



west virginia department of environmental protection

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**ENGINEERING
EVALUATION / FACT SHEET**

BACKGROUND INFORMATION

Application No.: G70-A130B
Plant ID No.: 017-00144
Applicant: Antero Resources Corporation
Facility Name: James Webb Wellpad
Location: Near Greenwood, Doddridge County, West Virginia
SIC Code: 1311
NAICS Code: 211111
Application Type: Modification
Received Date: September 14, 2015
Engineer Assigned: David Keatley
Fee Amount: \$1,500
Fees Received: September 16, 2015
Complete Date: February 8, 2016
Due Date: March 24, 2016
Applicant Ad Date: September 11, 2015
Newspaper: *The Doddridge Independent*
UTM's: Easting: 510.9548 km Northing: 4,343.2757 km Zone: 17N
Latitude/Longitude: Latitude: 39.238719 Longitude: -80.873061
Description: Permit registration G70-A130B will supersede and replace G70-A130A. With this application the applicant proposes to install: one (1) 1.5-mmBtu/hr gas production unit (GPU) heater, nine (9) 2.0-mmBtu/hr line heaters, and one (1) 12-mmBtu/hr enclosed combustor.

DESCRIPTION OF PROCESS

Raw natural gas from nine (9) natural gas wells will go through nine (9) 2.0-mmBtu/hr line heaters. The line heaters heats the raw natural gas to encourage phase separation. After being heated by the line heaters the raw gas goes to gas processing units (GPU) heaters (H001-H009) are used in conjunction with the associated GPU separators to help separate the gas from the liquid phases. The GPU heaters and line heaters are fueled by a slip stream of the separated gas. The gas from the GPUs exist the facility via pipeline. The produced water from the GPU is

sent to two (2) 400-bbl produced water tanks (TANKPW001-002). The condensate will be sent to a low-pressure separator. The gas from the low-pressure separator is compressed and will exit the facility via pipeline. The liquid from the low-pressure separator is sent to ten (10) 400-bbl condensate tanks (TANKCOND001-010). Flashing, working, and breathing losses from the tanks are routed to enclosed combustors (EC-001 and EC-002).

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 (L001) at a maximum rate of 11,497,500 gallons/year and produced water (L002) at a maximum rate of 22,995,000 gallons/year from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

SITE INSPECTION

A site visit was conducted by James Robertson of DAQ's Compliance and Enforcement Section on January 13, 2015. The site is not under development but will eventually be located on a hill overlooking Nutter Fork. James could not find an obvious entry to the site, but did drive the entire length of Nutter Fork in the area of the pad. There are a few scattered houses along Nutter Fork but none that are in close proximity to the proposed pad. Based on the site evaluation and Google Earth, it appears that the closest occupied dwelling is approximately 1000 feet away. James did not see any business, public building, school, church, community, institutional building, or public park within 300 feet of the site. In the inspector's opinion, this site is suitable for a General Permit.

Directions to the facility are as follows: From the intersection of WV 19 and Cabin Run, head northeast for 0.47 miles to reach destination on left.



ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

This section includes a description of the emission calculation methodology used for each type of equipment. All emission calculations were reviewed and verified by the writer.

Gas Processing Unit Heaters

Emission factors used for the emission calculations of the eleven GPU Heaters (H001 – H009) are from AP-42, Section 1.4 for natural gas combustion. The rating of each GPU heater is 1.50 MMBtu/hr. The fuel heating value is 1,227 Btu/scf. Emissions from the GPU heaters are not controlled.

Line Heaters

Emission factors used for the emission calculations of the eleven GPU Heaters (LH001 – LH009) are from AP-42, Section 1.4 for natural gas combustion. The rating of each GPU heater is 1.50 MMBtu/hr. The fuel heating value is 1,227 Btu/scf. Emissions from the line heaters are not controlled.

Storage Tanks

Emissions from the facility's emission sources were calculated using the extended analysis of the condensate and gas from the Prunty No. 1H, one of the wells in the Lockhart Heirs Pad. These extended analyses are considered representative of the materials from the James Webb well pad, being in the same Marcellus rock formation. Furthermore, both well pads are considered wet gas areas within the Marcellus Formation. The Prunty #1H condensate sample was selected because the natural gas BTU value (1250) is expected to be similar in heating value as the proposed wells on the James Webb well pad.

Vapor mass fractions, working, breathing, and flashing losses were calculated by the Promax modeling software program. Outputs from the modeling were provided in the application. The enclosed combustors (EC001 and EC002) is used to control the emissions from the condensate storage tanks (TANKCOND001 – TANKCOND010) and the produced water tanks (TANKPW001 – TANKPW002). Condensate storage tank emissions are based on a total throughput of 400 barrels per day (11,498,000 gallons/year). Produced water storage tank emissions are based on a total throughput of 4,800 barrels per day (22,995,000 gallons/year). Emissions from the storage tanks are controlled by enclosed combustors (EC001 and EC002) that has a destruction efficiency of 98% for VOCs and will be in operation 100% of the time that emissions are routed to it.

Enclosed Combustors (EC001 and EC002)

Emission factors for the combustion from the enclosed combustors are taken from AP-42, Section 1.4. Emissions from the enclosed combustors include the combustion of the pilot flame fuel stream; the controlled emissions from the condensate storage tanks and the combustion emissions of that stream; and the controlled emissions from the produced water storage tanks and

the combustion emissions of that stream. The enclosed combustors have a destruction efficiency of 98%.

Enclosed Combustors (EC001 and EC002) have a maximum design heat input of 12 MMBtu/hr and was designed per §60.18 according to the application. The pilot will have automatic reignition and a thermocouple will detect the presence of the pilot flame.

Truck loading (L001, L002)

The vapor mass fractions and molecular weight were provided in the output from the Promax simulation model. The RVP was taken from laboratory reports. The loading losses were calculated using the equation from AP-42, Chapter 5 for submerged loading dedicated service. The tank truck loading operation is not controlled and the emissions are vented to the atmosphere. The total condensate throughput used in the emission calculations is 11,498,000 gallons per year. The total produced water throughput used in the emission calculations is 22,995,000 gallons per year.

Table 1: Maximum Controlled Estimated Modified/New PTE

Emission Point ID	Emission Unit ID	Emission Source	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
EP-EC001 and EP-EC002	EC001 and EC002 (Controlling TANKCOND 001-010 and TANKPW001-002)	Cimarron Combustors (Controlling Condensate and Produced Water Tanks) Emissions per Each	Carbon Monoxide	0.24	1.04
			Nitrogen Oxides	0.28	1.24
			Volatile Organic Compounds	4.74	20.82
			Total Particulate Matter	0.02	0.09
			Benzene	0.01	0.03
			Ethylbenzene	<0.01	0.01
			n-Hexane	0.16	0.70
			Toluene	0.01	0.03
			Xylenes	0.01	0.02
			CO ₂ e	951	4,164
EP-LH001 through EP-LH009	LH001 through LH009	Line Heaters (Emissions per each)	Nitrogen Oxides	0.16	0.70
			Carbon Monoxide	0.13	0.59
			Volatile Organic Compounds	0.01	0.04

			PM	0.01	0.05
			PM ₁₀	0.01	0.05
			n-Hexane	<0.01	0.01
			CO _{2e}	193	633
H009	EP-H009	GPU Heater	Nitrogen Oxides	0.12	0.53
			Carbon Monoxide	0.10	0.44
			Volatile Organic Compounds	0.01	0.03
			PM	0.01	0.04
			PM ₁₀	0.01	0.04
			n-Hexane	0.01	0.03
			CO _{2e}	145	633
EP-L001	EU-L001	Condensate Truck Loading	Volatile Organic Compounds	10.14	5.78
			n-Hexane	0.02	0.01
			CO _{2e}	2	1
EP-L002	L002	Produced Water Truck Loading	Volatile Organic Compounds	<0.01	<0.01
			CO _{2e}	1	1
EP-FUG	EU-FUG	Fugitive Emissions	Volatile Organic Compounds	3.42	14.99
			Benzene	0.01	0.03
			Ethylbenzene	0.01	0.06
			n-Hexane	0.25	1.08
			Toluene	0.02	0.08
			Xylenes	0.04	0.19
			CO _{2e}	73	319

Table 2: Summarized Estimated Total Facility PTE

Pollutant	Facility Wide PTE (tons/year)
Nitrogen Oxides	14.92
Carbon Monoxide	36.09
Volatile Organic Compounds	63.51
Particulate Matter ₁₀	2.01
Sulfur Dioxide	0.07
n-Hexane	2.76
Benzene	0.09
Toluene	0.14
Ethylbenzene	0.08
Xylenes	0.23
Total HAPs	3.32
Carbon Dioxide Equivalent	22,077

REGULATORY APPLICABILITY

The following rules and regulations apply to the facility:

45CSR2 (To Prevent and Control Particulate Air Pollution From Combustion of Fuel in Indirect Heat Exchangers)

45CSR2 establishes emission limitations for smoke and particulate matter that are discharged from fuel burning units. The Gas Processing Unit Heaters (LH001 – LH009 and H009) are subject; however the units have a rating of 1.5 MMBtu/hr and therefore are not subject to the weight emission standard for particulate matter set forth in 45CSR2-4.1.

Antero Resources is subject to the opacity requirements set forth in 45CSR2, Section 3.1. Compliance will be demonstrated by demonstrating compliance with the G70-A, Section 7 requirements to which they applied.

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 enclosed combustors (EC001 and EC002) 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.

Antero will have two (2) enclosed combustors at this facility. The enclosed combustors are subject to section 4, emission standards for incinerators. The enclosed combustor has a maximum capacity of 317 lb/hr which has an F factor of 5.43 and an allowable emission rate of 0.86 pounds of particulate matter per hour. Each enclosed combustor has an hourly particulate matter emissions rate which is 0.02 lb/hr of total particulate matter. Therefore, the facility's enclosed combustors should demonstrate compliance with this section. The facility will also monitor the flame of the vapor combustor and record any malfunctions that may cause no flame to be present during operation.

45CSR10 (To Prevent and Control Air Pollution from the Emission of Sulfur Oxides)

45CSR10 establishes emission limitations for SO₂ emissions which are discharged from stacks of fuel burning units. A "fuel burning unit" means and includes any furnace, boiler apparatus, device, mechanism, stack or structure used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer. Sources that meet the definition of "Fuel Burning Units" per 45CSR10-2.8 include gas producing units, in-line heaters, heater treaters, and glycol dehydration unit reboilers.

The Gas Processing Unit Heaters (LH001 – LH009 and H009) each have a rating of 1.5 mmBtu/hr and are therefore exempt because they are less than 10 MMBtu/hr.

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)

As can be seen from Table 2, two pollutants are above the 6lb/hr and 10 tons/year thresholds and this facility requires a permit. In addition this permitting action is a modification because this action triggered 40CSR6 which has substantive requirements.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

Antero Resources is subject to 45CSR16 because they are subject NSPS, Subparts JJJJ and OOOO described in more detail in the federal regulations section.

45CSR22 (Air Quality Management Fee Program)

This facility is a minor source as can be seen in Table 2 and not subject to 45CSR30 since this facility is exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71. This facility has paid the applicable \$1,000 NSPS fee. This facility is not a natural gas compressor station and is a 9M source and is required to pay a \$200 annual fee. Antero is required to 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 (SO₂) 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.*

The nine (9) gas wells at the James Webb Wellpad will be drilled after August 23, 2011 and are therefore considered affected facilities under this Subpart. Compliance includes notification and recordkeeping and will be demonstrated with compliance to the requirements in Section 5 of the G70-A General Permit to which the registrant applied.

b. *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 continuous bleed gas-driven pneumatic controllers with bleed rates greater than 6 standard cubic feet per hour (scfh) at this facility. The pneumatic control valves that are part of the GPU heaters are intermittent low bleed valves that have a bleed rate of 6.6 scf/day. Therefore, there are no applicable requirements regarding pneumatic controllers under 40 CFR 60 Subpart OOOO that would apply.

c. *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.*

This regulation requires that the registrant 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 at this facility would emit 103.52 tons/year, but are controlled by enclosed combustors that have 98% control. This facility's enclosed combustors are not subject to this section of subpart OOOO because the enclosed combustors have a 95% control efficiency or higher.

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

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 enclosed combustor that Antero has proposed is not used to comply with one of these regulations. The purpose of the enclosed 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.

40CFR60 Subpart Kb (Standards of Performance for VOC Liquid Storage Vessels)

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The tanks that Antero has proposed to install are 63.60 cubic meters each. Therefore, Antero is not subject to this regulation.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from this 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. Antero included the following HAPs as emitted in

substantive amounts in their emissions estimate: Benzene, n-Hexane, Toluene, Xylene, and Ethylbenzene. 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
n-Hexane	HAP	No	Inadequate Data
Benzene	TAP	Yes	Category A - Known Human Carcinogen
Toluene	HAP	No	Inadequate Data
Xylene	HAP	No	Inadequate Data
Ethylbenzene	HAP	No	Category D - Not classifiable as to human carcinogenicity

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.

RECOMMENDATION TO DIRECTOR

The information provided in this facility's permit application indicates that compliance with all state and federal air quality requirements will be achieved and this facility is expected to meet the requirements of General Permit G70-A. It is recommended that Antero should be granted a modification G70-A permit for James Webb Wellpad.

 David Keatley
 Permit Writer – NSR Permitting

February 12, 2016

 Date