



**west virginia** department of environmental protection

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**ENGINEERING EVALUATION / FACT SHEET**

**BACKGROUND INFORMATION**

Application No.: R13-2127G  
Plant ID No.: 109-00017  
Applicant: Cranberry Pipeline Corporation (Cranberry)  
Facility Name: Bradley Compressor Station  
Location: Fanrock, Wyoming County  
NAICS Code: 211111 (Natural Gas Extraction)  
Application Type: Modification  
Received Date: November 3, 2015  
Engineer Assigned: Jerry Williams, P.E.  
Fee Amount: \$3,500.00  
Date Received: November 4, 2015  
Complete Date: December 1, 2015  
Due Date: February 29, 2016  
Applicant Ad Date: November 11, 2015  
Newspaper: *The Independent Herald*  
UTM's: Easting: 443.5 km Northing: 4,155.3 km Zone: 17  
Description: Change in emissions from glycol dehydration unit to account for an updated wet gas analysis.

**DESCRIPTION OF PROCESS**

The following process description was taken from Permit Application R13-2127G:

Natural gas enters the facility via pipeline where the wet gas is compressed to a higher pressure. Natural gas fired engines power compressors that compress the gas to a higher pressure. After compression, the compressed gas exits the facility to an underground storage site.

Pipeline quality natural gas has a moisture content of 7 pounds per million standard cubic feet (mmscf). Triethylene glycol (TEG) dehydration units are used to remove water from natural gas streams to prevent the formation of hydrates and corrosion in the pipeline. The natural gas stream is passed through a stream of TEG. At the point of contact, the glycol will absorb water and water vapor from the natural gas stream. During the absorption process, aromatic hydrocarbons include benzene, toluene, ethylbenzene, xylenes, hexane as well as other volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) present in the gas stream are absorbed along with the water vapor into the glycol stream. When the glycol is saturated with water, it is considered "rich" glycol. The rich glycol is then sent to a glycol still for regeneration to remove water and liquid hydrocarbons. The glycol still vent emits VOCs and HAPs depending on the concentration of those constituents in the processed wet gas. After regeneration, the glycol is considered "lean" glycol and is suitable for reuse.

Natural gas fired boilers provide process heat for processes such as glycol regenerator reboilers. The glycol regenerator reboiler fires natural gas and is also a potential source of criteria and HAP emissions. The reboiler has an exhaust stack where the by-products of natural gas combustion are vented.

This permit application involves the following:

Recent wet gas analyses from the Bradley Compressor Station indicate increased emissions above permitted levels for the glycol dehydration unit still vent. Additionally, an update to the potential to emit for storage vessels T1 and T2 based on new annual throughputs and an update of emissions from truck loading and fugitive leaks is requested.

The new emission estimates reflect the need to increase the VOC and HAP levels. These changes to emissions are a result of the increase to HAP and C8+ gas fractions measured within the wet gas inlet to the contactor column.

All other operating parameters on the dehydration unit were set to its maximum capacity. The lean TEG is recirculated through the unit by an electric driven pump. The pump has a maximum pump rate of 5.0 gallons per minute (GPM). The gas throughput was modeled to reflect the station's maximum flow of 30 million standard cubic feet per day (MMscfd). Additionally, the inlet water content was assumed to be saturated at 779 psig and 95 °F. The outlet is assumed to be pipeline quality natural gas at 7 lb H<sub>2</sub>O/MMscf. This equates to a TEG recirculation ratio of 3.35 gal TEG/lb H<sub>2</sub>O removed from the wet gas.

Pipeline liquids and produced water is separated at the station's inlet and dehydration separators as well as "compression drip" which is removed in the compression process and transferred to two (2) above ground storage tanks. The emission estimates for the tanks are based on direct measurement pressurized liquid testing and E&P Tanks simulation analysis taken at a representative Cranberry site. The throughput was based on a maximum of 5 barrels per day (bbls/d).

## SITE INSPECTION

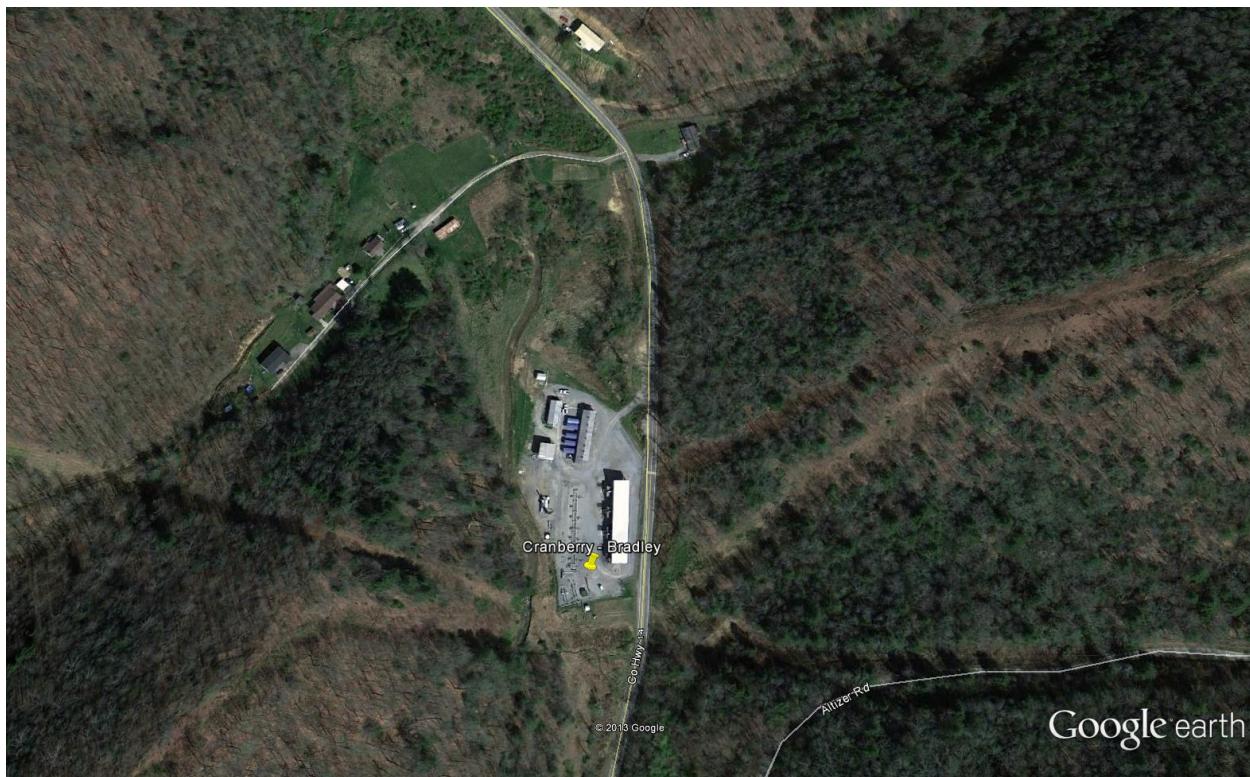
A site inspection was conducted on May 6, 2014 by Todd Shrewsbury of the DAQ Enforcement Section. The facility was found to be operating in compliance at that time. The facility is located approximately 400 feet from the closest residence.

Directions as given in the permit application are as follows:

*From I-64 Exit 42, take SR16 southwest. After 3.6 miles, bear right onto Lester Highway. Travel 3.3 miles and bear right onto SR54. Travel 6.6 miles and bear left on SR54. Travel 3.9 miles and turn right on SR97. Travel 12 miles and bear left onto SR10. Travel 1.1 miles and turn right onto SR16. Travel 5.1 miles and turn right onto CR12/4 (Indian Creek Road). Travel 5.2 miles and turn left onto CR14 (Brier Creek Road). Travel 1.8 miles and turn right onto local road. Travel 0.2 miles and bear left onto local road. Travel 0.1 miles to Bradley Compressor Station.*

Latitude: 37.545489

Longitude: -81.639058



## ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions associated with this modification application consist of one (1) TEG dehydrator still vent, two (2) condensate storage vessels, and an update to truck loading and fugitive leaks. Fugitive emissions for the facility are based on calculation methodologies presented in EPA Protocol for Equipment Leak Emission Estimates. The following table indicates which methodology was used in the emissions determination:

Emission Point ID#	Process Equipment	Calculation Methodology
011	30 mmscfd TEG Dehydrator Still Vent	GRI-GlyCalc 4.0
T1E	500 gal Pipeline Liquids Storage Tank	Direct measurement and E&P Tanks simulation analysis
T2E	2,100 gal Pipeline Liquids Storage Tank	Direct measurement and E&P Tanks simulation analysis
TL	153,300 gal/yr Truck Loading	EPA AP-42 Emission Factors

The total PTE after this proposed modification are shown in the following table:

Pollutant	Maximum Pre-Modification Annual Facility Wide Emissions (tons/year)	Maximum Post-Modification Annual Facility Wide Emissions (tons/year)	Net Facility Wide Emissions Changes (tons/year)
Nitrogen Oxides	64.08	64.08	0
Carbon Monoxide	99.14	99.14	0
Volatile Organic Compounds	33.34	73.43	40.09
Particulate Matter-10/2.5	1.51	1.51	0
Sulfur Dioxide	0.13	0.13	0
Total HAPs	16.73	23.65	6.92
Greenhouse Gas (CO <sub>2</sub> e)	17,913	18,451	538

Maximum detailed controlled point source emissions were calculated by Cranberry and checked for accuracy by the writer and are summarized in the table on the next page.

## Cranberry Pipeline Corporation – Bradley Compressor Station (R13-2127G)

Emission Point ID#	Source	NO <sub>x</sub>		CO		VOC		PM-10/2.5		SO <sub>2</sub>		Formaldehyde		Total HAPs		CO <sub>2e</sub>
		lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	ton/year
006	515 hp CAT G3508TA	2.27	9.94	1.70	7.45	0.44	1.93	0.04	0.16	<0.01	0.01	0.20	0.87	0.21	0.90	2059
009	1,100 hp White 8GT825	4.85	21.22	7.27	31.84	0.94	4.13	0.08	0.35	<0.01	0.02	0.42	1.85	0.44	1.93	4098
012	1,150 hp CAT G3516LE	4.56	19.97	3.80	16.64	0.99	4.32	0.08	0.37	<0.01	0.02	0.44	1.93	0.46	2.01	4369
013	1,775hp CAT G3606TA	2.74	11.99	9.62	42.13	1.52	6.67	0.13	0.56	<0.01	0.03	0.68	2.98	0.71	3.11	6022
010	2.04 MMBTU/hr Reboiler	0.20	0.88	0.17	0.74	0.01	0.05	0.02	0.07	<0.01	0.05	<0.01	<0.01	<0.01	0.02	1045
011	30 mmcf/d TEG Still Vent	0.00	0.00	0.00	0.00	11.92	52.18	0.00	0.00	0.00	0.00	0.00	0.00	3.58	15.68	785
010	100 gal Flash Tank	0.00	0.00	0.00	0.00	0.11	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
014	28 hp Emergency Gen.	0.31	0.08	1.38	0.35	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	6
T1E	500 gal Pipeline Liquids Tank	0.00	0.00	0.00	0.00	0.07	0.32	0.00	0.00	0.00	0.00	0.00	0.00	<0.01	<0.01	0
T2E	2,100 gal Pipeline Liquids Tank	0.00	0.00	0.00	0.00	0.07	0.32	0.00	0.00	0.00	0.00	0.00	0.00	<0.01	<0.01	0
TL	Truck Loading	0.00	0.00	0.00	0.00	0.06	0.21	0.00	0.00	0.00	0.00	0.00	0.00	<0.01	<0.01	0
<b>Total Point Source</b>		<b>14.92</b>	<b>64.08</b>	<b>23.94</b>	<b>99.14</b>	<b>16.14</b>	<b>70.62</b>	<b>0.34</b>	<b>1.51</b>	<b>0.00</b>	<b>0.13</b>	<b>1.74</b>	<b>7.63</b>	<b>5.39</b>	<b>23.64</b>	<b>18385</b>

Fugitive	Fugitive Emissions	0.00	0.00	0.00	0.00	NA	2.81	0.00	0.00	0.00	0.00	0.00	0.00	<0.01	0.01	66
<b>Total Fugitive</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>2.81</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>66</b>
<b>Total Sitewide</b>		<b>14.92</b>	<b>64.08</b>	<b>23.94</b>	<b>99.14</b>	<b>16.14</b>	<b>73.43</b>	<b>0.34</b>	<b>1.51</b>	<b>0.00</b>	<b>0.13</b>	<b>1.74</b>	<b>7.63</b>	<b>2.45</b>	<b>23.65</b>	<b>18451</b>

## REGULATORY APPLICABILITY

The following rules apply to this modification:

### **45CSR13** (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)

45CSR13 applies to this source due to the fact that Cranberry's proposed modification exceeds the regulatory emission threshold for criteria pollutants of 6 lb/hr and 10 ton/year. In addition, the glycol dehydration unit is subject to a substantive requirement under 40CFR63 Subpart HH. Cranberry published the required Class I legal advertisement notifying the public of their permit application, and paid the appropriate application fee.

### **45CSR22** (Air Quality Management Fee Program)

Cranberry is not subject to 45CSR30. The Bradley Compressor Station is subject to 40CFR60 Subparts JJJJ and OOOO, however they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided they are not required to obtain a permit for a reason other than their status as an area source.

Cranberry is required to pay the appropriate annual fees and keep their Certificate to Operate current.

### **40CFR60 Subpart OOOO** (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

EPA published in the Federal Register new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. 40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO<sub>2</sub>) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The following affected sources which commence construction, modification or reconstruction after August 23, 2011 are subject to the applicable provisions of this subpart:

- a. Each gas well affected facility, which is a single natural gas well.

*There are no gas wells at this facility. Therefore, all requirements regarding gas well affected facilities under 40 CFR 60 Subpart OOOO would not apply.*

- b. Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals that is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. For the purposes of this subpart, your centrifugal compressor is considered to have commenced construction on the date the compressor is installed (excluding relocation) at the facility. A centrifugal compressor located at a well site, or an

adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

*There are no centrifugal compressors at the Bradley Compressor Station. Therefore, all requirements regarding centrifugal compressors under 40 CFR 60 Subpart OOOO would not apply.*

- c. Each reciprocating compressor affected facility, which is a single reciprocating compressor located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. For the purposes of this subpart, your reciprocating compressor is considered to have commenced construction on the date the compressor is installed (excluding relocation) at the facility. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

*There is one (1) reciprocating internal combustion engine located at the Bradley Compressor Station that was constructed after August 23, 2011. Therefore, the requirements regarding reciprocating compressors under 40 CFR 60 Subpart OOOO would apply to Engine 014. Also, none of the engines have underwent any modifications.*

- d. Pneumatic Controllers

- Each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh which commenced construction after August 23, 2011, and is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not located at a natural gas processing plant.
- Each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller which commenced construction after August 23, 2011, and is located at a natural gas processing plant.

*There are no applicable pneumatic controllers which commenced construction after August 23, 2011. Therefore, all requirements regarding pneumatic controllers under 40 CFR 60 Subpart OOOO would not apply.*

- e. Each storage vessel affected facility, which is a single storage vessel, located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment.

40CFR60 Subpart OOOO defines a storage vessel as a unit that is constructed primarily of nonearthen materials (such as wood, concrete, steel, fiberglass, or plastic) which provides structural support and is designed to contain an accumulation of liquids or other materials. The following are not considered storage vessels:

- Vessels that are skid-mounted or permanently attached to something that is mobile (such as trucks, railcars, barges or ships), and are intended to be located at a site for less than 180 consecutive days. If the source does not keep or are not able to produce records, as required by §60.5420(c)(5)(iv), showing that the vessel has been located at a site for less than 180 consecutive days, the vessel described herein is considered to be a storage vessel since the original vessel was first located at the site.
- Process vessels such as surge control vessels, bottoms receivers or knockout vessels.
- Pressure vessels designed to operate in excess of 204.9 kilopascals and without emissions to the atmosphere.

This rule requires that the permittee determine the VOC emission rate for each storage vessel affected facility utilizing a generally accepted model or calculation methodology within 30 days of startup, and minimize emissions to the extent practicable during the 30 day period using good engineering practices. For each storage vessel affected facility that emits more than 6 tpy of VOC, the permittee must reduce VOC emissions by 95% or greater within 60 days of startup. The compliance date for applicable storage vessels is October 15, 2013.

*The storage vessels located at the Bradley Compressor Station were installed prior to August 23, 2011 and have the potential to emit to less than 6 tpy of VOC. Therefore, Cranberry is not required by this section to reduce VOC emissions by 95%.*

- f. The group of all equipment, except compressors, within a process unit is an affected facility.
- Addition or replacement of equipment for the purpose of process improvement that is accomplished without a capital expenditure shall not by itself be considered a modification under this subpart.
  - Equipment associated with a compressor station, dehydration unit, sweetening unit, underground storage vessel, field gas gathering system, or liquefied natural gas unit is covered by §§60.5400, 60.5401, 60.5402, 60.5421 and 60.5422 of this subpart if it is located at an onshore natural gas processing plant. Equipment not located at the onshore natural gas processing plant site is exempt from the provisions of §§60.5400, 60.5401, 60.5402, 60.5421 and 60.5422 of this subpart.
  - The equipment within a process unit of an affected facility located at onshore natural gas processing plants and described in paragraph (f) of this section are exempt from this subpart if they are subject to and controlled according to subparts VVa, GGG or GGGa of this part.

*The Bradley Compressor Station is not a natural gas processing plant. Therefore, Leak Detection and Repair (LDAR) requirements for onshore natural gas processing plants would not apply.*

- g. Sweetening units located at onshore natural gas processing plants that process natural gas produced from either onshore or offshore wells.
  - Each sweetening unit that processes natural gas is an affected facility; and
  - Each sweetening unit that processes natural gas followed by a sulfur recovery unit is an affected facility.
  - Facilities that have a design capacity less than 2 long tons per day (LT/D) of hydrogen sulfide (H<sub>2</sub>S) in the acid gas (expressed as sulfur) are required to comply with recordkeeping and reporting requirements specified in §60.5423(c) but are not required to comply with §§60.5405 through 60.5407 and paragraphs 60.5410(g) and 60.5415(g) of this subpart.
  - Sweetening facilities producing acid gas that is completely reinjected into oil-or-gas-bearing geologic strata or that is otherwise not released to the atmosphere are not subject to §§60.5405 through 60.5407, 60.5410(g), 60.5415(g), and 60.5423 of this subpart.

*There are no sweetening units at the Bradley Compressor Station. Therefore, all requirements regarding sweetening units under 40 CFR 60 Subpart OOOO would not apply.*

#### **40CFR63 Subpart HH** (National Emission Standards for Hazardous Air Pollutants for Oil and Natural Gas Production Facilities)

Subpart HH establishes national emission limitations and operating limitations for HAPs emitted from oil and natural gas production facilities located at major and area sources of HAP emissions. The glycol dehydration units at the Bradley Compressor Station is subject to the area source requirements for glycol dehydration units.

The following rules do not apply to the facility:

**45CSR30** (Requirements for Operating Permits)

As a result of the granting of this permit, Cranberry is not subject to 45CSR30.

**40CFR60 Subpart KKK** (Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants)

40CFR60 Subpart KKK applies to onshore natural gas processing plants that commenced construction after January 20, 1984, and on or Before August 23, 2011. The Bradley Compressor Station is not a natural gas processing facility, therefore Cranberry is not subject to this rule.

**45CSR14** (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants)

**45CSR19** (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment)

The Bradley Compressor Station is located in Wyoming County, which is an attainment county for all pollutants. Because Wyoming County is an attainment county, 45CSR19 does not apply to this facility.

As shown in the table below, Cranberry is not subject to 45CSR14 or 45CSR19 review.

Pollutant	PSD (45CSR14) Threshold (tpy)	NANSR (45CSR19) Threshold (tpy)	Bradley PTE (tpy)	45CSR14 or 45CSR19 Review Required?
Carbon Monoxide	250	NA	99.14	No
Nitrogen Oxides	250	NA	64.08	No
Sulfur Dioxide	250	NA	0.13	No
Particulate Matter 2.5	250	NA	1.51	No
Ozone (VOC)	250	NA	70.62	No

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following HAPs are common to this industry. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	Category B1 - Probable Human Carcinogen
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Ethylbenzene	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at [www.epa.gov/iris](http://www.epa.gov/iris).

### AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) or 45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) as shown in the table listed in the Regulatory Discussion section under 45CSR14/45CSR19.

### SOURCE AGGREGATION

“Building, structure, facility, or installation” is defined as all the pollutant emitting activities which belong to the same industrial grouping, are located on one or more contiguous and adjacent properties, and are under the control of the same person.

The Bradley Compressor Station is located in Wyoming County and will be operated by Cranberry.

“Contiguous or Adjacent” determinations are made on a case by case basis. These determinations are proximity based, and it is important to focus on this and whether or not it meets the common sense notion of a plant. The terms “contiguous” or “adjacent” are not defined by USEPA. Contiguous has a dictionary definition of being in actual contact; touching along a boundary or at a point. Adjacent has a dictionary definition of not distant; nearby; having a common endpoint or border.

There are no other Cranberry properties in question that are considered to be on contiguous or adjacent property with the Bradley Compressor Station.

Because there are no other facilities that are considered to be on contiguous or adjacent properties, the emissions from the Bradley Compressor Station should not be aggregated with other facilities in determining major source or PSD status.

### **MONITORING OF OPERATIONS**

Cranberry will be required to perform the following monitoring and recordkeeping:

1. Monitor and record quantity of natural gas consumed for all combustion devices.
2. Monitor and record quantity of wet gas throughput for the glycol dehydration unit.
3. Monitor and record quantity of condensate loaded into storage tanks.
4. Maintain records of testing conducted in accordance with the permit. Said records shall be maintained on-site or in a readily accessible off-site location
5. Maintain the corresponding records specified by the on-going monitoring requirements of and testing requirements of the permit.
6. Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility. These records shall include the natural gas compressor engines and ancillary equipment.
7. The records shall be maintained on site or in a readily available off-site location maintained by Cranberry for a period of five (5) years.

### **RECOMMENDATION TO DIRECTOR**

The information provided in the permit application indicates that Cranberry meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Wyoming County location should be granted a 45CSR13 modification permit for their facility.

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Jerry Williams, P.E.  
Engineer

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Date