RUBY CANYON ENGINEERING

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October 22, 2013

Ms. Jessica Bede
Climate Change Program Evaluation Branch
Stationary Source Division
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Subject: California Air Resources Board: Proposed Compliance Offset Protocol Mine Methane Capture Projects, dated August 19, 2013

Dear Ms. Bede:

Ruby Canyon Engineering Inc. (RCE) hereby respectfully submits these comments for your consideration in support of the above-referenced Protocol. These comments are restricted to further analysis of abandoned mine methane (AMM) project additionality and potential emission reductions associated with AMM project development.

Table 1 (at the end of the document) lists the methane recovery projects believed to be currently active in the United States sorted by project developer. Thirty-eight mines are involved in drainage activities. There are 12 project developers. Of those twelve project developers two are mining companies; Consol Energy (11 mines) and Walter Resources (2 mines). Of those 13 mines all but three were continuation of methane drainage for pipeline sales that were active prior to mine abandonment. The Blue Tip Energy project is a continuation of drainage after abandonment for gas sales but was developed by an independent project developer and not a mining company. Blue Tip Energy has registered Verified Carbon Units (VCU) under the Verified Carbon Standard (VCS)

protocol VRM0002 which was based on a modification of the Clean Development Mechanism methodology ACM0008.

The project developer DTE Methane drains gas from 11 mines contiguous with each other networked together by pipelines and compressors. The gas is treated to remove water, oxygen, hydrogen sulfide, carbon dioxide and nitrogen prior compression and sale to an interstate pipeline. These mines were abandoned from 1950 to 1998 and the project was initiated in 2002 by Illinois Methane which ceased operations in 2004. The project was inactive for about a year after which DTE Methane purchased and retrofitted the project for the reduced production rates realized after the first two years of production. DTE Methane has also registered VCUs with VCS. Recently DTE Methane sold the project to Keyrock Energy who has also recently registered VCUs with VCS.

The other primary developer of AMM recovery projects is Grayson Hills Farms which has aggregated approximately 8 mines in the Illinois basin and is processing the gas for CNG vehicle fuel, power generation and pipeline sales. The rest are small developers of which very little is known.

RCE modeled the credits (using the decline curve method) that would have been generated had the draft ARB MMC protocol been in effect in year 2000. The analysis assumed that the projects started in 2000 or later had started in 2000 (except for the cases where the mine was abandoned after 2000).

Table 2 shows that of the 27 mines capturing methane since 2000, four were a continuation of an active MMC project selling gas to a pipeline: Blue Creek #3 and Blue Creek #5 (Walter Energy), VP 8 (Consol Energy) and Aberdeen (Blue Tip Energy). The yearly emission reductions based on the draft protocol baseline decline curve were calculated based on the EPA initial emission rate for these mines (mines closed before 1971 have no emissions data so were not used). The last column in **Table 2** shows yearly

average methane capture in tCO2e from 2000 through 2013. Note that the four highest emission reductions occurred at the four mines that had been selling gas to a pipeline prior to closure. Should it be decided that continuation of the use of a non-qualifying destruction device after mine closure disqualifies that methane drainage project from participating in the ARB offset market (for abandoned mines) then significant reduction in the calculated reductions occurs.

RCE also modeled the potential for offset generation of the current inventory of closed mines. The model used is based on the yearly emission reductions that would qualify under the draft protocol to establish an economic benchmark against which to measure project economic viability. This was done through a pro forma economic analysis of a generic power generation project at a mine with various baseline emission levels assuming 50$/MWhr power sales price and 10$/tCO2e using four 400 ft deep wells to drain the mine and assuming $1.3 million/MW installed generation equipment. **Figure 1** shows the results of the analysis.

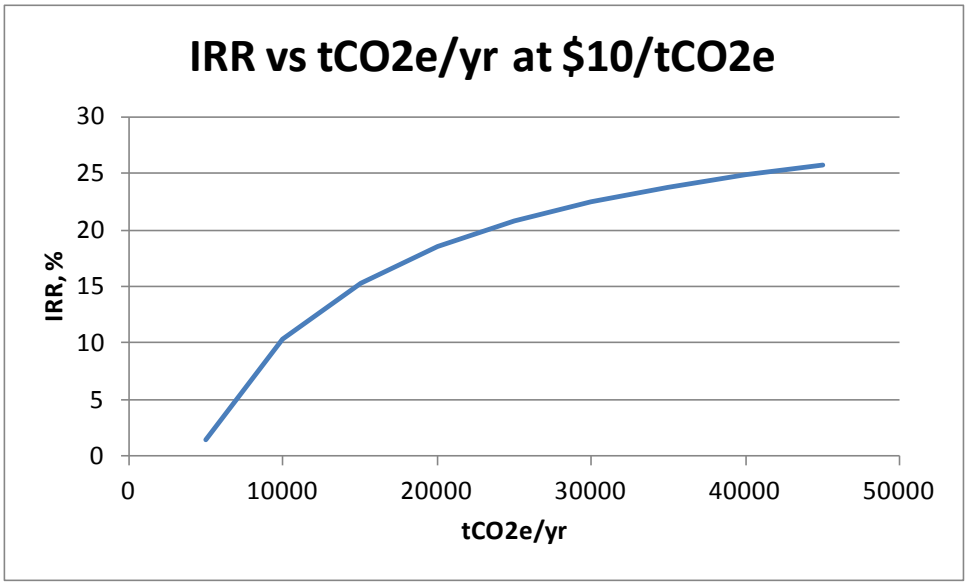

Figure 1: Return on investment versus yearly tCO2e/year baseline emission reduction

The number of potential projects relates to an acceptable return on investment. A 15% IRR would require a yearly average value of 15,000 tCO2e while a 25% IRR would require 44,000 tCO2e.

The baseline emission level of potential projects was determined by the initial rate from EPA data, the time since abandonment and the baseline decline curve with the 20% deduction. To meet a 25% IRR requirement, there are 16 potential projects with an aggregate of 1,054,000 tCO2e/year as shown in **Figure 2**.

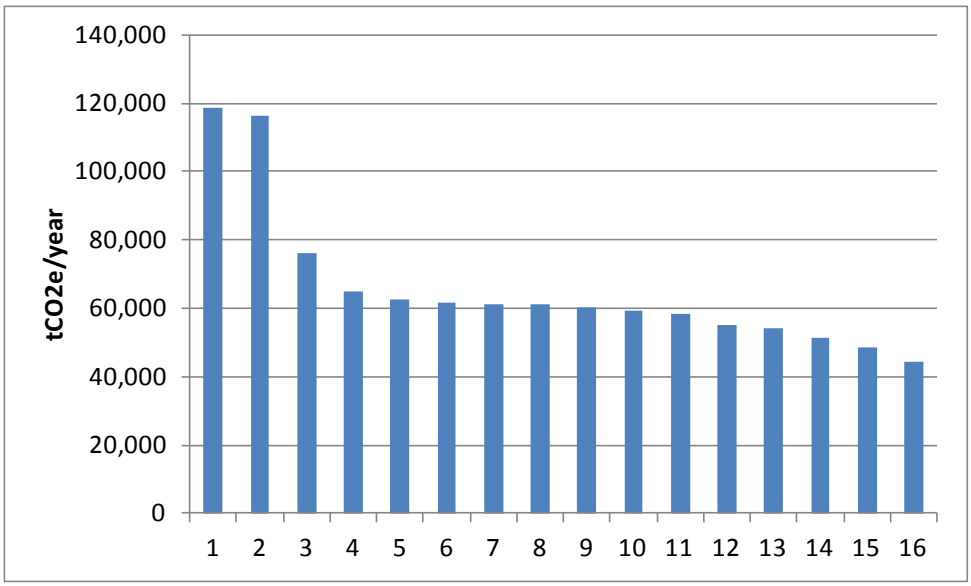

Figure 2: Potential emission reduction projects with baselines above 44,000 tCO2e/yr

To meet a 15% IRR (15,000 tCO2e/year) minimum requirement, the number of potential projects increases to 100 projects with an aggregate of 3,267,000 tCO2e/year. The actual number of potential projects is expected to be somewhat lower as risk factors such as mine void collapse and communication, low quality methane, and degree of flooding cannot be ascertained until test wells have been drilled.

Sincerely,

Ronald C. Collings P.E.
Vice President
Ruby Canyon Engineering, Inc.

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Table 1: list of methane recovery projects at abandoned underground coal mines in the United States.

MSHA ID	Mine Name	Coal Company Name	Project Developer	Date of Abandonment	AMM Project Start	Continuation of Active Mine Project?
42-02028	Aberdeen	Andalex Resources Inc	Blue Tip Energy	09/25/08	2008	Yes
33-00967	Nelms #1	Harrison Mining Corp	CBM Ohio	6/10/77	1993	No
44-02134	VP No 4	Island Creek Coal Co	Consol Energy	8/9/93	1994	Yes
44-00246	VP 1	Consolidated Coal Co	Consol Energy	3/10/94	1995	Yes
44-04517	VP No 6	Consolidated Coal Co	Consol Energy	6/27/94	1995	Yes
44-01009	VP No 2	Island Creek Coal Co	Consol Energy	12/11/96	1997	Yes
46-01452	Arkwright No 1	Consolidation Coal Co	Consol Energy	5/24/96	1997	Yes
46-01455	Osage No. 3	Consolidation Coal Co.	Consol Energy	5/25/96	1997	Yes
46-01867	Blacksville No 1	Consolidated Coal Co	Consol Energy	6/10/93	1997	No
44-01520	VP No 3	Consolidated Coal Co	Consol Energy	3/10/98	1998	Yes
46-01438	Ireland	Consolidated Coal Co	Consol Energy	6/10/94	2003	No
44-03795	VP 8	Island Creek Coal Company	Consol Energy	06/26/06	2006	Yes
46-01286	Windsor Mine	Windsor Coal Company	Consol Energy	03/22/05	2007	No
11-00588	Old Ben No 21	Old Ben Coal Co	DTE Methane	11/13/95	2002	No
11-00589	Old Ben No 24	Old Ben Coal Co	DTE Methane	7/10/98	2002	No
11-00590	Old Ben No 26	Old Ben Coal Co	DTE Methane	7/10/98	2002	No
11-02392	Old Ben No 25	Old Ben Coal Co	DTE Methane	9/10/96	2007	No
N/A	5 mines	various	DTE Methane	1950-1971	2007	No
11-00599	Orient No 6	Freeman United Coal Mining Co	DTE Methane	03/13/97	2008	No
11-00600	Orient #3	Freeman	DTE Methane	02/01/84	2009	No

MSHA ID	Mine Name	Coal Company Name	Project Developer	Date of Abandonment	AMM Project Start	Continuation of Active Mine Project?
N/A	3 mines	various	Grayson Hill Farms	1950-1971	2003	No
N/A	5 mines	various	Grayson Hill Farms	1950-1971	2011	No
01-00758	Blue Creek No. 3	Jim Walter Resources Inc	Jim Walter Resources Inc	4/26/00	2000	Yes
01-01322	Blue Creek No 5 Mine	Jim Walter Resources Inc	Jim Walter Resources Inc	04/26/07	2007	Yes
46-01434	Consol No 9	Consolidation Coal Co.	small developer (name?)	9/10/78	1997	No
46-05722	Consol No. 20	Consolidation Coal Co.	small developer (name?)	10/1/82	1997	No
36-00906	Gateway Mine	Gateway Coal Company	small developer (name?)	12/9/92	1999	No
46-01482	Valley Camp 3	Valley Camp	small developer (name?)	1/10/83	2007	No
12-00323	Kings	Kings Station	small developer (Roy Farmer)	10/29/73	2001	No
05-02820	Golden Eagle	Basin Resources Inc	XTO	5/30/96	1997	No

Table 2: Emission reductions assuming project start date year 2000.

MSHA ID	Mine Name	Coal Company Name	Project Developer	Voluntary Carbon Registry	Date of Closure	AMM Project Start	Continuation of Active Mine Project?	Initial Rate MMcf/d	Average Yearly Reductions tCO2e
01-00758	Blue Creek No. 3	Jim Walter Resources Inc	Jim Walter Resources Inc	CCX	4/26/00	2000	Yes	12.7	378,460
12-00323	Kings	Kings Station	small developer (Roy Farmer)		10/29/73	2001	No	0.35	4,535

MSHA ID	Mine Name	Coal Company Name	Project Developer	Voluntary Carbon Registry	Date of Closure	AMM Project Start	Continuation of Active Mine Project?	Initial Rate MMcf/d	Average Yearly Reductions tCO2e
11-00588	Old Ben No 21	Old Ben Coal Co	DTE Methane	VCS	11/13/95	2002	No	1.4	30,957
11-00589	Old Ben No 24	Old Ben Coal Co	DTE Methane	VCS	7/10/98	2002	No	1.2	30,747
11-00590	Old Ben No 26	Old Ben Coal Co	DTE Methane	VCS	7/10/98	2002	No	1.6	40,996
46-01438	Ireland	Consolidated Coal Co	Consol Energy		6/10/94	2003	No	1.4	29,111
N/A	3 mines	various	Grayson Hill Farms	CCX	1950-1971	2003	No	NA	
44-03795	VP 8	Island Creek Coal Company	Consol Energy		06/26/06	2006	Yes	42.6	1,563,895
46-01286	Windsor Mine	Windsor Coal Company	Consol Energy		03/22/05	2007	No	0.49	16,717
11-02392	Old Ben No 25	Old Ben Coal Co	DTE Methane	VCS	9/10/96	2007	No	1	23,021
46-01482	Valley Camp 3	Valley Camp	small developer (name?)		1/10/83	2007	No	1	15,153
01-01322	Blue Creek No 5 Mine	Jim Walter Resources Inc	Jim Walter Resources Inc	CCX	04/26/07	2007	Yes	15.12	564,198
N/A	5 mines	various	DTE Methane	VCS	1950-1971	2007	No	NA	
11-00599	Orient No 6	Freeman United Coal Mining Co	DTE Methane	VCS	03/13/97	2008	No	1	23,643
42-02028	Aberdeen	Andalex Resources Inc	Blue Tip Energy	VCS	09/25/08	2008	Yes	2.87	107,898
11-00600	Orient #3	Freeman	DTE Methane	VCS	02/01/84	2009	No	1.5	23,231
N/A	5 mines	various	Grayson Hill Farms	CCX	1950-1971	2011	No	NA	