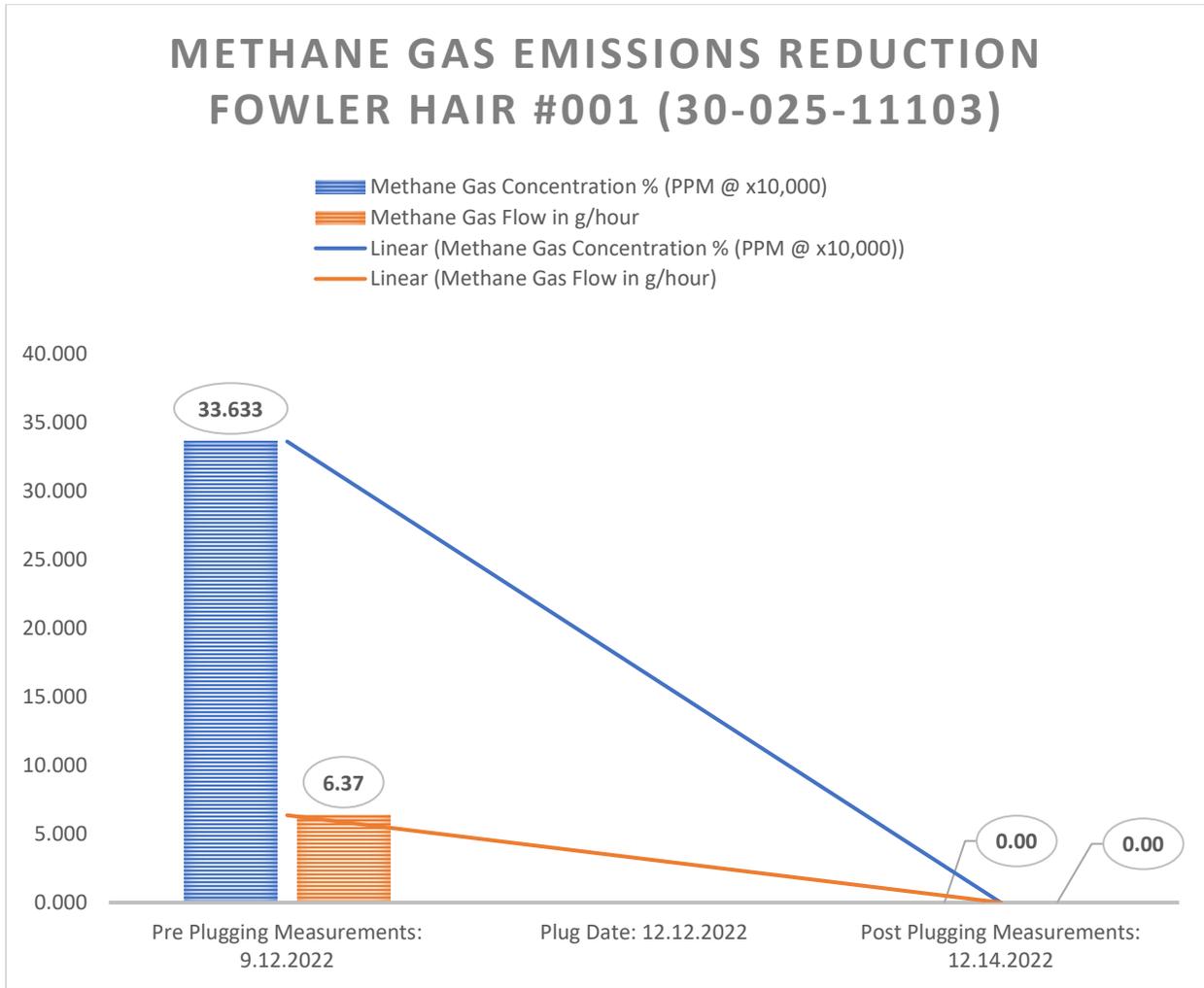
**PASSED BY VALIDATOR REASON:** Close enough to be considered reasonable.

**VALIDATOR:** Brooke Rush

**VALIDATOR COMMENTS:** ok

Method(s): Gas C6+ - GPA 2261, Extended Gas - GPA 2286, Calculations - GPA 2172

Analyzer Information			
Device Type:	Gas Chromatograph	Device Make:	Shimadzu
Device Model:	GC-2014	Last Cal Date:	Sep 26, 2022



**District I**  
 1625 N. French Dr., Hobbs, NM 88240  
 Phone:(575) 393-6161 Fax:(575) 393-0720  
**District II**  
 811 S. First St., Artesia, NM 88210  
 Phone:(575) 748-1283 Fax:(575) 748-9720  
**District III**  
 1000 Rio Brazos Rd., Aztec, NM 87410  
 Phone:(505) 334-6178 Fax:(505) 334-6170  
**District IV**  
 1220 S. St Francis Dr., Santa Fe, NM 87505  
 Phone:(505) 476-3470 Fax:(505) 476-3462

**State of New Mexico**  
**Energy, Minerals and Natural Resources**  
**Oil Conservation Division**  
**1220 S. St Francis Dr.**  
**Santa Fe, NM 87505**

QUESTIONS

Action 173287

**QUESTIONS**

Operator: PRIMAL ENERGY CORPORATION 211 Highland Cross Houston, TX 77073	OGRID: 154303
	Action Number: 173287
	Action Type: [UF-OMA] Post-Plug Methane Monitoring (UF-OMA-MMB)

**QUESTIONS**

<b>Prerequisites</b>	
[OGRID] Well Operator	[154303] PRIMAL ENERGY CORPORATION
[API] Well Name and Number	[30-025-11103] FOWLER HAIR #001
Well Status	Reclamation Fund Approved

<b>Monitoring Event Information</b>	
Reason For Filing	Post-Plug Methane Monitoring
Date of monitoring	12/15/2022

<b>Monitoring Event Details</b>	
Flow rate in cubic meters per day (m³/day)	0.00
Test duration in hours (hr)	1.0
Average flow temperature in degrees Celsius (°C)	5.0
Average gauge flow pressure in kilopascals (kPag)	0.0
Methane concentration in part per million (ppm)	0
Methane emission rate in grams per hour (g/hr)	0.00
Testing Method	Tedlar Bag

<b>Monitoring Contractor</b>	
Name of monitoring contractor	Well Done Foundation, Inc.