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**GENERAL PERMIT REGISTRATION APPLICATION
ENGINEERING EVALUATION / FACT SHEET**

BACKGROUND INFORMATION

Registration No.: G70-A071A
Plant ID No.: 085-00037
Applicant: Antero Resources Corporation
Facility Name: John Richards Wellpad
Location: Pullman, Ritchie County, WV
SIC Code: 1311
Application Type: Modification
Received Date: October 26, 2015
Engineer Assigned: Thornton E. Martin Jr.
Fee Amount: \$1,500.00
Date Received: October 27, 2015
Complete Date: January 08, 2016
Applicant Ad Date: October 28, 2015
Newspaper: *The Pennsboro News*
UTM's: Easting: 506.9554 km Northing: 4,339.5728 km Zone: 17
Description: Modification of a natural gas production facility near Pullman, Ritchie County, West Virginia. The modification will facilitate increased production and include: the addition of two (2) wells, addition of two (2) gas production unit heaters, addition of six (6) line heaters, addition of four (4) condensate tanks and the addition of three (3) Cimarron enclosed combustors.

DESCRIPTION OF PROCESS

Antero Resources Corporation (Antero) has submitted a General Permit Registration application to modify a natural gas production facility (Well Pad). A mixture of condensate, water and entrained gas from the wells enters the facility through a series of line heaters (LH001-006) and gas production unit (GPU) heaters (H001-006) which are 3-phase separators where the gas, condensate and produced water are separated. The line heaters and GPU's are fueled by a slip stream of the separated gas. The separated gas from the three phase separators is metered and sent to the sales gas pipeline. The separated water flows to the produced water storage tanks (TANKPW001-002). The separated condensate is then sent to two phase low pressure separators where the gas is further separated. The separated gas is routed to the compressor (ENG001), compressed and sent to the sales gas line. The condensate from the two phase separators flow to the condensate storage tanks (TANKCOND001-010). The line heaters are only used during the first several months from start of production and will be removed once production has normalized.

The facility has ten (10) tanks (TANKCOND001-010) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to up to four (4) enclosed combustors (EC001-004) to control the emissions. The enclosed combustors that will be used to control emissions are designed to achieve 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 (L001) and produced water (L002) from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

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 well pad. These extended analyses are considered to be representative of the materials from John Richards well pad, being in the same Marcellus rock formation.

John Richards 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 Ness pad. This operates independently and is approximately 1.07 miles southeast of the facility.

DESCRIPTION OF FUGITIVE EMISSIONS

Sources of fugitive emissions include loading operations, haul road emissions, equipment leaks and pneumatic control valves. Fugitive emissions were calculated using AP-42 factors. Routine equipment leaks are assumed to be occurring continuously throughout the year. Loading operations and haul road emissions only occur when tanker trucks are onsite.

Equipment Leaks

Equipment include valves, flanges and connectors installed in various process equipment such as gas processing unit heaters, pipelines and separators. Emissions are assumed to be occurring throughout the year.

Pneumatic Control Valves

Pneumatic control valves are part of the gas processing unit heaters. These are intermittent low bleed valves and their emissions are assumed to be occurring throughout the year.

Loading Operations

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.

Haulroad Emissions

Haul road emissions are emitted when tanker trucks or service vehicles enter the facility. The facility is flat and unpaved.

Leak sources associated with this modification application are summarized in the table below.

Table 1: Leak Sources

Source	Pollutant	Number of Source Components	Estimated Annual Emission Rate (lb/yr)
Pumps	Light Liquid VOC	--	--
	Heavy Liquid VOC	--	--
	Non-VOC	--	--
Valves	Gas VOC	300	4,968.45
	Light Liquid VOC	312	14,646.55
	Heavy Liquid VOC	--	--
	Non-VOC	--	--
Safety Relief Valves	Gas VOC	see Valves	see Valves
	Non-VOC	see Valves	see Valves
Open-ended Lines	VOC	--	--
	Non-VOC	--	--
Sampling Connections	VOC	--	--
	Non-VOC	--	--
Compressors	VOC	--	--
	Non-VOC	--	--
Flanges	VOC	78	111.96
	Non-VOC	--	474.30
Other	VOC	304	260.57
	Non-VOC	--	1,103.89

SITE INSPECTION

Every oil and gas well permitted in West Virginia since 1929 has been issued an API (American Petroleum Institute) number. The API is used by agencies to identify and track oil and gas wells.

The API number has the following format: 047-001-00001

Where:

- 047 = State Code. The state code for WV is 047.
- 001 = County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).
- 00001 = Well number. Each well will have a unique well number.

The API number(s) for each NG well at this facility as provided in the well completion notification and as provided to the WVDEP Office of Oil and Gas for the well permit are as follows: 047-085-10102, 047-085-10103, 047-085-10138, 047-085-10139 and two (2) wells not yet permitted as of this application for modification.

A full on-site, targeted inspection was conducted by the James Robertson of the Compliance and Enforcement Section on March 10, 2015. The applicant met the specific criteria and siting requirements for a Class II General Permit G70-D Registration and received a status code of 30 - In Compliance.

Directions provided for the John Richards Well Pad are as follows:

Go 1.2 miles North West, from the intersection of Right Fork-White Oak Creek and Sugar Run. The facility will be towards the right.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Equipment and emissions associated with this modification application are summarized in the table below. The Emission Unit ID nomenclature for the flare (enclosed combustor) listed in Antero's application for construction (G70-A071) was (FL001). This application to modify lists the flare (enclosed combustor) as (EC001) for clarity in terminology.

Table 2: Emission Units

Emission Unit ID	Emission Unit Description	Year Installed/Modified	Design Capacity	Type ¹ and Date of Change	Control Device ²
LH001 - LH006	Line Heaters	2015	2.0 MMBtu/hr (each)	New	N/A
H001, H002, H003, H004	3-Phase Gas Processing Unit Heaters	2014	1.5 MMBtu/hr (each)	Existing	N/A
H005, H006	3-Phase Gas Processing Unit Heaters	2015	1.5 MMBtu/hr (each)	New	N/A
TANKPW001-002	PW Tank F/W/B	2014	400 BBL (each)	Existing	EC001, EC002, EC003, EC004
TANKCOND001-006	Condensate Tank F/W/B	2014	400 BBL (each)	Existing	EC001, EC002, EC003, EC004
TANKCOND007-010	Condensate Tank F/W/B	2015	400 BBL (each)	New	EC001, EC002, EC003, EC004
ENG001	Compressor Engine (Kubota DG972-E2)	2014	24 HP	Existing	N/A
L001	Loading (Condensate)	2015	200 BBL capacity (each)	Modified	N/A
L002	Loading (Water)	2015	200 BBL capacity (each)	Modified	N/A
F001	Fugitives	2015	N/A	Modified	N/A
EC001	Flare (Cimmaron 48", Model 700-TI-603-D-31C)	2014	12 MMBtu/hr (each), 90 scf/min	Existing	N/A
EC002, EC003, EC004	Flare (Cimmaron 48", Model 700-TI-603-D-31C)	2015	12 MMBtu/hr (each), 90 scf/min	New	N/A
PCV	Pneumatic CV	2015	6.6 scf/day/PCV	Modified	N/A
HR001	Haul Truck	2015	40 ton capacity	Modified	N/A

¹ New, Existing or Modified

² N/A - Not Applicable

The following will summarize the calculation methodologies used by Antero to calculate the potential-to-emit (PTE) of the facility.

Gas-Fired Heaters

Criteria Pollutant emissions from the natural gas-fired heaters (H001 - H006 and LH001 - LH006) were based on the emission factors provided for natural gas combustion as given in AP-42 (AP-42 is a database of emission factors maintained by USEPA) Section 1.4.

Hourly emissions were based on the maximum design heat input (MDHI) of each unit and annual emissions were based on an annual operation of 8,760 hours. A heat content of the gas of 1,247 Btu/scf was used in the calculations.

Storage Tanks

Uncontrolled flashing, working, and breathing emissions from the ten (10) 16,800-gallon condensate tanks and from the two (2) 16,800-gallon produced-water tanks were calculated using ProMax 3.2 - a tank emissions simulation program. Input and summary sheets for the program are included in the permit application. Input variables were based on the extended analysis of the condensate and gas analysis from the Prunty Unit 1H of the Lockhart Heirs well pad. These extended analyses are considered to be representative of the materials from John Richards well pad, being in the same Marcellus rock formation.

As all uncontrolled emissions from the storage tanks are routed to the enclosed flare for control, the controlled emissions from the tanks are based on the enclosed flare's minimum 98% hydrocarbon control efficiency. A daily throughput of 1,200 bbl/day of produced-water was used in the calculations for each produced-water storage tank and a daily throughput of 600 bbl/day was used in the condensate tank calculations in ProMax 3.2.

Truck Loading

Air emissions from condensate truck loading operations occur as fugitive emissions generated by displacement of vapors when loading trucks. The emission factor used to generate the VOC emissions is based on the Loading Loss equation of AP-42 Section 5.2-4. In this equation, Antero used variables specific to the liquids loaded (the vapor pressure of the condensate and the molecular weight of the vapors was based on values calculated by the ProMax 3.2 program and laboratory reports) and to the method of loading - in this case "submerged filling - dedicated normal service." Additionally, worst-case annual emissions were based on a maximum loading rate of 9,198,000 gal/year of condensate and a maximum loading rate of 18,396,000 gal/year of produced water.

Fugitives

Antero based their fugitive equipment leak calculations on emission factors taken from the document EPA-453/R-95-017 - "Protocol for Equipment Leak Emission Estimates." Emission factors were taken from Table 2-4 and no control efficiency, as based on a Leak Detection and Repair (LDAR) protocol, was applied. Emissions of Greenhouse Gases (GHGs) were based on Subpart W of 40 CFR 98 - Federal GHG Reporting Rule. Input variables were based on the extended analysis of the condensate and gas analysis from the Prunty Unit 1H, of the Lockhart Heirs well pad. These extended analyses are considered to be representative of the materials from John Richards well pad, being in the same Marcellus rock formation.

Enclosed flare

The 12 mmBtu/hr enclosed flares will receive captured vapors from the storage tanks. The amount of emissions received is determined by the calculation methodologies described above. A 98% control was applied to the uncontrolled VOC/HAP/methane emissions received by the enclosed flares to determine the amount of pass-through emissions of the combustor. The emissions of NO_x, CO, particulate matter, VOCs and GHGs from the combustion of the vapors were based on emission factors taken from AP-42 Sections 13.5 (CO and NO_x), 1.4 (VOCs), 2.4 (particulate matter) and the calculated MDHI of the unit (flare rated at 38.03 scf-waste gas/minute at a calculated waste gas higher heat content of 2,197.54 Btu/scf). Emissions from the small pilot light are considered nominal and not included.

Emissions Summary

The original application to construct (G70-A071) included input variables that were based on the extended analysis of the condensate from the Prunty Unit 1H and gas analysis from Constable Unit 1H, two of the wells in the Lockhart Heirs well pad. This modification application (G70-A071A) includes input variables that are based on the extended analysis of the condensate and gas analysis from only the Prunty Unit 1H, of the Lockhart Heirs well pad. Very slight differences in emission values would be anticipated in comparisons, however, based on the above estimation methodology, which is determined to be appropriate, the potential to emit (PTE) for the John Richards natural gas production facility (Previous, Proposed and Difference) are given in the following tables:

Table 3: Previous - Aggregate Regulated Air Pollutant/GHG PTE (Controlled) Summary

Facility-Wide (All Sources)	CO	NO _x	PM ⁽¹⁾	PM _{2.5} ⁽¹⁾	SO ₂	VOCs	HAPs	CO _{2e} ⁽²⁾
<i>Hourly (lb/hr)</i>	6.394	1.208	2.591	0.062	0.003	17.324	0.993	1,982.49
<i>Annual (ton/yr)</i>	28.000	5.290	5.470	0.273	0.013	36.162	3.983	8,648.12

- (1) Conservatively, all particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
- (2) Based on multiplying the mass amount of emissions for each of the six greenhouse gases by the gas's associated global warming potential published at Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials.

Table 4: Previous - Aggregate Annual (ton/yr) Speciated HAP PTE Summary⁽¹⁾

Pollutant	ton/yr
Lead	0.00002
Benzene	0.03580
Formaldehyde	0.02310
Xylene	0.10930
Other HAPs	3.81478
Total HAPs	3.98300

- (1) As the PTE of all individual HAPs are less than 10 TPY and the PTE of total HAPs is less than 25 TPY, the John Richards Natural gas production facility (Well Pad) is defined as a minor (area) source of HAPs for purposes of 40 CFR 61, 40CFR63, and Title V.

Table 5: Proposed - Aggregate Regulated Air Pollutant/GHG PTE Summary

Pollutant		Controlled Emissions	Threshold	Threshold Exceeded ?
CO	lb/hr	7.255	6	Yes
	ton/yr	31.777	10	Yes
NO _x	lb/hr	2.233	6	
	ton/yr	9.780	10	
PM	lb/hr	2.019	6	
	ton/yr	2.167	10	
PM _{2.5}	lb/hr	0.144	6	
	ton/yr	0.629	10	
SO ₂	lb/hr	0.010	6	
	ton/yr	0.045	10	
VOCs	lb/hr	6.304	6	Yes
	ton/yr	32.239	10	Yes
Total HAPs	lb/hr	0.409	2	
	ton/yr	1.802	5	
CO _{2e}	lb/hr	2,878.536		
	ton/yr	12,609.965		
Lead	ton/yr	4.20E-05		
Benzene	ton/yr	0.044		
Formaldehyde	ton/yr	0.027		
Xylene	ton/yr	0.144		
Other HAPs	ton/yr	1.587		

Table 6: Difference - Aggregate Regulated Air Pollutant/GHG PTE Summary

Pollutant	Controlled Emissions	
	lb/hr	ton/yr
CO	0.861	3.77
NOx	1.025	4.49
PM	-0.572	-3.303
PM _{2.5}	0.082	0.356
SO ₂	0.007	0.032
VOCs	-11.020	-3.923
Total HAPs	-0.584	-2.181
CO ₂ e	896.046	3,961.845
Lead	--	2.2E-5
Benzene	--	0.0082
Formaldehyde	--	0.0039
Xylene	--	0.0347
Other HAPs	--	-2.23

REGULATORY APPLICABILITY

The proposed Antero natural gas production facility (Well Pad) is subject to substantive requirements in the following state and federal air quality rules and regulations: 45CSR6, 45CSR13, 40 CFR 60 Subpart JJJJ, 40 CFR 60 Subpart OOOO and 40 CFR 63 Subpart ZZZZ. Each applicable rule (and ones that have reasoned non-applicability), and Antero’s compliance therewith, will be discussed in detail below.

45CSR2 To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers - (NON APPLICABILITY)

The additional heaters have been determined to not meet the definition of a “fuel burning unit” under 45CSR2 - they do not use indirect heat transfer - and are not, therefore, subject to the applicable requirements therein.

45CSR6 To Prevent and Control Particulate Air Pollution from Combustion of Refuse

Antero has proposed additional enclosed flares for controlling the working/breathing/flashing emissions produced from the condensate/produced-water storage tanks. The enclosed flare meets the definition of an “incinerator” under 45CSR6 and is, therefore, subject to the requirements therein. The substantive requirements applicable to the enclosed flare are discussed below.

45CSR6 Emission Standards for Incinerators - Section 4.1

Section 4.1 limits PM emissions from incinerators to a value determined by the following formula:

$$\text{Emissions (lb/hr)} = F \times \text{Incinerator Capacity (tons/hr)}$$

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions

<u>Incinerator Capacity</u>	<u>Factor F</u>
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

Based on the vendor data sheet submitted in the application, the proposed enclosed flare is designed to be “smokeless” and, therefore, any particulate matter emissions from the unit should be nominal.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to Section 4.3, and subject to the exemptions under 4.4, the combustor has a 20% limit on opacity during operation. As the primary constituent in the vapors combusted in the unit shall be clean burning methane/ethane and the unit is designed as “smokeless,” particulate matter emissions from the combustor are expected to be nominal. Therefore, the enclosed flare should easily meet this requirement.

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

45CSR10 has requirements limiting SO₂ emissions from “fuel burning units,” limiting in-stack SO₂ concentrations of “manufacturing processes,” and limiting H₂S concentrations in process gas streams. The only potential applicability of 45CSR10 to the John Richards natural gas production facility (Well Pad) is the limitations on fuel burning units. The heaters each have been determined to not meet the definition of a “fuel burning unit” under 45CSR10 - they do not use indirect heat transfer - and are not, therefore, subject to the applicable requirements therein.

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 modification of the John Richards natural gas production facility (Well Pad) has a controlled potential to emit, in excess of six (6) lbs/hour and ten (10) TPY of a regulated pollutant, therefore, pursuant to §45-13-2.24, the facility is defined as a “stationary source” under 45CSR13 using that definition. 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 or register with an appropriate general permit under 45CSR13 for the modification and operation of the natural gas production facility (Well Pad).

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 ad ran on October 28, 2015 in *The Pennsboro News* and the affidavit of publication for this legal advertisement was submitted on January 04, 2016.

45CSR14 (NON APPLICABILITY)

The facility-wide potential-to-emit of the John Richards natural gas production facility (Well Pad) (see Table 5 above) is below the levels that would define the source as "major" under 45CSR14, Section 2.43 and, therefore, the modification evaluated herein is not subject to the provisions of 45CSR14.

Potential Source Aggregation

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 John Richards natural gas production facility (Well Pad) will be located approximately 1.10 miles from the known nearest other Antero facility (Ness Well Pad). Ness shares the same major industrial grouping (by SIC code) as John Richards and is owned by Antero. Therefore, the potential classification of the John Richards facility as one stationary source with Ness depends on the determination if these stations are considered "contiguous or adjacent properties."

"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 John Richards natural gas production facility (Well Pad) is not located contiguous with, or *directly* adjacent to the Ness facility. As noted above, the facilities are 1.10 miles apart. Facilities separated by this distance do not meet the common sense notion of a single plant. Therefore, the John Richards and Ness facilities are not considered to be on contiguous or adjacent property.

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

45CSR16 applies to this source because they are subject to 40CFR60 Subpart JJJJ.

45CSR22 *Air Quality Management Fee Program*

This facility is a minor source and not subject to 45CSR30. Antero Resources Corporation is required to keep their Certificate to Operate current.

45CSR30 *Requirements for Operating Permits - (NON APPLICABILITY)*

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The proposed facility does not meet the

definition of a "major source under § 112 of the Clean Air Act" as outlined under §45-30-2.26 and clarified (fugitive policy) under 45CSR30b. However, as the facility is subject to a New Source Performance Standard (NSPS) - 40 CFR 60, Subpart JJJJ and 40 CFR 60, Subpart OOOO - the facility would, in most cases, be subject to Title V as a "deferred source." However, pursuant to §60.5370(c), as a non-major source (see Table 5), Antero is not required to obtain a Title V permit for the proposed facility. Therefore, the John Richards natural gas production facility (Well Pad) is not subject to 45CSR30.

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 - (NON APPLICABILITY)

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." The storage tanks located at the John Richards facility are each 16,800 gallons, or 64 m³. Therefore, Subpart Kb does not apply to the storage tanks.

40CFR60 Subpart JJJJ Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The facility has a 24 hp reciprocating combustion engine installed onsite. The engine was manufactured in 2013 and constructed in 2014. The facility will be subject to the requirements of 40CFR§60.4230(4)(iii), which states owners and operators of stationary SI ICE that commence construction after June 12, 2006, where the stationary SI ICE are manufactured on or after July 2008, for engines with a maximum engine power less than 500 HP.

The engine is required to meet the following emission standards of 40CFR§60.4233(a), which states that owners and operators of stationary SI ICE with a maximum engine power less than or equal to 25 HP manufactured on or after July 1, 2008, must comply with the emission standards in §60.4231(a) for their stationary SI ICE.

§60.4231(a) states that stationary SI internal combustion engine manufacturers must certify their stationary SI ICE with a maximum engine power less than 25 HP manufactured after July 1, 2008 to the certification emission standards and other requirements for new nonroad SI engines in 40 CFR part 90 or 1054, as follows:

If engine displacement is * * *	and manufacturing dates are * * *	the engine must meet emission standards and related requirements for nonhandheld engines under * * *
(1) below 225 cc	July 1, 2008 to December 31, 2011	40 CFR part 90.
(2) below 225 cc	January 1, 2012 or later	40 CFR part 1054.
(3) at or above 225 cc	July 1, 2008 to December 31, 2010	40 CFR part 90.
(4) at or above 225 cc	January 1, 2011 or later	40 CFR part 1054.

The engine at the facility has a displacement of 0.962L or 962 ml or 962 cc and the manufacturing date is 2013. Therefore, from the table above, the facility will have to demonstrate compliance with 40 CFR part 1054. The facility has presented an EPA certificate of conformity to

demonstrate the engine will be an EPA certified engine in accordance with 40 CFR part 1054 (see file for certificate).

The facility will be required to maintain the certified engine according to the manufacturer's emission-related written instructions, keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. (§60.4243)

The facility will be required to meet the notification, reporting and recordkeeping, which includes: maintenance conducted on the engine, documentation from the manufacturer that the engine is certified to meet 40 CFR part 1054. (§60.4245)

40 CFR 60, Subpart OOOO Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

On April 27, 2012, the USEPA issued a final rule (with amendments finalized on August 16, 2012) that consists of federal air standards for natural gas wells that are hydraulically fractured, along with requirements for several other sources of pollution in the oil and gas industry that currently were previously not regulated at the federal level. Each potentially applicable section of Subpart OOOO is discussed below.

Gas Wells - §60.5370

Antero will have drilled gas wells at the John Richards well-pad and, therefore, these are defined as "affected facilities" under Subpart OOOO and subject to applicable provisions. The substantive requirements for gas wells drilled prior to January 1, 2015 are given under §60.5375(a)(3) of the rule. It requires that flowback emissions (gas produced from the well after fracturing) must be directed to the flow line or a completion combustion device. Other requirements pertaining to the gas wells include:

- Antero must maintain a log for each well completion operation at each gas well affected facility. The log must be completed on a daily basis for the duration of the well completion operation and must contain the records specified in §60.5420(c)(1)(iii).
[40CFR§60.5375(b)]
- Antero must demonstrate initial compliance with the standards that apply to gas well affected facilities as required by §60.5410.
[40CFR§60.5375(c)]
- Antero must demonstrate continuous compliance with the standards that apply to gas well affected facilities as required by §60.5415.
[40CFR§60.5375(d)]
- Antero must perform the required notification, recordkeeping and reporting as required by §60.5420.
[40CFR§60.5375(e)]

Storage Tanks - §60.5395 (NON APPLICABILITY)

Pursuant to §60.5365(e), for "[e]ach 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" that is constructed after August 23, 2011 and, pursuant to

§60.5395 has “VOC emissions equal to or greater than 6 tpy” must meet the control requirements under §60.5395 by “October 15, 2013 for Group 1 storage vessels and by April 15, 2014, or 30 days after startup (whichever is later) for Group 2 storage vessels.” The substantive requirement is to “reduce VOC emissions by 95.0 percent or greater.” Based on a letter from USEPA to the American Petroleum Instituted dated September 28, 2012, applicability of storage vessels to Subpart OOOO is based on individual tank PTE - which includes federally enforceable control devices.

The ten (10) condensate and two (2) produced-water storage tanks are calculated to have a PTE of less than 6 TPY of VOCs and, therefore, are not subject to Subpart OOOO.

Pneumatic Controllers

Pursuant to §60.5365(d)(2), “[f]or the natural gas production segment (between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not including natural gas processing plants), 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” that is constructed after August 23, 2011 is subject to the applicable provisions of Subpart OOOO. The substantive requirements for pneumatic controllers are given under §60.5390. While not identified, it is assumed the facility will use pneumatic controllers and will be required to meet this requirement.

40CFR63 Subpart ZZZZ (National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

This subpart establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major or area sources of HAP emissions.

The subpart would apply to the facility’s 24 hp RB4S engine. The engine is located at an area source of HAP, constructed after June 12, 2006. The engine is required to meet the requirements of 40 CFR part 60, subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines). No further requirements apply for such engines under this part. See this section in the Regulatory Discussion for requirements.

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the John Richards natural gas production facility (Well Pad) 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: n-Hexane, Benzene, Toluene, Ethylbenzene, and Xylenes. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 7: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
n-Hexane	VOC	No	Inadequate Data
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Toluene	VOC	No	Inadequate Data
Ethylbenzene	VOC	No	Category D - Not Classifiable
Xylenes	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 John Richards natural gas production facility (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 modification, modeling was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

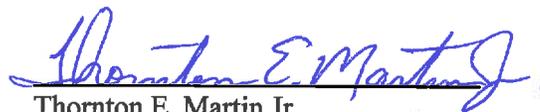
The following substantive monitoring, compliance demonstration, and record-keeping requirements (MRR) are required under the G70-A General Permit:

- For each gas well affected facility, compliance must be demonstrated by submitting reports of this permit and maintaining the records for each completion operation. Reporting requirements are defined in Section 5.4.1 of the general permit;
- Monitor on a monthly and yearly basis the aggregate throughput for the storage tanks;
- Monitor on a monthly and yearly basis the actual emissions from the storage tanks;

- Monitor on a monthly and yearly basis the emissions from each storage tank is below 6 tpy;
- Monitor on a monthly and yearly basis the amount of natural gas consumed in the heaters and the hours of operation;
- At the request of the Director, conduct Method 9 emission observations for the purpose of demonstrating compliance with 45CSR§2-3.1;
- Monitor the throughput on a monthly and yearly basis of the truck loading facility;
- Monitor the presence of the pilot flame using a thermocouple or any other equivalent device to detect the presence of a flame when emissions are vented to it once per calendar month;
- Conduct an initial visible emission check of the vapor combustor within 180 days of start-up to demonstrate compliance with 45CSR§6. Visible emission checks shall be in accordance with Method 22; and
- Maintain a closed vent system in accordance with Section 6.1.9. Initial inspect closed vent system within 180 days after startup and annually inspection after startup.

RECOMMENDATION TO DIRECTOR

The information provided in permit application G70-A071A indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of General Permit Registration G70-A071A to Antero Resources Corporation for the modification and operation of the John Richards natural gas production facility (Well Pad) located near Pullman, Ritchie County, WV.



Thornton E. Martin Jr.
Permit Engineer

January 08, 2016

Date