



**west virginia department of environmental protection**

Division of Air Quality  
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**ENGINEERING EVALUATION / FACT SHEET**

**BACKGROUND INFORMATION**

Application No.: G70-A094  
Plant ID No.: 051-00208  
Applicant: Chesapeake Appalachia LLC  
Facility Name: Van Aston Pad  
Location: Marshall County  
NAICS Code: 211111  
Application Type: Construction  
Received Date: September 9, 2014  
Engineer Assigned: David Keatley  
Fee Amount: \$4,000 (\$500 Class II GP, \$1,000 NSPS, and \$2,500 NESHAP)  
Date Fee Received: September 11, 2014 and October 1, 2014  
Complete Date: December 2, 2014  
Due Date: January 16, 2014  
Applicant Ad Date: September 12, 2014  
Newspaper: *Moundsville Daily Echo*  
UTM's: Easting: 529.89 km Northing: 4,410.95 km Zone: 17  
Description: Installation and operation of three (3) 145-bhp flash gas compressor engines, four (4) 1.0-mmBtu/hr gas production unit (GPU) burners, two (2) 0.5-mmBtu/hr heater treaters, one (1) 30-mmscfd TEG dehydration unit with associated 0.75 mmBtu/hr reboiler, five (5) 400-bbl condensate tanks, five (5) 400-bbl produced water tanks, and a 30 mmBtu/hr vapor combustor with associated three (3) 50 scfd pilots.

**DESCRIPTION OF PROCESS**

This facility produces natural gas and condensate. Raw natural gas (condensate, natural gas, and water) come from four (4) natural gas wells which are metered by wellheads. The raw natural gas is sent to four (4) mmBtu/hr gas product unit. The GPU burners heat the raw natural gas in the first step of separation. Natural gas from the GPU will be sent to a triethylene glycol (TEG) dehydration unit. The liquids from the GPUs are sent to two (2) 0.5-mmBtu/hr heater treaters. Flash

gases from the heater treaters are sent to flash gas compressors. After compression the flash gases are sent to a TEG dehydration unit. The flash gas compressors are powered by three (3) four-stroke rich-burn 145-bhp Caterpillar G3306 NA natural gas fired compressor engines. The produced water from the heater treaters is sent to five (5) 400-bbl produced water tanks. The condensate from the heater treaters is sent to two (2) low-pressure towers. The flash gases from the low-pressure towers are sent to the inlet side of the flash gas compressors. The liquid from the low-pressure towers flows to five (5) 400-bbl condensate tanks. Working, breathing, and flash vapors from the condensate and produced water tanks will be routed to a 30 mmBtu/hr MRW Technologies, Inc. vapor combustor. The vapor combustor will have three (3) 50-scfid pilots (150 scfd total) to ensure a constant flame to ensure a 98% control efficiency.

The natural gas stream from the GPUs and flash gas compressors will be routed to a triethylene glycol (TEG) dehydration unit to reduce water content. The 30 mmscf/day (maximum) natural gas will flow countercurrent to circulating TEG in a contactor. The dehydrated natural gas will exit the facility via pipeline. The rich TEG will first be sent to a flash tank to reduce hydrocarbons. The flash tank vapors will be controlled by the vapor combustor with a 96% control efficiency. Liquids from the flash tank will be sent to a regenerator to remove the water from the TEG. The regenerator is heated by a 0.75 mmBtu/hr reboiler. Vapors from the still vent will be controlled first by a condenser and then by the reboiler for a control efficiency of 50%.

## SITE INSPECTION

A site inspection was conducted by Alfred Carducci of DAQ's Compliance and Enforcement Sections Northern Panhandle Regional Office on November 17, 2014. The nearest residence is well over 1,000 feet from the center of the pad. Based on this the facility meets the G70-A siting criteria.

From the intersection of US 250 and SR 2 in Moundsville, travel east on US 250 for approximately 14.2 miles to the intersection of US 250 and CR 17 (Fork Ridge Road). Turn right onto CR 17 (Fork Ridge Road) and travel approximately 3.8 miles to CR 17/2 (Brushy Run). Travel approximately 0.7 miles on CR 17/2 and the road to the facility is on the left.

## ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Table 1: Calculation Methodology

Emission Unit ID#	Process Equipment	Calculation Methodology
EU-MC2071 EU-MC2536 EU-MC2548	145 bhp Caterpillar G3306 Flash Gas Compressor Engine w/ NSCR <sup>1</sup>	Manufacturer's Data/AP-42
EU-GPU1 Through EU-GPU4	1.0 MMBTU/hr Gas Production Unit Burners <sup>2</sup>	EPA AP-42 Emission Factors
EU-HT1 EU-HT2	0.5 MMBTU/hr Heater Treater <sup>2</sup>	EPA AP-42 Emission Factors
EU-DEHY1	30.0 mmscfd TEG Dehydration Unit <sup>3</sup>	GRI-GLYCalc 4.0 using inputs gas analysis from ProMax with a 20% to account for fluctuations in gas
EU-RB1	TEG Dehydration Unit Reboiler	EPA AP-42 Emission Factors
EU-TANKS-PW	Five (5) 400-bbl Produced Water Tanks <sup>3</sup>	Working & Breathing Losses, TANKS 4.0.9d Flashing Losses, ProMax
EU-LOAD-COND	Condensate Truck Loading <sup>4</sup>	EPA AP-42 Emission Factors
EU-LOAD-PW	Produced Water Truck Loading <sup>4</sup>	EPA AP-42 Emission Factors
APC-COMB-TKLD	30 mmBtu/hr Vapor Combustor <sup>5</sup>	EPA AP-42 Emission Factors, TCEQ Air Permit Technical Guidance, Mass Balance
EU-PILOT	Vapor Combustor Pilot	EPA AP-42 Emission Factors

<sup>1</sup> Per Caterpillar, NMNEHC emission factor does not include formaldehyde, therefore, NMNEHC and formaldehyde factors have been added to arrive at total VOC. In addition, per AP-42, all PM from combustion of natural gas (total, condensable, and filterable PM) is presumed < 1 micrometer.

<sup>2</sup> Per AP-42, all PM from combustion of natural gas (total, condensable, and filterable PM) is presumed < 1 micrometer.

<sup>3</sup> Maximum annual emissions based on average daily production with rolling daily throughput total not to exceed maximum annual throughput.

<sup>4</sup> Maximum hourly based on average hourly truck loading rate.

<sup>5</sup> NOx and CO emission factors are from TCEQ Air Permit Technical Guidance for Flares and Thermal Oxidizers. PM emission factors are from EPA AP-42.

Fugitive emissions for the facility are based on calculation methodologies presented in the 2009 American Petroleum Institute Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry. The factors presented in the API Compendium are for methane emissions. Therefore, the fugitive VOC and HAP emissions were calculated using a representative gas analysis and the weight percent of each respective pollutant.

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Table 2: Control Device Efficiencies

Emission Unit	Pollutant	Control Device	Control Efficiency
EU-MC2071 EU-MC2536 EU-MC2548 Compressor Engines	Nitrogen Oxides	Non Selective Catalytic Reduction (NSCR)	92.58 %
	Carbon Monoxide		85.15 %
EU-TANKS-COND, EU-TANKS-PW Storage Tanks	Volatile Organic Compounds	APC-COMB-TKLD	98.00 %
	Total HAPs		98.00 %
EU-LOAD-COND, EU-LOAD-PW Loadout Racks	Volatile Organic Compounds	Vapor Return/ APC-COMB-TKLD	69.00 %
EU-DEHY1	Volatile Organic Compounds	Condenser/EU-RB1	50%

Table 3: Estimated Maximum Controlled Air Emissions

Source ID	Emission Source	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
EU-MC2071	Flash Gas Compressor Engines	Nitrogen Oxides	0.64	2.80
		Carbon Dioxide	0.64	2.80
EU-MC2536	Caterpillar G3306 NA 145-bhp (Emissions from Each)	Volatile Organic Compounds	0.02	0.09
EU-MC2548		Total Particulate Matter	0.02	0.09
		Formaldehyde	0.02	0.09
		CO <sub>2</sub> e	156	680
EU-GPU1 through EU-GPU4	GPU Burner 1.00 MMBTU/hr (Emissions from Each)	Nitrogen Oxides	0.11	0.48
		Carbon Dioxide	0.09	0.39
		Volatile Organic Compounds	0.01	0.03
		Total Particulate Matter	0.01	0.04
		PM <sub>10</sub>	0.01	0.04
EU-HT1 and EU-HT2	Heater Treater 0.5 MMBTU/hr (Emissions from Each)	CO <sub>2</sub> e	117	513
		Nitrogen Oxides	0.06	0.26
		Carbon Monoxide	0.05	0.22
EU-DEHY1	TEG Dehydration Unit Still Vent 30 mmscfd	CO <sub>2</sub> e	59	257
		Volatile Organic Compounds	2.11	9.24
		Benzene	0.11	0.46
		Ethylbenzene	0.02	0.11
		n-Hexane	0.06	0.24
		Toluene	0.12	0.52
	Xylenes	0.06	0.27	

EU-RB1	TEG Dehydration Unit Reboiler 0.75 mmBtu/hr	Nitrogen Oxides	0.08	0.35
		Carbon Monoxide	0.07	0.31
		Volatile Organic Compounds	<0.01	0.02
		Total Particulate Matter	0.01	0.03
		CO <sub>2</sub> e	88	385
EP-TANKS-COND	Five (5) Condensate Tanks 400-bbl each	Volatile Organic Compounds	4.03	17.65
		Benzene	<0.01	0.02
		Ethylbenzene	0.03	0.12
		n-Hexane	0.22	0.97
		Toluene	0.03	0.12
EP-TANKS-PW	Five (5) Produced Water Tanks 400-bbl each	Xylenes	0.07	0.31
		Volatile Organic Compounds	1.94	8.48
		Benzene	<0.01	0.02
		Ethylbenzene	0.01	0.03
		n-Hexane	0.07	0.30
EP-LOAD-COND	Condensate Truck Loading 12,264,000 gallons/year	Toluene	0.01	0.05
		Xylenes	0.02	0.08
		Volatile Organic Compounds	3.68	16.12
		Benzene	<0.01	0.02
		Ethylbenzene	0.02	0.11
EP-LOAD-PW	Produced Water Truck Loading 15,330,000 gallons/year	n-Hexane	0.20	0.88
		CO <sub>2</sub> e	0.42	1.67
		Volatile Organic Compounds	0.01	0.03
		n-Hexane	<0.01	0.01
		CO <sub>2</sub> e	0.09	0.41
APC-COMB-TKLD	Vapor Combustor 30 mmBtu/hr	Nitrogen Oxides	4.14	18.13
		Carbon Monoxide	8.27	36.22
		Volatile Organic Compounds	6.02	26.37
		Total Particulate Matter	0.09	0.39
		Benzene	<0.01	0.04
		Ethylbenzene	0.02	0.15
		n-Hexane	0.22	1.27
		Toluene	0.04	0.17
		Xylenes	0.09	0.39
CO <sub>2</sub> e	3,513	15,387		
EU-PILOTS	Vapor Combustor Pilots 150 scf/hr total	Nitrogen Oxides	0.02	0.09
		Carbon Monoxide	0.01	0.06
		CO <sub>2</sub> e	16	70
EU-FUG	Fugitive Emissions	Volatile Organic Compounds	1.08	4.72
		CO <sub>2</sub> e	35	152

Table 4: Summarized Estimated Total Facility Wide Air Emissions

Pollutant	Maximum Annual Facility Wide Emissions (tons/year)
Nitrogen Oxides	29.42
Carbon Monoxide	47.00
Volatile Organic Compounds	87.39
Total Particulate Matter	7.31
PM <sub>10</sub>	7.31
Sulfur Dioxide	0.03
Formaldehyde	0.26
Benzene	0.58
Ethylbenzene	0.54
Toluene	0.99
Xylenes	1.40
n-Hexane	3.93
Total HAP Emissions	7.85
CO <sub>2,e</sub>	20,695

## REGULATORY APPLICABILITY

The following rules and regulations apply to the facility:

### **45CSR2** (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

The purpose of 45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers) 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 sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 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 (EU-GPU1 through EU-GPU4, EU-HT1, and EU-HT2) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However, CHK would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

#### **45CSR6 (To Prevent and Control Air Pollution from the Combustion of Refuse)**

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

CHK has one (1) vapor combustor at the Van Aston pad. The vapor combustor is subject to section 4, emission standards for incinerators. The vapor combustor has a maximum capacity of 0.15 tons/hr and an allowable emission rate of 0.82 pounds of particulate matter per hour. The vapor combustor has an hourly particulate matter emissions rate of 0.09 lb/hr. Therefore, the facility's vapor combustor should demonstrate compliance with this section. The facility will help demonstrate compliance by maintaining records of the amount of natural gas consumed by the vapor combustor and the hours of operation. 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 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, recordkeeping, 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 (EU-GPU1 through EU-GPU4, EU-HT1, and EU-HT2) 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)**

As can be seen from Table 4 several pollutants are above the 6lb/hr and 10 tons/year thresholds and this facility requires a Construction permit.

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

This facility is a minor source as can be seen in Table 4 and not subject to 45CSR30 since they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71. This facility has maximum horsepower capacity less than 1,000 hp (facility wide 435 hp) and is a 9M source and is required to pay the \$200 annual fee. CHK 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 (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.

*The four (4) gas wells that currently exist at the Van Aston Pad were drilled principally for the production of natural gas and were done so after August 23, 2011. Therefore, these wells would be considered affected facilities under this subpart. The compliance date for these hydraulically fractured wells is October 15, 2012. CHK is required under §60.5410 to submit an initial notification, initial annual report, maintain a log of records for each well completion, and maintain records of location and method of compliance. §60.5420 requires CHK demonstrate continuous compliance by submitting reports and maintaining records for each completion operation.*

- b. 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 are three (3) proposed reciprocating compressors located which will be located at the Roy Ferrell Pad. These compressors will be delivered after the effective date of this rule. However, §60.5365(c) states that 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. Therefore, all requirements regarding reciprocating compressors under 40 CFR 60 Subpart OOOO would not 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.

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.

*All storage vessels (TANKCOND and TANKPW) located at this facility would emit more than 6 tpy of VOC per tank uncontrolled (177 tpy each and 31.62 tpy respectively). CHK has proposed installing a vapor combustor to control 98% of the VOC emissions from the storage tanks, which makes this facility not subject to this section of this regulation.*

#### **40 CFR 63 Subpart HH - National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities**

On June 1, 2013 the DAQ took delegation of the area source provisions of 40 CFR 63, Subpart HH. This facility is a natural gas production facility that processes, upgrades, or stores natural gas prior to transmission. This facility is an area source of HAPs refer to the previous facility wide emissions table.

Pursuant to §63.760(b)(2), each glycol dehydration unit (GDU) located at an area source that meets the requirements under §63.760(a)(3) is defined as an affected facility under Subpart HH. The requirements for affected sources at area sources are given under §63.764(d). However, for a GDU, exemptions to these requirements are given under

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§63.764(e)(2) “actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram [1 TPY] per year.”

As can be seen above in Table 3, the maximum controlled PTE of benzene emissions from the GDU process vent is 0.46 tons/yr. Therefore, the GDU is exempt from the Subpart HH requirements given under §63.764(d).

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

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

The facility is a minor source of hazardous air pollutants (HAPS < 10 tpy of an individual HAP and < 25 tpy of aggregate HAPs) as can be seen in Table 4. The facility is therefore considered an area source (§63.6585(c)). The engine is considered new stationary RICE (§63.6590(a)(2)(iii)) due to the installation dates of the engines (EU-MC2071, EU-MC2536, and EU-MC2548) being after June 12, 2006.

Stationary RICE subject to Regulations under 40 CFR Part 60 must meet the requirements of those subparts that apply (40 CFR 60 Subpart JJJJ, for spark ignition engines) if the engine is a new stationary RICE located at an area source (§63.6590(c)(1)). No additional requirements apply for this engine under this subpart.

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

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

40CFR60 Subpart JJJJ sets forth emission limits, fuel requirements, installation requirements, and monitoring requirements based on the date of construction, date of manufacture, and horsepower (hp) of the spark ignition internal combustion engine. All proposed engines will commence construction after June 12, 2006.

Engines EU-MC2071, EU-MC2536, and EU-2548 were manufactured before July 1, 2008 and were operated at other facilities prior to July 1, 2010. Therefore, these engines are not subject to this regulation.

**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 CHK has proposed is not used to comply with one of these rules. 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 vapor combustors, which are essentially enclosed combustion devices. Therefore, CHK is not subject to this standard.

**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 CHK has proposed to install are 63.60 cubic meters each. Therefore, CHK would not be subject to this rule.

**TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS**

There will be small amounts of various regulated hazardous air pollutants emitted from the operation of this facility as seen in Table 3. The facility is a minor source of HAPs as can be seen in Table 4. If you want to obtain additional information about certain hazardous air pollutants feel free to visit [<http://www.epa.gov/ttn/atw/hlthef/hapindex.html>].

**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. It is recommended that Chesapeake Appalachia LLC should be granted a G70-A General Construction Permit Registration for Van Aston Wellpad.



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David Keatley  
Permit Writer - NSR Permitting

December 3, 2014

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Date

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