Well Done FOUNDATION
P.O. Box 10640 Bozeman, Montana 59719 (406) 460-0903

TO: Randy Pancheco, APWS; Jim Griswold, NMOCD

FROM: Curtis Shuck, Chairman

DATE: November 14, 2022

RE: Foster #001 (30-025-07968) 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 #10000002000038AA for Orphan Oil & Gas Wells in Lea County, NM.

The site conditions found at Foster #001 by the WDF Measure 1 Field Team on November 14, 2022, at 10:20 A.M. revealed a cement plugged orphan well with an open wellbore. The WDF Measure 1Team took site photographs, performed field gas measurements and collected a gas sample for immediate laboratory analysis.

Image 1.1 – Lea County Field

The Pre-Plugging Methane Flow Monitoring Test on September 22, 2022, using Ventbuster™ Instruments VB100-0039 Ultra-Low Flow Meter with GPS, resulted in 339.86 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 670,960 ppm, pursuant to Test ID 2022058184 performed by Laboratory Services of Hobbs, NM. Therefore, the adjusted average methane gas emission measured at this wellhead is calculated at **5,263.75 grams per hour (g/hour)**.[1]

The State of New Mexico used the methane flow data collected by WDF to prioritize the Foster #001 orphan well plugging under the IIJA Program and began mobilizing a contractor to location on October 31, 2022. A-Plus Well Service, Inc. of Farmington, NM was awarded the plugging contract. A-Plus completed the orphan well plugging on Thursday November 10, 2022 and recorded cement to the surface.

WDF arrived at the Foster #001 location on November 14 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 H2s gasses. The post plugging collected gas samples, analyzed by Laboratory Services, Inc. confirmed 0.00 ppm or methane gas and 0.00 ppm of H2s gas.**

[1] Methane Calculation: 554 grams CH4 per cubic meter (554 x 339.86 = 184,883.84 g/day total /24 = 7,845.10 g/hour x 0.670960 (methane concentration) = **5,263.75 g/hour CH4**). **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^3; 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^3], or 0.0003202 *ounce per cubic inch* [oz/inch^3] .

This orphan well clearly exceeded 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)[2].

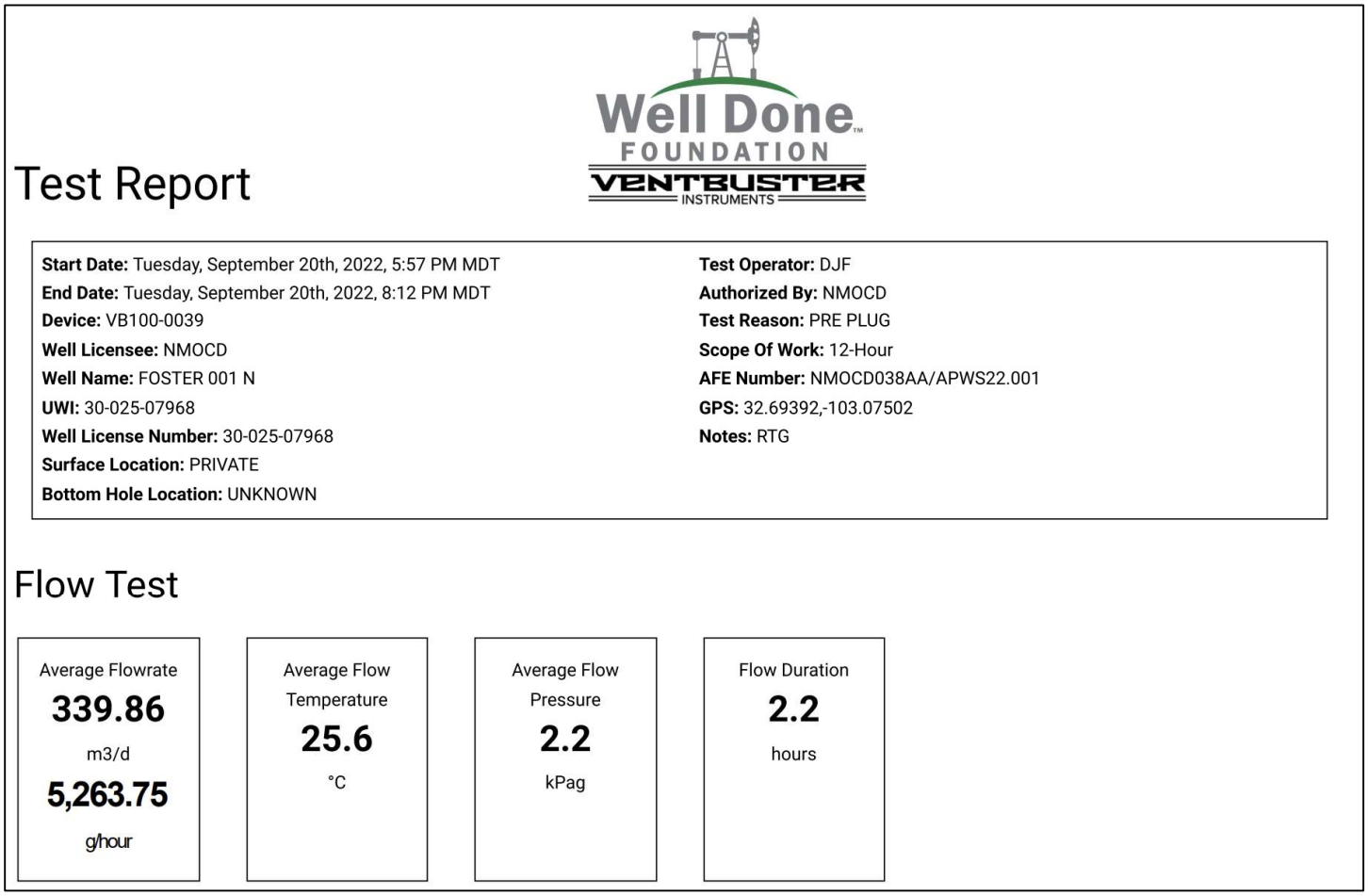


Image 2.1 – Foster #001 (30-025-07968) Pre-Plugging Methane Monitoring Dashboard

BACKGROUND

The Foster #001 (30-025-07968) Orphan Well is located in the City of Hobbs in Lea County, NM at Latitude 32.6938744, Longitude -103.0749512 was measured and monitored by the WDF Measure 1 Field Team on 9/20/2022 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 5:30 P.M MDT on 9.20.2022 as the well was being prepared for the Flow Measurement. Gas Sample #2 was collected in the same 1 Liter Tedlar Bag on 9.20.2022 before the Flow Test was concluded 8:12 P.M. MDT.

[2] 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 VB100-039 Continuous Ultra-Low Flow Meter with GPS for testing site confirmation for a minimum 2-Hour Methane Emission Test and began Test ID: 28ef69e5, 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 later in the evening on 9.20.2022 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 remained on location for the duration of the test on 9.20.2022 (approximately 2.2 hours) to closely monitor the Pre-Plugging Methane Emission Flow Test, destroy the flow test emissions through thermal oxidization and rig the VB100-039 down and secure 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 Foster #001 plugging as part of their IIJA Orphan Well Program of Projects. A-Plus Well Services, Inc. of Farmington, NM was dispatched to plug the prioritized orphan well on October 31, 2022 and the orphan well plugging was completed, with cement to the surface on November 10, 2022.

The WDF Measure 1 Team arrived back on location on November 14, 2022 to measure Methane gas concentration and emissions. WDF found the cement to be -13.8” 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 and the findings concluded 0.00 ppm Methane Gas and 0.00 ppm H2s Gas.

TECHNICAL FINDINGS

Foster #001 (30-025-07968):

- **Total C1 through C6 Gas Concentration: 817,210 ppm**
- **Total Measured Wellhead Gas Emissions: 339.86 m3/day**
- **Methane Gas Concentration: 670,960 ppm**
- **Calculated Average Wellhead Methane Gas Emissions: 5,263.75 g/hour**
- **Peak Methane Flow Measured at: 6,289.44 g/hour**
- **Post Plugging Methane Gas Concentration: 0.00 ppm**
- **Post Plugging Methane Flow: 0.00 g/hour**

CONCLUSIONS

- The Foster #001 (30-025-07698) was emitting Methane gas pre-plugging at the average rate of 5,263.75 g/hour, which is well 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.

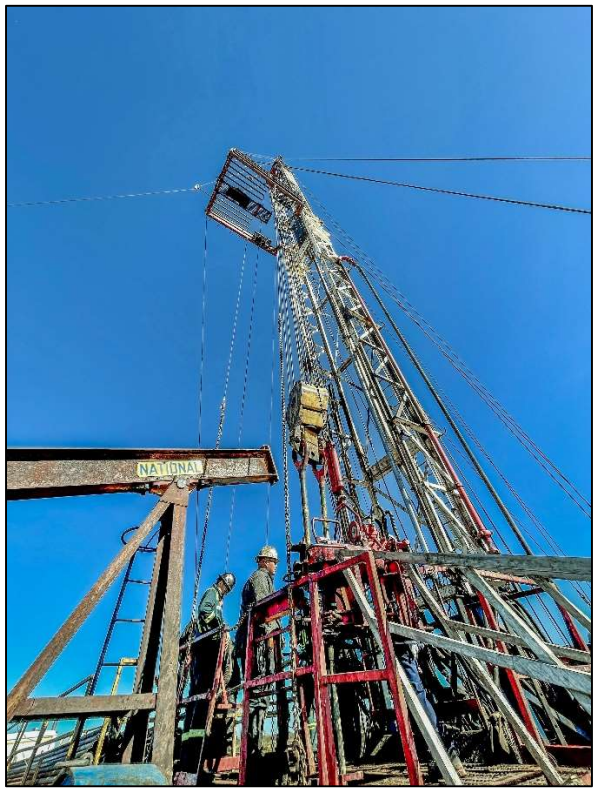
- Post Plugging, the Foster #001 (30-025-07698) presented 0.00 ppm of Methane gas emissions from field gas tests and laboratory analysis of WDF collected gas samples.

FIELD NOTES

#	Date	Note
1	2022-07-30	ces: On location. Found gas leaking at tubing head packing at a high rate. National pump jack on location with concrete base. One 210 barrel stock tank one 160 barrel saltwater tank one fiberglass trader/separator one steel heater treater and one steel separator. Tank battery does not have containment. Surface staying at tank battery approximately 10' x 10' surface standing at
2	2022-07-30	ces: Access off of E. Moreland Rd. OK through a lot gate. Side is flat was plenty of room to move thank batteries do not appear to be leaking.
3	2022-07-30	ces: Gas test tubing head show high levels of H2 S4 134+ ppm. Methane level is high, over limit. Exercise caution!
4	2022-07-30	ces: IMPORTANT - Field gas test was conducted in the mixing zone. Actual gas concentrations will be higher within the wellbore! Well is under pressure!
5	2022-07-30	ces: Stock tank has approximately 4+ feet of material.
6	2022-09-20	ces: WDF Measure 1 team arrived on location at Foster #001 North at approximately 5:15 P.M. WDF performed JHA prior to beginning work to address elevated levels of H2S gas and the planned flaring operations. Began rigging up the VB100-0039 for testing at the 4" casing that is pressured up and leaking by the 2-3/8" tubing packing at the wellhead. Position the WDF Mobile Flare to destroy emission gas from the flow testing and improve site safety. Collected gas sample for Lab analysis. Start IIJA Pre-Plugging Methane Flow Test at 5:57 P.M. WDF Team closely monitoring the methane flow and performance of the Mobile Flare Unit. Turn on Light Plant at approximately 7:45 as darkness sets in. Conclude Methane Flow Test at 8:12 P.M. Rig down VB100-039 and rig down Mobile Flare. Secure well location and wellhead however, as the Methane Flow test Results conclude from this interval, the flow steadily increased and pressure at the 2-3/8" packing never subsided. Clean up and roll off location at 9:05 P.M. - WILDCAT OUT!
7	2022-11-10	ces: On location Foster 1 with A-Plus Well Services Plugging Crew to witness cement to surface and photo document operations.
8	2022-11-14	ces: On location with WDF Measure 1 to photo Post Site conditions and measure post plugging methane emissions. Field gas analysis produced 0.00 ppm Methane Gas and 0.00 H2S Gas. Collected Gas Sample in Tedlar Bag for Laboratory Analysis and transported to Laboratory Services in Hobbs, NM for analysis.

Image 4.2 – Foster #001 (30-025-07968) Field Notes from WDF Well Intel™ Orphan Well Project Management IoT

Appendix A – Post Plugging Site Photos for Foster #001 (30-025-07968)



1) Foster #001 (30-025-07968) – North Facing Plugging

2) Foster #001 (30-025-07698) – Plugging Crew Safety Meeting

3) Foster #001 (30-025-07698) – Post Plugging Site 1 - North

4) Foster #001 (30-025-07698) – Post Plugging Site 2 - East

5) Foster #001 (30-025-07698) – Post Plugging Site 3 – Wellhead

6) Foster #001 (30-025-07698) – Cement Level in plugged well

6) Foster #001 (30-025-07698) – Post Plugging - Field Gas

7) Foster #001 (30-025-07698) – Post Plugging - Gas Sample

LABORATORY SERVICES Natural Gas Analysis
www.permianls.com
575.397.3713 2609 W Marland Hobbs NM 88240

C6+ Gas Analysis Report

Sample Point Code	Sample Point Name	Sample Point Location
15270G	Foster #1 Post Plug	Foster #1 Post Plug

Source Laboratory	Lab File No	Container Identity	Sampler
Laboratory Services	2022060169	Tedlar Bag	Curtis - Spot

District	Area Name	Field Name	Facility Name
USA	USA	USA	New Mexico

Date Sampled	Date Effective	Date Received	Date Reported
Nov 14, 2022 10:40	Nov 14, 2022 10:40	Nov 14, 2022 11:37	Nov 14, 2022

Ambient Temp (°F)	Flow Rate (Mcf)	Analyst	Press PSI @ Temp °F Source Conditions
		Torrance	

Operator	Lab Source Description
Well Done Foundation	NG

Component	Normalized Mol %	Un-Normalized Mol %	GPM
H2S (H2S)	0.0000	0	
Nitrogen (N2)	99.3350	99.33545	
CO2 (CO2)	0.0360	0.03594	
Methane (C1)	0.0000	0	
Ethane (C2)	0.0390	0.03898	0.0100
Propane (C3)	0.0430	0.04272	0.0120
I-Butane (IC4)	0.0090	0.00924	0.0030
N-Butane (NC4)	0.0410	0.04053	0.0130
I-Pentane (IC5)	0.0530	0.05312	0.0190
N-Pentane (NC5)	0.0520	0.0519	0.0190
Hexanes Plus (C6+)	0.3920	0.39211	0.1700
TOTAL	100.0000	100.0000	0.2460

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

Gross Heating Values (Real, BTU/ft³)

14.696 PSI @ 60.00 Â°F		14.73 PSI @ 60.00 Â°F	
Dry	Saturated	Dry	Saturated
27.8	28.2	27.9	28.3

Calculated Total Sample Properties

GPA2145-16 *Calculated at Contract Conditions

Relative Density Real	Relative Density Ideal
0.9785	0.9786

Molecular Weight: 28.3438

C6+ Group Properties

Assumed Composition

C6 - 60.000% C7 - 30.000% C8 - 10.000%

Field H2S: 0 PPM

PROTREND STATUS:
Passed By Validator on Nov 14, 2022

DATA SOURCE:
Imported

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

VALIDATOR:
Luis Cano

VALIDATOR COMMENTS:
ok

Analyzer Information

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

Source	Date	Notes
Luis Cano	Nov 14, 2022 3:36 pm	Methane: 0 PPM

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 158777

QUESTIONS

Operator: ROBINSON OIL INC P.O. Box 1829 Eunice, NM 88231	OGRID: 37636
	Action Number: 158777
	Action Type: [UF-OMA] Post-Plug Methane Monitoring (UF-OMA-MMB)

QUESTIONS

Prerequisites	
[OGRID] Well Operator	**[37636] ROBINSON OIL INC**
[API] Well Name and Number	**[30-025-07968] FOSTER #001**
Well Status	**Reclamation Fund Approved**

Monitoring Event Information	
Reason For Filing	**Post-Plug Methane Monitoring**
Date of monitoring	11/14/2022

Monitoring Event Details	
Flow rate in cubic meters per day (m^3/day)	0.00
Test duration in hours (hr)	1.0
Average flow temperature in degrees Celsius (°C)	25.0
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	bag sample

Monitoring Contractor	
Name of monitoring contractor	Well Done Foundation