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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: G70-A122
Plant ID No.: 017-00141
Applicant: Antero Resources Corporation (Antero)
Facility Name: Brooks Well Pad
Location: near New Milton, Doddridge County
SIC Code: 1311 - Crude Petroleum and Natural Gas
NAICS Code: 211111 - Crude Petroleum and Natural Gas Extraction
Application Type: Construction
Received Date: December 5, 2014
Engineer Assigned: John Legg
Fee Amount: \$1,500
Date Received: November 14, 2014
Complete Date: December 12, 2014
Due Date: February 25, 2015
Applicant Ad Date: December 9, 2014 and January 13, 2015
(Newspaper: The Herald Record (both times)
UTM's: Easting: 531.12 km Northing: 4,337.68 km Zone: 17N
Lat/Long Coordinates: Latitude: 39.1877848° Longitude: -80.6397181°
Description: Installation of: Nine (9) Gas Production Unit (GPU) heaters at 1 MM Btu/hr each; six (6) storage tanks at 400 barrels (bbl) each for Condensate and Produced Water (PW); one (1) loading rack at 200 bbl for condensate and produced water; one (1) flare at 138.8 scfm; and one (1) compressor engine at 24 HP.

Id. No. _____ Reg. _____
Company _____
Facility _____ Region 8
Initials JCL

NON-CONFIDENTIAL
ENTIRE DOCUMENT

DESCRIPTION OF PROCESS

A mixture of condensate and entrained gas from up to nine (9) wells enters the Facility through nine (9) low pressure separators where the gas phase is separated from the liquid phase. Nine (9) Gas Production Unit (GPU) heaters (H001 - H009) are used in conjunction with the separators to help separate the gas from the liquid phases. These heaters are fueled by a slip stream of the separated gas. The separated gas from the low pressure separators is sent to a compressor (ENG001). The compressed gas is then metered and sent to the sales gas pipeline.

The facility has six (6), 400 barrel (16,800 gallon) capacity storage tanks (TANK001 thru TANK006) to store condensate and produced water (PW) prior to removal from the site. The maximum annual condensate and produced water flow rate is 5.381 MM gal/yr.

Flashing, working, and breathing losses from the condensate and process water storage tanks are routed to the flare (FL001) to control the emissions. The flare is a AbuTec -200 with a maximum design heat input of 18.4 MM Btu/hr, and a VOC destruction efficiency of 98%.

Condensate and produced water are transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump condensate and produced water from the storage tanks into 40 ton capacity tanker trucks. Emissions from the loading operation (Unit ID: L001; Emission Point ID: EP-L001) are vented to the atmosphere.

Table 1: Wells Feeding Antero's Brooks Well Pad (Attachment G, Permit Applicant: Natural Gas Well Affected Facility Data Sheet).

| | |
|-------------------------------------|-----------------|
| 47-017-06515-00 | 47-017-06514-00 |
| 47-017-06516-00 | 47-017-06517-00 |
| 47-017-06638-00 | 47-017-06639-00 |
| Three (3) wells - Not Permitted Yet | |

Table 2: Technical Information Related to Antero's Brooks Well Pad (Attachment I, Permit Application: Emission Calculations, Table 1).

| Technical Information | |
|---|-------------------------|
| Max Condensate Site Throughput (barrels/day; bbl/day) (1 bbl = 42 gallon) | 27 (1,134 gal/day) |
| Max Produced Water Site Throughput (barrels/day; bbl/day) (1 bbl = 42 gallon) | 324 (13,608 gal/day) |
| Equipment | |
| IC Engines | 1 |
| GPU Heaters | 9 |
| Condensate and Produced Water Tanks | 6 |
| Loading Jobs/Racks | 1 |
| Flares/Vapor Combustors | 1 |

Table 3: Emissions Unit Data Sheet (Attachment G in Permit Application).

| Emission | | | Year Installed | Design Capacity | Type of Change | Control Device |
|----------------------|----------------------|---|----------------|--------------------------------------|----------------|----------------|
| Unit ID | Point ID | Description | | | | |
| H001 thru H009 | EP-H001 thru EP-H009 | Nine (9) Gas Production Unit (GPU) Heaters | 2015 | 1 MM Btu/hr each | New | None |
| F001 | F001 | Fugitives (VOC emissions from equipment components) | 2015 | 0 | New | None |
| TANK001 thru TANK006 | FL001 | Six (6) Condensate/Produced Water Tanks | 2015 | 400 barrel ⁽¹⁾ (bbl) each | New | FL001 |
| L001 | EP-L001 | Loading (Condensate and Produced Water) | 2015 | 200 bbl ⁽¹⁾ | New | None |
| HR001 | EP-HR001 | Haul Road Emissions | 2015 | 40 ton Tank Truck Capacity | New | None |

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Table 3: Emissions Unit Data Sheet (Attachment G in Permit Application).

| Emission | | | Year Installed | Design Capacity | Type of Change | Control Device |
|----------|-----------|--|----------------|-----------------|----------------|----------------|
| Unit ID | Point ID | Description | | | | |
| FL001 | FL001 | Flare | 2015 | 138.8 scf/min | New | None |
| PCV | EP-PCV | Twenty seven (27) Pneumatic Control Valves | 2015 | 6.6 scf/day | New | None |
| ENG001 | EP-ENG001 | Compressor Engine | 2015 | 24 HP | New | None |

(1) 1 barrel = 42 gallons.

Table 4: Information in Attachment G on Antero's Brooks Well Pad Compressor Engine (ENG001).

| | |
|--|------------------------------|
| Emission Unit (Source) ID No. | ENG001 |
| Emission Point ID No. | EP-ENG001 |
| Engine Manufacturer and Model | Kubota DG972-E2 |
| Manufacturer's Rated bhp/rpm | 24 HP @ 3600 rpm |
| Source Status | New Source |
| Installation Date | 2015 |
| Engine Manufactured | 2013 |
| Is this engine subject to 40 CFR 60, Subpart JJJJ? | Yes |
| Is this a Certified Stationary Spark Ignition Engine according to 40 CFR 60, Subpart JJJJ? | Yes |
| Is this engine subject to 40 CFR 63, Subpart ZZZZ? | Yes |
| Engine Type | Rich Burn Four Stroke (RB4S) |
| Air Pollution Control Device | -- |
| Fuel Type | Natural Gas |
| H ₂ S (gr/100 scf) | 0 |
| Operating bhp/rpm | 16.5 hp /2400 rpm |

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Table 4: Information in Attachment G on Antero's Brooks Well Pad Compressor Engine (ENG001).

| | |
|--|-------------|
| Emission Unit (Source) ID No. | ENG001 |
| Emission Point ID No. | EP-ENG001 |
| Brake Specific Fuel Consumption (BSFC) (Btu/bhp-hr) | 9,773 |
| Fuel Throughput (ft ³ /hr) | 193 |
| Fuel Throughput (MM ft ³ /yr) | 1.6907 |
| Operating Hours | 8,760 hr/yr |

MATERIAL SAFETY DATA SHEETS (MSDS)

Antero developed and submitted three (3) generic MSDS of their own in Attachment N to the application:

Natural Gas - Dry Field Natural Gas. The MSDS for natural gas reflects pipeline quality odorized gas. This is essentially the same as the material delivered to the metering and downstream gathering lines from the Antero well pad.

95% methane; 4% ethane; 0.3% propane; 0.4% nitrogen; 0.2% carbon dioxide. Composition can vary greatly.

Condensate - Natural Gas Condensate; Drips; Gas Well Condensate; High Pressure Inlet Liquids; Lease Condensate; NG Liquids; Pipeline Liquids. The hydrocarbon liquid that has been separated from raw natural gas through the well pad gas production unit. The liquid is often characterized as having gasoline-like odor and consistency.

25 - 95% Octanes or Heptanes or n-Hexanes; 5 - 70% n-Pentanes; 0 - 45% N-butane; 0 - 15% Propane. Composition can vary greatly.

Produced Water - Produced Brine Water; Brine; Brine Water; Formation Water. Primarily groundwater with residual trace hydrocarbons that has been withdrawn from the ground during the gas extraction process and then separated from the natural gas and condensate in the gas production units.

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80% Water; 20% Sodium Chloride. Composition can vary greatly.

SITE INSPECTION

James Robertson of WVDEP DAQ Compliance and Enforcement Section performed a site visit on January 13, 2015. He deemed the site suitable for a general permit, writing: "I did not see any business, public building, school, church, community, institutional building, or public park within 300' of the site.

Directions as given in the "Application for General Permit Registration," 12A, page 2 of 5:

Go 1.0 miles southeast from the intersection of Meathouse Fork and Indian Fork.

UTM (per entry 17A, page 2 of 5) and Latitude & Longitude Coordinates (19A, page 2 of 5):

| | | | |
|-------------|---------------|-------------|-----------|
| 4337.6774 - | Northing (KM) | 39.1877848 | Latitude |
| 531.1149 - | Easting (KM) | -80.6397181 | Longitude |
| 17N - | Zone | | |

AGGREGATION

Antero states in their "Process Description" given in Attachment B:

Brooks Well Pad calculation of potential to emit included all of the emission sources that:

- belong to the same industrial grouping,
- are located on contiguous or adjacent properties, and
- are under the control of the same person.

The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Victor Pad. This operates independently and is approximately 0.5 miles east of the Facility.

For further discussion on aggregation, see **REGULATORY NON-APPLICABILITY, 45CSR14 - "Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration."**

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BACKGROUND INFORMATION RELATED TO CALCULATING EMISSIONS

Antero states in their "Process Description" given in Attachment B:

Emissions from the Brooks Well Pad's emission sources were calculated using the extended analysis of the condensate and gas from Tom's Fork Unit 1H, one of the wells in the Erwin Hilltop Pad. These extended analyses are considered representative of the materials from Brooks Well Pad, being in the same Marcellus rock formation.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Maximum controlled point source emissions for the Brooks Well Pad are listed below in Tables 5 thru 7, and were calculated by Antero and reviewed (by the writer) for accuracy.

- Emissions from the nine (9) heater treaters [gas production unit (GPU) heaters: EU-H001 thru EU-H009] and flare were calculated using USEPA AP-42 emission factors Section 1.4 Natural Gas Combustion. The flare is considered to have a 98% efficiency.
- Emissions from the 24 hp natural gas-fired compressor engine (ENG001) were calculated using manufacturer data as well as AP-42, Section 3.2 "Natural Gas-fired Reciprocating Engines," Table 3.2-3.
- Storage tank and loading emissions were calculated using AP-42, ProMax 3.2 and TANKS 4.0.9.
- Fugitive emissions were calculated based on an estimated component count and from using emission factors for oil and gas production from the USEPA's "Protocol for Equipment Leak Emission Estimates," November 1995, EPA 4531, R-95-017, Table 2-4.

The rightmost column in Table 5 gives the annual controlled PTE for the Brooks Well Pad facility as listed in Antero's January 13, 2015 legal advertisement appearing in *The Herald Record*:

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Table 5: PTE Brooks Well Pad, New Milton (see Permit Application, Attachment I, Table 3).

| Pollutant | PTE Facility Wide | | | |
|--|-----------------------------|---------------------------|-----------------------------|--|
| | Hourly (lb/hr) | | Annual (ton/yr) | |
| | Uncontrolled ⁽¹⁾ | Controlled ⁽²⁾ | Uncontrolled ⁽¹⁾ | Controlled ⁽²⁾ (As Advertised) |
| Nitrogen Oxide | 1.06 | 1.09 | 4.65 | 4.74 |
| Carbon Monoxide | 6.27 | 6.29 | 27.47 | 27.55 |
| Volatile Organic Compounds | 10.94 | 3.58 | 47.90 | 17.09 |
| Particulate Matter- 2.5 | 0.06 | 0.06 | 0.26 | 0.27 |
| Particulate Matter- 10 | 0.80 | 0.43 | 0.50 | 0.39 |
| Sulfur Dioxide | 0.01 | 0.01 | 0.02 | 0.02 |
| Lead | <0.01 | <0.01 | <0.01 | <0.01 |
| Total HAPs | 0.64 | 0.33 | 2.81 | 1.42 |
| Benzene | 0.01 | 0.01 | 0.04 | 0.01 |
| Formaldehyde | --- | --- | --- | 0.03 |
| Xylenes | 0.11 | 0.09 | 0.47 | 0.39 |
| Carbon Dioxide Equivalent (CO _{2e}) | --- | --- | --- | 4,680.04 |
| <p>(1) Found in Application, Attachment I, Emission Calculations, Table 3, "Permit Summary." (2) Emissions based on 98% Flare DRE operating 100% of the time.</p> | | | | |

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Table 6: Estimated Maximum Controlled Emissions for Antero's Brooks Well Pad Facility listed by Emission Point.

| Emission Point ID | Emission Unit ID | Emission Source | Pollutant | Maximum Emissions After Controls | |
|---|----------------------------|---|----------------------------|----------------------------------|-------|
| | | | | (lb/hr) | (tpy) |
| FL001 | TANK001 thru TANK006 | AbuTec Combustor (Used to Control Emissions from Tanks Storing Condensate and Produced Water) | Nitrogen Oxides | 0.03 | 0.10 |
| | | | Carbon Monoxide | 0.02 | 0.09 |
| | | | Volatile Organic Compounds | 0.15 | 0.66 |
| | | | Total HAP | 0.01 | 0.03 |
| | | | PM10 | 0.01 | 0.01 |
| EP-H001 thru EP-H009 | H001 thru H009 | GPU Heaters | Nitrogen Oxides | 0.75 | 3.26 |
| | | | Carbon Monoxide | 0.63 | 2.74 |
| | | | Volatile Organic Compounds | 0.04 | 0.18 |
| | | | Total HAP | 0.02 | 0.07 |
| | | | PM10 | 0.06 | 0.25 |
| EP-L001 | L001 | ⁽¹⁾ Condensate and Produced Water Tanker Truck Loading | Volatile Organic Compounds | 5.40 | 1.44 |
| | | | Total HAP | 0.02 | 0.01 |
| EP-FUG | FUG | ⁽²⁾ Fugitive Emissions | Volatile Organic Compounds | 3.38 | 14.78 |
| | | | Total HAP | 0.30 | 1.30 |
| | | | PM10 | 0.74 | 0.24 |
| EP- ENG001 | ENG001 | Compressor Engine | Nitrogen Oxides | 0.32 | 1.39 |
| | | | Carbon Monoxide | 5.65 | 24.73 |
| | | | Volatile Organic Compounds | 0.01 | 0.04 |
| | | | PM10 | 0.01 | 0.01 |
| <p>(1) Loading emissions occur when condensate and produced water are transferred out of the well site via tanker trucks. Fugitive emissions were estimated using AP-42 loading loss formula: $L=12.46 * SPM/T$, and Bryan & Engineering (BR&E) software known as Promax.</p> <p>(2) Fugitive Emissions include:</p> <p>Equipment Component Leaks - Leaks from valves, flanges, and connectors installed in various process equipment such as gas production unit heaters, compressor, pipelines, and separators. Emission are assumed to be occurring throughout the year.</p> <p>Pneumatic Control Valve Leaks - Pneumatic control valves are part of the gas production unit heaters. They are intermittent low bleed valves and their emissions are assumed to be occurring throughout the year.</p> <p>Haul Road Emissions - Haul road emissions are emitted when tanker trucks or service vehicles enter the Facility. The Facility is flat and unpaved.</p> | | | | | |

Table 7: Estimated Maximum Controlled Emissions from Antero's Middle Well Pad, New Milton, Doddridge County, WV.

| Emission Point ID | Emission Unit ID | Emission Source | Controlled Annual Emission Rate (ton/yr) | | | | |
|----------------------------|----------------------------|--|--|-------|-------|-----------|-------|
| | | | NOx | CO | VOC | Total HAP | PM10 |
| FL001 | TANK001 Thru TANK006 | AbuTec Combustor (Used to Control Emissions from Tanks storing Condensate and Produced Water) | 0.10 | 0.09 | 0.66 | 0.03 | 0.01 |
| EP-H001 thru EP-H009 | H001 thru H009 | GPU Heaters | 3.26 | 2.74 | 0.18 | 0.07 | 0.25 |
| EP-L001 | L001 | Tanker Truck Loading of Condensate and Produced Water | --- | --- | 1.44 | 0.01 | --- |
| EP-FUG | FUG | Fugitive Emissions | --- | --- | 14.78 | 1.30 | 0.24* |
| EP-HR001 | HR001 | Haul Trucks | --- | --- | --- | --- | 0.12 |
| EP-ENG001 | ENG001 | Compressor Engine | 1.39 | 24.73 | 0.03 | 0.03 | 0.01 |
| Total | | | 4.74 | 27.55 | 17.09 | 1.42 | 0.39* |

* PM₁₀ Emissions from EP-FUG not included in Total PM₁₀.

REGULATORY APPLICABILITY

The proposed Antero natural gas production facility is subject to substantive requirements in the state and federal air quality rules and regulations listed below. Each applicable rule (and ones that have reasoned non-applicability) are reviewed below.

45CSR2 - "Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers"

The purpose of 45CSR2 is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units.

45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from:

- Section 4 - weight emission standard,

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- Section 5 - control of fugitive particulate matter,
- Section 6 - registration,
- Section 8 - testing, monitoring, record keeping, reporting and
- Section 9 - startups, shutdowns, malfunctions.

However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of all of the proposed fuel burning units/GPU Heaters (EU-H001 through EU-H009) are below 10 MM BTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However Antero would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

45CSR4 - “To Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors”

This facility shall not cause the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public. 45CSR4 states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable.

45CSR6 - “To Prevent and Control Air Pollution from the Combustion of Refuse”

45CSR6 prohibits open burning, establishes emission limitations for particulate matter, and establishes opacity requirements. Sources subject to 45CSR6 include completion combustion devices, enclosed combustion devices, and flares.

The facility-wide requirements of the general permit include the open burning limitations §§45-6-3.1 and 3.2.

All completion combustion devices, enclosed combustion devices, and flares are subject to the particulate matter weight emission standard set forth in §45-6-4.1; the opacity requirements in §§45-6-4-3 and 4-4; the visible emission standard in §45-6-4.5; the odor standard in §45-6-4.6; and the testing standard in §§45-6-7.1 and 7.2. Sections 5.0, 6.0 and 14.0 of the G70-A general permit include requirements for 45CSR6.

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Enclosed combustion control devices and flares that are used to comply with emission standards of NSPS, Subpart OOOO are subject to design, operational, performance, record keeping and reporting requirements of the NSPS regulation that meet or exceed the requirements of 45CSR6.

Antero has one (1) flare at the Brooks Well Pad. The flare has negligible particulate matter emissions. Therefore, the facility's flare should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the flare and the hours of operation. The facility will also monitor the flame of the flare and record any malfunctions that may cause no flame to be present during operation.

45CSR10 - "To Prevent and Control Air Pollution from the Emissions of Sulfur Oxides"

45CSR10 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 3 (weight emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring, record keeping, reporting). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of all of the proposed fuel burning units/GPU Heaters (EU-H001 through EU-H009) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR10.

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"

The construction of Antero's natural gas production facility has a potential to emit a regulated pollutant in excess of six (6) lbs/hour and ten (10) TPY and, therefore, pursuant to §45-13-2.24, the facility is defined as a "stationary source" under 45CSR13. Pursuant to §45-13-5.1, "[n]o person shall cause, suffer, allow or permit the construction . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct." Therefore, Antero is required to obtain a permit registration under 45CSR13 for the construction and operation of the natural gas production facility.

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As required under §45-13-8.3 (“Notice Level A”), Antero placed a Class I legal advertisement in a “newspaper of general circulation in the area where the source is . . . located.” The Class I legal advertisement was published on January 13, 2015 in *The Herald Record*.

45CSR22 - “Air Quality Management Fee Program”

Antero's Brooks Well Pad is not subject to 45CSR30. The facility is subject to 40CFR60 Subpart OOOO, however it is exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided it is not required to obtain a permit for a reason other than its status as an area source, therefore, the facility is not subject and will pay its annual fees through the Rule 22 program.

40CFR60 Subpart JJJJ - *Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE)*

40CFR60.4230 states that a source that commenced construction after June 12, 2006 whose SI ICE was less than 500 hp and was manufactured on or after July 1, 2008 is subject to this rule. Antero has proposed to install one (1) 24 HP SI ICE. Since the SI ICEs that Antero will install were manufactured in 2013, Antero is subject to this rule. Antero submitted an EPA Certificate of Conformity's for the engine.

40CFR60 Subpart OOOO - “Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution”

Subpart OOOO applies to facilities that commence construction, reconstruction, or modification after August 23, 2011 (October 15, 2012 for well completions). Since the Brooks Well Pad began operation after August 23, 2011 it is subject to the requirements of Subpart OOOO.

The tanks at the Brooks Well Pad will utilize a flare to control emissions, therefore the tanks will not have the potential to emit more than 6 tpy of VOC's, and will not be subject to the rule.

The site will also include pneumatic controllers that were ordered and installed after August 23, 2011, therefore the controllers will be subject to the applicable provisions of Subpart OOOO. There are twenty seven (27) PCVs

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located at the facility. Each PCV emits only 6.6 scf/day of natural gas, much less than the 6 scf/hr of natural gas triggering Subpart OOOO. The PCV natural gas emissions were viewed as being fugitive emissions.

The gas wells at the Brooks Well Pad will also be affected facilities subject to Subpart OOOO.

REGULATORY NON-APPLICABILITY

The following rules and regulations do not apply to the facility:

45CSR14 - *Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration.*

The facility-wide potential-to-emit of the Brooks Well Pad is below the levels that would define the source as “major” under 45CSR14 and, therefore, the construction evaluated herein is not subject to the provisions of 45CSR14.

Classifying multiple facilities as one “stationary source” under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of “Building, structure, facility, or installation” as given in §45-14-2.13 and §45-19-2.12. The definition states:

“Building, Structure, Facility, or Installation” means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same “Major Group” (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

The Brooks Well Pad shares the same SIC code as several other well pads owned by Antero in the area. Therefore, the potential classification of the Brooks Well Pad as one stationary source with another facility depends on the determination if these stations are considered “contiguous or adjacent properties.”

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"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 one stationary source. 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*.

The Brooks Well Pad is not located contiguous with, or directly adjacent to any other Antero facility. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Victor Pad. This facility operates independently and is approximately 0.5 miles east of the Brooks Well Pad.

The Brooks Well Pad is under common control with other like Antero facilities in the area. However, there are no co-located facilities with the Brooks Well Pad.

The Brooks Well Pad does share the same industrial grouping with other nearby facilities. However, the facilities are not located on contiguous or adjacent properties. Therefore, the emissions from the Brooks Well Pad should not be aggregated with other facilities in determining major source or PSD status.

40CFR60 Subpart A §60.18 "General Control Device and Work Practice Requirements"

40CFR60 Subpart A §60.18 contains requirements for control devices when they are used to comply with applicable subparts of 40CFR60 and 40CFR61. The vapor combustor that Antero has proposed is not used to comply with one of these regulations. The purpose of the vapor combustor is to control emissions from the tanks that are routed to it. However, these tanks are not subject to 40CFR60 Subpart Kb due to their size. In addition 40CFR60.18 refers to flares but makes no mention of enclosed combustion devices. Therefore, Antero is not subject to this regulation.

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40CFR60 Subpart Kb

“Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984”

Pursuant to §60.110b, 40 CFR 60, Subpart Kb applies to “each storage vessel with a capacity greater than or equal to 75 cubic meters (m³) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984.

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The tanks that Antero have proposed to install are 21.35 cubic meters each and therefore, would not be subject to this regulation.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from Antero’s Brooks Well Pad natural gas production facility and that are not classified as “criteria pollutants.”

Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM₁₀), Particulate Matter less than 2.5 microns (PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare.

Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) standards promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

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.

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Antero included the following HAPs as emitted in substantive amounts in their emissions estimate: Benzene, Ethylbenzene, n-Hexane, Toluene, and Xylenes. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Potential HAPs - Carcinogenic Risk

| HAPs | Type | Known/Suspected Carcinogen | Classification |
|--------------|------|----------------------------|-------------------------------------|
| Benzene | VOC | Yes | Category A - Known Human Carcinogen |
| Ethylbenzene | VOC | No | Inadequate Data |
| n-Hexane | VOC | No | Inadequate Data |
| Toluene | VOC | No | Inadequate Data |
| Xylene | VOC | No | Inadequate Data |

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects 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.

AIR QUALITY IMPACT ANALYSIS

The estimated maximum emissions from the proposed Brooks Well Pad are less than applicability thresholds that would define the proposed facility as a "major stationary source" under 45CSR14 and, therefore, no air quality impacts modeling analysis was required. Additionally, based on the nature of the proposed construction, modeling was not required under 45CSR13, Section 7.

MONITORING OF OPERATIONS

The following substantive monitoring, compliance demonstration, and record-keeping requirements (MRR) shall be required:

- For the purposes of demonstrating compliance with maximum limit for the aggregate production of condensate/liquids from the wells set forth in Section 4.0 of the general permit registration, Antero shall be required to monitor and record the monthly and rolling twelve month total of condensate/liquids (in gallons) produced in the wells. Monitoring and recording the monthly and rolling twelve month total of condensate/liquids (in gallons) unloaded from the storage tanks can be used to show compliance with this requirement.
- For the purposes of demonstrating compliance with visible emissions limitations set forth in Section 7.0 of the G70-A general permit, Antero shall be required to:
 - (1) Conduct an initial Method 22 visual emission observation on the GPU heaters to determine the compliance with the visible emission provisions. Antero shall be required to take a minimum of two (2) hours of visual emissions observations on the line heaters.
 - (2) Conduct monthly Method 22 visible emission observations of the heater treater stack to ensure proper operation for a minimum of ten (10) minutes each month the line heaters are in operation.
 - (3) In the event visible emissions are observed in excess of the limitations given under Section 7.5 of the G70-A general permit, Antero shall be required to take immediate corrective action.
- Antero shall be required to maintain records of all visual emission observations pursuant to the monitoring required under Section 7.2 of the G70-A general permit including any corrective action taken.
- Antero shall be required to report any deviation(s) from the allowable visible emission requirement for any emission source discovered during observations using 40CFR Part 60, Appendix A, Method 9 or 22 to the Director of the Division of Air Quality as soon as practicable, but in any case within ten (10) calendar days of the occurrence and shall include at least the following information: the results of the visible determination of opacity of emissions, the cause or suspected cause of the violation(s), and any corrective measures taken or planned.

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RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates compliance with all state and federal air quality requirements will be satisfied and this facility is expected to meet the requirements of General Permit G70-A. Therefore Antero's request to construct and operate its Brooks Well Pad natural gas production facility is recommended to the Director of Air Quality.

John Legg

John Legg
Permit Writer - NSR Permitting

March 3, 2015

Date *March 3, 2015*