Cottonwood CONSULTING

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June 17, 2016

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

RE: Soil Gas Survey Results
Bondad, Colorado

Dear Mr. Hughes:

Cottonwood Consulting LLC (Cottonwood) and Four Corners Geoscience, Inc. are pleased to provide you with the results of a soil gas survey conducted in the vicinity of the Bryce 1-X abandoned well in Bondad, Colorado (Figure 1). The methodology and associated results are summarized below.

Background

The Bryce 1-X abandoned well (API #05-067-09087) appears to be the primary conduit for methane migration that resulted in the explosion of the nearby Yoakum residence in 2005. Following the explosion, approximately 20 soil gas surveys were conducted between February 2005 and September 2010 to evaluate the presence of methane seepage at the site. Results of the soil gas surveys indicated the presence of methane seepage from February 2005 through July 2007. Methane seepage was not detected in the vicinity of the Bryce 1-X between September 2007 and September 2010. The absence of methane seepage during this time was likely the result of the initial remediation of the Bryce 1-X conducted by the COGCC in November 2005. Cottonwood and Four Corners Geoscience, Inc. were retained by the COGCC in June 2016 to conduct an additional soil gas survey to evaluate current site conditions and determine the presence or absence of methane seepage in the vicinity of the Bryce 1-X and surrounding area.

Methodology

Cottonwood was on-site to conduct the soil gas survey on June 16, 2016. Prior to the soil gas survey, Cottonwood notified and obtained access from the relevant landowner within the survey area. Cottonwood also conducted a utility locate to ensure that all underground utilities within the survey area were properly marked prior to ground disturbance.

The soil gas survey was conducted using a grid-mapping system to systematically cover the area. Soil gas measurements were collected at 50-foot intervals across the gridded areas including the Bryce 1-X abandoned well and the location of the former Yoakum residence. Additional soil gas measurements were collected adjacent to the Bryce 1-X and near the water well (Permit #233433) associated with the former Yoakum residence to determine if these wells were acting as conduits for methane migration.

Cottonwood used a slide-hammer to advance a borehole to a total depth of approximately two feet below ground surface (bgs) at each measurement location. Tubing connected to a GEM2000® Landfill Gas Meter was lowered into each borehole to collect measurements of methane, oxygen, carbon dioxide, carbon monoxide, and hydrogen sulfide. The concentration of each gas and the associated measurement location was recorded using a Trimble GeoXT®. Additional observations regarding vegetation and general site conditions were recorded in a field notebook.

Results

Results indicate that methane was not detected at any of the 32 measurement locations during the soil gas survey. Additionally, carbon dioxide, carbon monoxide, and hydrogen sulfide were not detected at any of the measurement locations and oxygen levels were generally consistent with background levels. Vegetation appeared to be healthy in the vicinity of the survey area and no visual evidence that would suggest the presence of methane seepage was observed. Figure 2 and Table 1 present the results of the soil gas survey. Photographic documentation of site conditions during the survey are included as Attachment 1.

Conclusions

Based on the results of the June 2016 soil gas survey and the historical surveys, it appears that methane seepage is no longer present in the vicinity of the Bryce 1-X abandoned well.

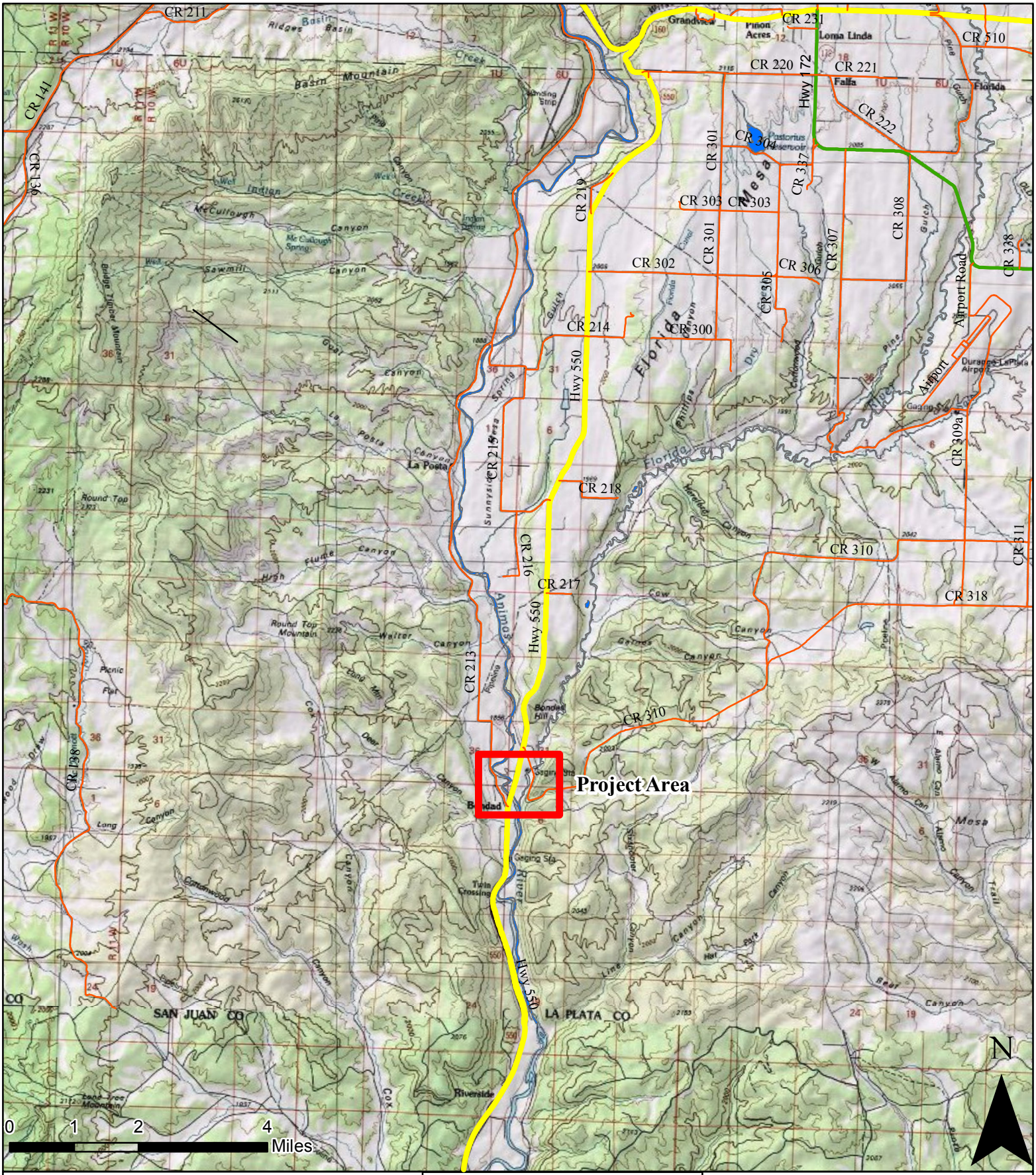
Should you have any questions regarding this cost estimate, please do not hesitate to contact me at 970-764-7356 or ksiesser@cottonwoodconsulting.com. We appreciate the opportunity to provide services to the COGCC.

Sincerely,

Kyle G. Siesser

Kyle G. Siesser, Principal
Cottonwood Consulting, LLC

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



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Mapping: J. Harter, 6/17/16
Coordinate System:
NAD 1983 UTM Z13

FIGURE 1
PROJECT AREA MAP
BRYCE 1-X
BONDAD COLORADO
COGCC

Project Area: SW1/4, Sec. 31, T33N, R9W NMPM, La Plata County, CO

Legend

- Bryce 1-X
- Water Wells
- Gas Measurement Locations

Project Area: SW1/4, Sec. 31, T33N, R9W NMPM, La Plata County, CO

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Mapping: J. Harter, 6/17/16
Coordinate System:
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FIGURE 2
SOIL GAS SURVEY MAP
BRYCE 1-X
BONDAD COLORADO
COGCC

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TABLE 1
SOIL GAS SURVEY RESULTS
BRYCE 1-X - BONDAD, COLORADO
COLORADO OIL AND GAS CONSERVATION COMMISSION

SAMPLE ID #	CH_4 %	CO_2 %	H_2S ppm	CO ppm	O_2 %
1	0.0	0.0	0.0	0.0	21.6
2	0.0	0.0	0.0	0.0	21.5
3	0.0	0.0	0.0	0.0	21.5
4	0.0	0.0	0.0	0.0	21.4
5	0.0	0.0	0.0	0.0	21.3
6	0.0	0.0	0.0	0.0	21.3
7	0.0	0.0	0.0	0.0	21.2
8	0.0	0.0	0.0	0.0	21.3
9	0.0	0.0	0.0	0.0	21.2
10	0.0	0.0	0.0	0.0	21.2
11	0.0	0.0	0.0	0.0	21.2
12	0.0	0.0	0.0	0.0	21.2
13	0.0	0.0	0.0	0.0	21.3
14	0.0	0.0	0.0	0.0	21.3
15	0.0	0.0	0.0	0.0	21.3
16	0.0	0.0	0.0	0.0	21.3
17	0.0	0.0	0.0	0.0	21.3
18	0.0	0.0	0.0	0.0	21.4
19	0.0	0.0	0.0	0.0	21.3
20	0.0	0.0	0.0	0.0	21.4
21	0.0	0.0	0.0	0.0	21.4
22	0.0	0.0	0.0	0.0	21.3
23	0.0	0.0	0.0	0.0	21.3
24	0.0	0.0	0.0	0.0	21.3
25	0.0	0.0	0.0	0.0	20.6
26	0.0	0.0	0.0	0.0	20.5
27	0.0	0.0	0.0	0.0	20.5
28	0.0	0.0	0.0	0.0	20.1
29	0.0	0.0	0.0	0.0	20.1
30	0.0	0.0	0.0	0.0	20.1
31	0.0	0.0	0.0	0.0	19.7
32	0.0	0.0	0.0	0.0	19.7

Notes:

All measurements collected on June 16, 2016.

CH_4 - Methane
CO_2 - Carbon Dioxide
H_2S - Hydrogen Sulfide
CO - Carbon Monoxide
O_2 - Oxygen

- Number (GPS reference point)
ppm - Parts Per Million
% - Percent

Photo 1: Bryce 1-X Abandoned well, view east.

Photo 2: Vegetation in the vicinity of the Bryce 1-X, view north.

Photo 3: Location of former Yoakum residence, view southwest.

Photo 4: Water well associated with former Yoakum residence, view east.