

November 15, 2017

Deborah Watson
WPX Energy Production LLC
721 S Main Ave.
Aztec, NM 87410

**RE: Soil Gas Survey Results
Ignacio 33-8 #8 P&A Gas Well**

Dear Ms. Watson,

Cottonwood Consulting LLC (Cottonwood) is pleased to provide you with the results of a soil gas survey conducted in the vicinity of the Ignacio 33-8 #8 plugged and abandoned well in Ignacio, Colorado (Figure 1). The methodology and associated results are summarized below.

Background

The Ignacio 33-8 #8 plugged and abandoned gas well (API #05-067-05502) was spud in 1957 by the Pacific Northwest Pipeline Corporation, drilled to a total depth of 5,575 feet below ground surface (bgs), and completed into the Mesaverde formation (Attachment 1). The well is currently owned by WPX Energy Production LLC (WPX), and was plugged and abandoned in 1996.

Cottonwood was retained by WPX in November 2017 to conduct a soil gas survey to evaluate current site conditions and determine the presence or absence of methane seepage in the vicinity of the Ignacio 33-8 #8 plugged and abandoned gas well.

Methodology

Cottonwood was on-site to conduct the soil gas survey on November 9, 2017. 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 Ignacio 33-8 #8 plugged and abandoned gas well (Figure 2). An additional gas measurement was collected from a soil vapor tube near the plugged and abandoned well marker.

Cottonwood used a slide-hammer to advance a borehole to a total depth of approximately two feet bgs at each measurement location. 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.

Results

Methane was not detected at any of the 29 soil gas measurement locations or at the soil vapor tube during the soil gas survey. Additionally, hydrogen sulfide and carbon monoxide were not detected at any of the measurement locations. Carbon dioxide was detected between 0.1 – 0.4%, and oxygen levels were generally consistent with background levels (20.0 – 21.3%). Vegetation appeared to be less dense in the immediate vicinity of the plugged and abandoned well marker; however, no significant areas of stressed or dead vegetation were observed. Results of the soil gas survey are presented in Table 1, and photographic documentation of site conditions during the survey are included as Attachment 2.

Conclusions

Based on the results of the November 2017 soil gas survey, it appears that methane seepage is not present in the vicinity of the Ignacio 33-8 #8 plugged and abandoned gas 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 WPX Energy Production LLC.

Sincerely,



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

Attachments: Figure 1 – Project Area Map
Figure 2 – Soil Gas Survey Map
Table 1 – Soil Gas Survey Results
Attachment 1 – Scout Card
Attachment 2 – Photographic Documentation



Legend

★ Project Location

Project Location: SESE Sec 12 T33N R8W






Mapping by: H. Ertl, 11/13/17
 Coordinate System:
 NAD 1983 UTM Zone 13 N

FIGURE 1
PROJECT LOCATION MAP
IGNACIO 33-8 #8
WPX ENERGY
PRODUCTION LLC



All measurements collected on 11/9/17. No methane was detected at the soil vapor tube or any of the gas measurement locations.

Legend

-  **Plugged & Abandoned Well**
-  **Soil Vapor Tube**
-  **Gas Measurement Locations**

Project Location: SESE Sec 12 T33N R8W



Mapping by: H. Ertl, 11/13/17
 Coordinate System:
 NAD 1983 UTM Zone 13 N

FIGURE 2
SOIL GAS SURVEY MAP
IGNACIO 33-8 #8
WPX ENERGY
PRODUCTION LLC

TABLE 1
SOIL GAS SURVEY RESULTS
IGNACIO 33-8 #8
WPX ENERGY PRODUCTION LLC

SAMPLE ID	CH ₄ %	CO ₂ %	H ₂ S ppm	CO ppm	O ₂ %
1	0	0.3	0	0	20.3
2	0	0.3	0	0	20.1
3	0	0.3	0	0	20.1
4	0	0.2	0	0	20.0
5	0	0.3	0	0	20.1
6	0	0.3	0	0	20.0
7	0	0.3	0	0	20.1
8	0	0.2	0	0	20.1
9	0	0.2	0	0	20.1
10	0	0.3	0	0	20.2
11	0	0.2	0	0	20.1
12	0	0.2	0	0	20.4
13	0	0.3	0	0	20.5
14	0	0.2	0	0	20.6
15	0	0.3	0	0	20.6
16	0	0.2	0	0	20.8
17	0	0.2	0	0	20.8
18	0	0.2	0	0	20.8
19	0	0.2	0	0	20.8
20	0	0.2	0	0	20.9
21	0	0.1	0	0	20.9
22	0	0.2	0	0	20.9
23	0	0.4	0	0	20.9
24	0	0.2	0	0	20.9
25	0	0.2	0	0	21.1
26	0	0.2	0	0	21.1
27	0	0.2	0	0	21.3
28	0	0.2	0	0	21.2
29	0	0.2	0	0	21.2
Soil Vapor Tube	0	-	-	-	-

Notes:

All measurements collected 11/9/17.

CH₄- Methane

CO₂- Carbon Dioxide

H₂S- Hydrogen Sulfide

CO- Carbon Monoxide

O₂- Oxygen

ppm- Parts Per Million

%- Percent

COGIS - WELL Information

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[Wellbore](#)
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Surface Location Data for API # 05-067-05502 Status: PA 1/16/1996

Well Name/No: [IGNACIO 33-8 #8](#) (click well name for production)
Operator: WPX ENERGY PRODUCTION LLC - 96705
Status Date: 1/16/1996 **Federal or State Lease #:**
FacilityID: 214182 **LocationID:** 385383
County: LA PLATA #067 **Location:** SESE 1 33N8W N PM
Field: IGNACIO BLANCO - #38300 **Elevation:** 6,567 ft.
Planned Location 660 FSL 660 FEL **Lat/Long:** 37.127739/-107.661512 **Lat/Long** Calculated From Footages

Wellbore Data for Sidetrack #00 Status: AB 1/16/1996

Spud Date: 9/29/1957 **Spud Date is:** ACTUAL
Wellbore Permit
Permit #: 19570000 **Expiration Date:** 9/16/1958
Prop Depth/Form: 5575 **Surface Mineral Owner Same:**
Mineral Owner: FEE **Surface Owner:**
Unit: **Unit Number:**
Formation and Spacing: Code: MVRD , Formation: MESAVERDE , Order: 0 , Unit Acreage: 0, Drill Unit:

Wellbore Completed

Completion Date: 10/14/1957
Measured TD: 5575 **Measured PB depth:** 5574
True Vertical TD: **True Vertical PB depth:**
Casing: String Type: SURF , Hole Size: , Size: 9.625, Top: 0, Depth: 222, Weight: 36
Cement: Sacks: 200, Top: 0, Bottom: , Method Grade:
Casing: String Type: 1ST , Hole Size: , Size: 7, Top: 0, Depth: 3450, Weight: 20
Cement: Sacks: 200, Top: 0, Bottom: , Method Grade:
Casing: String Type: 2ND , Hole Size: , Size: 5, Top: 0, Depth: 5575, Weight: 11.5
Cement: Sacks: 200, Top: 0, Bottom: , Method Grade:

Formation	Log Top	Log Bottom	Cored	DSTs
KIRTLAND	1645			
FRUITLAND	2505			
PICTURED CLIFFS	3004			
LEWIS	3277			
CLIFF HOUSE	5192			
MENELEE	5239			
POINT LOOKOUT	5390			

Completed information for formation MVRD Status: AB

1st Production Date: 12/17/1957 **Choke Size:** 0.750
Status Date: 1/16/1996 **Open Hole Completion:**
Commingled: **Production Method:** FLOWING
Formation Name: MESAVERDE **Status:** AB
Tubing Size: 1.25 **Tubing Setting Depth:** 5535
Tubing Packer Depth: **Tubing Multiple Packer:**
Open Hole Top: **Open Hole Bottom:**
Initial Test Data:
Test Date: 12/17/1957 **Test Method:** FLOWING
Hours Tested: 3 **Gas Type:**
Gas Disposal:

Test Type	Measure
CALC_MCF_GAS	2574

Perforation Data:
Interval Bottom: 5572 **Interval Top:** 5334
of Holes: **Hole Size:**

PHOTOGRAPHIC DOCUMENTATION



Photo 1. Plugged and abandoned well marker.



Photo 2. Soil gas measurement instrumentation and soil vapor tube next to abandoned well marker.



Photo 3. Well maker and surrounding vegetation (1).



Photo 4. Well maker and surrounding vegetation (2).