KLEINFELDER
Bright People. Right Solutions.

February 11, 2015

Assistant Director for Permitting
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

RE: Antero Resources Corporation – Jackson Well Pad
West Virginia Department of Environmental Protection, Division of Air Quality, G-70A General Air Permit Application

To Whom it May Concern,

On behalf of Antero Resources Corporation, please find attached the G-70A General Air Permit Application for the proposed Jackson Well Pad located in Ritchie County, West Virginia. Jackson Well Pad is a new source expected to begin construction on or around January 2016. Enclosed are copies of the entire permit application plus the original, including the permit application form and the required attachments. Per 45CSR13, a $1,500 application fee is also enclosed, which covers the Class II General Permit Registration $500 application fee and an additional $1,000 for NSPS requirements.

A copy of the Air Quality Permit Notice for the advertisement is included as Attachment J. As the Notice is being submitted simultaneously with the application, the official affidavit of publication will be submitted to the Division of Air Quality separately once it is completed.

Please call if you have any questions or if I can be of further assistance. I can be reached at (719)632-3593 or by email at kmeszaros@kleinfelder.com .

Sincerely,
Kleinfelder

Kaitlin Meszaros
Air Quality Specialist

Enclosures: Jackson Well Pad G-70A General Air Permit Application

1801 California Street, Suite 1100 ❖ Denver, CO 80202 ❖ 303.237.6601 ❖ fax 303.237.6602

Antero Resources Corporation

Jackson Well Pad

General Permit Application
West Virginia Department of Environmental Protection
Division of Air Quality
G-70A

Ritchie County, West Virginia

February 2015

Prepared by:

1801 California Street, Suite 1100
Denver, CO 80202
(303) 237-6601
Fax (303) 237-6602
www.kleinfelder.com

DEN15O12637

Table of Contents

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475 • *www.dep.wv.gov/daq*

APPLICATION FOR GENERAL PERMIT REGISTRATION

CONSTRUCT, MODIFY, RELOCATE OR ADMINISTRATIVELY UPDATE
A STATIONARY SOURCE OF AIR POLLUTANTS

Ξ CONSTRUCTION MODIFICATION RELOCATION CLASS I ADMINISTRATIVE UPDATE
CLASS II ADMINISTRATIVE UPDATE

CHECK WHICH TYPE OF GENERAL PERMIT REGISTRATION YOU ARE APPLYING FOR:

G10-D – Coal Preparation and Handling
G20-B – Hot Mix Asphalt
G30-D – Natural Gas Compressor Stations
G33-A – Spark Ignition Internal Combustion Engines
G35-A – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit)
G40-C – Nonmetallic Minerals Processing
G50-B – Concrete Batch
G60-C - Class II Emergency Generator
G65-C – Class I Emergency Generator
Ξ **G70-A –** Class II Oil and Natural Gas Production Facility

SECTION I. GENERAL INFORMATION

1. Name of applicant (as registered with the WV Secretary of State's Office):
Antero Resources Corporation

2. Federal Employer ID No. **(FEIN):**
80-0162034

3. Applicant's mailing address:
____1615 Wynkoop Street_____
_____Denver, CO 80202_____

4. Applicant's physical address:
__To access the pad from US-50 W, turn right onto Pullman Drive and follow for 1.6 miles. Turn right onto Eagle Drive, and then take the first right onto Collins Ave. Take the first left onto Rose Hill and continue for 1.0 miles. The entrance to the pad will be on the left.__

5. If applicant is a subsidiary corporation, please provide the name of parent corporation:

6. **WV BUSINESS REGISTRATION.** Is the applicant a resident of the State of West Virginia? Ξ **YES** **NO**

- IF **YES,** provide a copy of the Certificate of **Incorporation/ Organization / Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A**.
- IF **NO,** provide a copy of the **Certificate of Authority / Authority of LLC / Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A**.

SECTION II. FACILITY INFORMATION

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.): **Natural Gas Well Pad**

8a. Standard Industrial Classification AND 8b. North American Industry
Classification (SIC) code: **1311** System (NAICS) code: **211111**

9. DAQ Plant ID No. (for existing facilities only):
___ ___ ___ - ___ ___ ___ ___ ___

10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only):
_____
_____

A: PRIMARY OPERATING SITE INFORMATION

11A. Facility name of primary operating site:	12A. Address of primary operating site:
___**Jackson Well Pad**_____	Mailing: ___**Same as applicant address**_____ Physical:_____

13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? Ξ **YES** **NO**

– IF **YES**, please explain: __**Antero leases the mineral rights of the proposed site.**_____

– IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14A. – For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

– For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_To access the pad from US-50 W, turn right onto Pullman Drive and follow for 1.6 miles. Turn right onto Eagle Drive, and then take the first right onto Collins Ave. Take the first left onto Rose Hill and continue for 1.0 miles. The entrance to the pad will be on the left.___

15A. Nearest city or town:	16A. County:	17A. UTM Coordinates:
Pennsboro	**Ritchie**	Northing (KM): __**4349.154**_____ Easting (KM): __**501.615**_____ Zone: ____**17**_____

18A. Briefly describe the proposed new operation or change (s) to the facility:	19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
New construction	Latitude: _**39.29176**_____ Longitude: _**-80.98127**_____

B: 1ST ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits)

11B. Name of 1st alternate operating site:	12B. Address of 1st alternate operating site:
_____	Mailing:_____ Physical:_____

13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? **YES** **NO**

– IF **YES**, please explain: _____

– IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14B. – For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

– For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

C: 2ND ALTERNATE OPERATING SITE INFORMATION (only available for G20, G40, & G50 General Permits):

11C. Name of 2nd alternate operating site: _____ _____	12C. Address of 2nd alternate operating site: Mailing:_____ Physical:_____ _____

13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? **YES** **NO**

- IF **YES**, please explain: _____

_____

- IF **NO**, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.

14C. – For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

– For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP** as **Attachment F**.

_____

_____

_____

15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18C. Briefly describe the proposed new operation or change (s) to the facility:		19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

20. Provide the date of anticipated installation or change: **_1____/_1___/_2016____** ☐ If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: : _____/_____/_____	21. Date of anticipated Start-up if registration is granted: **__2____/__1____/_2016_____**

22. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).

Hours per day___**24**_____ Days per week ___**7**_____ Weeks per year ___**52**_____ Percentage of operation __**100%**_____

SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

24. Include a **Table of Contents** as the first page of your application package.

All of the required forms and additional information can be found under the Permitting Section (General Permits) of DAQ's website, or requested by phone.

25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

- Ξ ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
- Ξ ATTACHMENT B: PROCESS DESCRIPTION
- Ξ ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
- Ξ ATTACHMENT D: PROCESS FLOW DIAGRAM
- Ξ ATTACHMENT E: PLOT PLAN
- Ξ ATTACHMENT F: AREA MAP
- Ξ ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
- Ξ ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
- Ξ ATTACHMENT I: EMISSIONS CALCULATIONS
- Ξ ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
- ATTACHMENT K: ELECTRONIC SUBMITTAL
- Ξ ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
- ATTACHMENT M: SITING CRITERIA WAIVER
- Ξ ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
- Ξ ATTACHMENT O: EMISSIONS SUMMARY SHEETS
- Ξ OTHER SUPPORTING DOCUMENTATION NOT DESCRIBED ABOVE (Equipment Drawings, Aggregation Discussion, etc.)

Please mail an original and two copies of the complete General Permit Registration Application with the signature(s) to the DAQ Permitting Section, at the address shown on the front page of this application. Please DO NOT fax permit applications. For questions regarding applications or West Virginia Air Pollution Rules and Regulations, please refer to the website shown on the front page of the application or call the phone number also provided on the front page of the application.

SECTION IV. CERTIFICATION OF INFORMATION

This General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of a Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, Emission Inventory, Certified Emission Statement, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. Any administratively incomplete or improperly signed or unsigned Registration Application will be returned to the applicant.

FOR A CORPORATION (domestic or foreign)

I certify that I am a President, Vice President, Secretary, Treasurer or in charge of a principal business function of the corporation

FOR A PARTNERSHIP

I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

I certify that I am the President or a member of the Board of Directors

FOR A JOINT VENTURE

I certify that I am the President, General Partner or General Manager

FOR A SOLE PROPRIETORSHIP

I certify that I am the Owner and Proprietor

☒ *I hereby certify that* (please print or type) ***See Attachment R***

is an Authorized Representative and in that capacity shall represent the interest of the business (e.g., Corporation, Partnership, Limited Liability Company, Association Joint Venture or Sole Proprietorship) and may obligate and legally bind the business. If the business changes its Authorized Representative, a Responsible Official shall notify the Director of the Office of Air Quality immediately, and/or,

I hereby certify that all information contained in this General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible

Signature _____
(please use blue ink) Responsible Official Date

Name & Title _____
(please print or type)

Signature Barry S chatz 2/11/2014
(please use blue ink) Authorized Representative (if applicable) Date

Applicant's Name **Barry Schatz, Senior Environmental and Regulatory Manager**

Phone & Fax **303-357-7276** **303-357-7315**
Phone Fax

Email **bschatz@anteroresources.com**

Discussion of Nearby Facilities

Jackson Well Pad – Closest Antero Resources Corporation Facilities

1. Common Control: Only those facilities that are owned and managed by Antero were included in the aggregation discussion. This includes Antero Resources Corporation production facilities in addition to the Antero Midstream LLC midstream facilities.

2. SIC Code: The Jackson Well Pad will operate under SIC code 1311 (crude oil and natural gas). The closest facility owned by Antero Resources Corporation with this SIC code is a well pad 0.5 miles northeast of the Facility. All Antero Midstream LLC midstream facilities operate under the SIC code of 4922 (pipeline transportation of natural gas).

3. Continuous or Adjacent: The land between the Jackson Well Pad and its nearest facility operating under the same SIC code is not owned or managed by Antero Resources Corporation. Therefore, the facilities are not considered to be adjacent or continuous.

Based on this three-pronged evaluation, there are no other existing facilities that should aggregate emissions with Jackson Well Pad.

Attachment A.
Business Certificate

State of West Virginia

Certificate

I, Natalie E. Tennant, Secretary of State of the State of West Virginia, hereby certify that

ANTERO RESOURCES CORPORATION

a corporation formed under the laws of Delaware, which is authorized to transact business in West Virginia by a Certificate of Authority has filed in my office as required by the provisions of the West Virginia Code, a copy of an amendment to its Articles of Incorporation authenticated by the proper office of the state or country of its incorporation and was found to conform to law.

Therefore, I issue this

CERTIFICATE OF AMENDMENT TO CERTIFICATE OF AUTHORITY

Given under my hand and the Great Seal of the State of West Virginia on this day of June 10, 2013

Natalie E Tennant

Secretary of State

Attachment B.
Process Description

Attachment B
Jackson Well Pad – Process Description

The proposed Jackson Well Pad will be located in Ritchie County, West Virginia. The facility will consist of ten (10) wells, ten (10) gas production units (GPUs) each with a 1.5 MMBtu/hr heater, ten (10) 400-bbl condensate tanks, two (2) 400-bbl produced water tanks, one (1) 24 horsepower (hp) Kubota DG972-E2 compressor engine, and one (1) Abutec combustor for tank emissions control.

Extracted production fluids from the wellheads will enter the facility and be directed to their corresponding GPU (GPU-01 through GPU-10) where the separation of gas, water, and condensate occurs. Separated gas is sent to the 24 hp compressor engine (CE-01) where it is compressed to a pressure suitable for pipeline. The gas is then metered and sent to sales. Separated condensate is directed to one of ten (10) condensate tanks (T01 through T10). The separated water is sent to one of two (2) produced water tanks (T11 and T12). As needed, condensate and produced water are loaded out via tanker trucks.

Gas off of the condensate and produced water tanks is routed to the combustor (FL-01). It is conservatively assumed the combustor has 98% destruction efficiency.

Fugitive emissions also occur from component leaks and from haul road dust from onsite truck traffic.

Sources of emissions from the well pad include:

- GPU Heaters: NOx, CO, VOC, SOx, PM_{10}, $PM_{2.5}$, HAPs, CO_2e
- Condensate Storage Tanks: VOC, HAPs, CO_2e
- Produced Water Storage Tanks: VOC, HAPs, CO_2e
- Combustor: NOx, CO, VOC, SOx, PM_{10}, $PM_{2.5}$, HAPs, CO_2e
- Compressor Engine: NOx, CO, VOC, SOx, PM_{10}, $PM_{2.5}$, HAPs, CO_2e
- Truck Loading: VOC, HAPs, CO_2e
- Fugitive Component Leaks: VOC, HAPs, CO_2e
- Fugitive Dust: PM_{10}, $PM_{2.5}$

<u>Representative Samples</u>

The Blanche No. 1H hydrocarbon liquid was used as a representative sample for the Jackson Well Pad. Both sites are located in wet gas areas within the Marcellus formation. The Blanche No. 1H is of the same field as the wells planned for the Jackson Well Pad and in the same county (Ritchie). The API and RVP of the condensate are expected to be similar to the wells of the Jackson Well Pad.

The Hendershot 1H gas sample was used as a representative sample for the Jackson Well Pad. Both sites are located in wet gas areas within the Marcellus formation. The Hendershot 1H gas sample is of the same field as the wells planned for the Jackson Well Pad and in the same county (Ritchie). The heating value of the Hendershot 1H gas sample (1,250 Btu/scf) is expected to be similar to the wells of the proposed Jackson Well Pad.

Attachment C.
Description of Fugitive Emissions

Attachment C
Jackson Well Pad – Description of Fugitive Emissions

The fugitive emissions that will occur at the Jackson Well Pad include:

1. Equipment leaks – components in gas service and light liquid service

Each piece of equipment onsite are fitted with components such as flanges, valves, connectors, open-ended lines, and pressure relief valves to ensure a safe and efficient production process. These components are designed to have a small amount of gas vent to the atmosphere. The component counts were estimated using Table W-1B of 40 CFR Part 98 Subpart W for equipment in natural gas service. Weight fractions of specific pollutant components were retrieved from a gas analysis of a nearby well and from the ProMax output of the flashing gas evolved from the hydrocarbon liquid.

2. Haul road emissions – truck traffic

The gravel access road allowing entry and exit onto the well pad is not paved. Truck travel on the gravel access road results in the dislodging of particulates from the road and lifting dust to the atmosphere. It is assumed no more than one condensate tanker truck, six produced water tanker trucks, and two light-duty pickup trucks will drive onsite per day. The gravel access road distance is expected to be 250 feet.

Equipment Leaks

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components[1]	Number of Components Monitored by Frequency[2]	Average Time to Repair (days)[3]	Estimated Annual Emission Rate (lb/yr)[4]
Pumps[5]	light liquid VOC[6,7]				
	Non-VOC[9]				
Valves[10]	Gas VOC	185		1st attempt – 5 days Final repair – 15 days	3,114.0
	Light Liquid VOC	93		1st attempt – 5 days Final repair – 15 days	2,736.4
Safety Relief Valves[11]	Gas VOC				
	Non VOC				
Open-ended Lines[12]	Gas VOC	10		1st attempt – 5 days Final repair – 15 days	74.8
	Light Liquid VOC	5		1st attempt – 5 days Final repair – 15 days	82.4
Sampling Connections[13]	VOC				
	Non-VOC				
Connectors	Gas VOC	527		1st attempt – 5 days Final repair – 15 days	394.3
	Light Liquid VOC	264		1st attempt – 5 days Final repair – 15 days	652.5
Flanges	Gas VOC	80		1st attempt – 5 days Final repair – 15 days	116.7
	Light Liquid VOC	40		1st attempt – 5 days Final repair – 15 days	51.8
Other	Gas VOC	4		1st attempt – 5 days Final repair – 15 days	131.7
	Light Liquid VOC	2		1st attempt – 5 days Final repair – 15 days	176.5
	Non-VOC				

[1 - 13] See notes on the following page.

Notes for Leak Source Data Sheet

1. For VOC sources include components on streams and equipment that contain greater than 10% w/w VOC, including feed streams, reaction/separation facilities, and product/by-product delivery lines. Do not include certain leakless equipment as defined below by category.

2. By monitoring frequency, give the number of sources routinely monitored for leaks, using a portable detection device that measures concentration in ppm. Do not include monitoring by visual or soap-bubble leak detection methods. "M/Q(M)/Q/SA/A/O" means the time period between inspections as follows:

   Monthly/Quarterly, with Monthly follow-up of repaired leakers/Quarterly/Semi-annual/Annually/Other (specify time period)

   If source category is not monitored, a single zero in the space will suffice. For example, if 50 gas-service valves are monitored quarterly, with monthly follow-up of those repaired, 75 are monitored semi-annually, and 50 are checked bimonthly (alternate months), with non checked at any other frequency, you would put in the category “valves, gas service:” 0/50/0/75/0/50 (bimonthly).

3. Give the average number of days, after a leak is discovered, that an attempt will be made to repair the leak.

4. Note the method used: MB - material balance; EE - engineering estimate; EPA - emission factors established by EPA (cite document used); O - other method, such as in-house emission factor (specify).

5. Do not include in the equipment count sealless pumps (canned motor or diaphragm) or those with enclosed venting to a control device. (Emissions from vented equipment should be included in the estimates given in the Emission Points Data Sheet.)

6. Volatile organic compounds (VOC) means the term as defined in 40 CFR □51.100 (s).

7. A light liquid is defined as a fluid with vapor pressure equal to or greater than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if 20% w/w or more of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a light liquid.

8. A heavy liquid is defined as a fluid with a vapor pressure less than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if less than 20% w/w of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a heavy liquid.

9. LIST CO, H_2S, mineral acids, NO, NO_2, SO_3, etc. DO NOT LIST CO_2, H_2, H_2O, N_2, O_2, and Noble Gases.

10. Include all process valves whether in-line or on an open-ended line such as sample, drain and purge valves. Do not include safety-relief valves, or leakless valves such as check, diaphragm, and bellows seal valves.

11. Do not include a safety-relief valve if there is a rupture disk in place upstream of the valve, or if the valve vents to a control device.

12 Open-ended lines include purge, drain and vent lines. Do not include sampling connections, or lines sealed by plugs, caps, blinds or second valves.

13. Do not include closed-purge sampling connections.

Haul Road Dust

Attachment L
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	4.8	4.8
p =	Number of days per year with precipitation >0.01 in.	160	160

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Condensate Tank Truck	4	40	--	0.09	1	365	NA	NA
2	Produced Water Tank Truck	4	40	--	0.09	1	2,190	NA	NA
3	Pick-up Trucks	4	3	--	0.09	2	730	NA	NA
4									
5									
6									
7									
8									

Source: *AP-42 Fifth Edition – 13.2.2 Unpaved Roads*

$E = k \times 5.9 \times (s \div 12) \times (S \div 30) \times (W \div 3)^{0.7} \times (w \div 4)^{0.5} \times ((365 - p) \div 365) =$ lb/Vehicle Mile Traveled (VMT)

Where:

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	4.8	4.8
S =	Mean vehicle speed (mph)	---	---
W =	Mean vehicle weight (tons)	31.8	31.8
w =	Mean number of wheels per vehicle	4	4
p =	Number of days per year with precipitation >0.01 in.	160	160

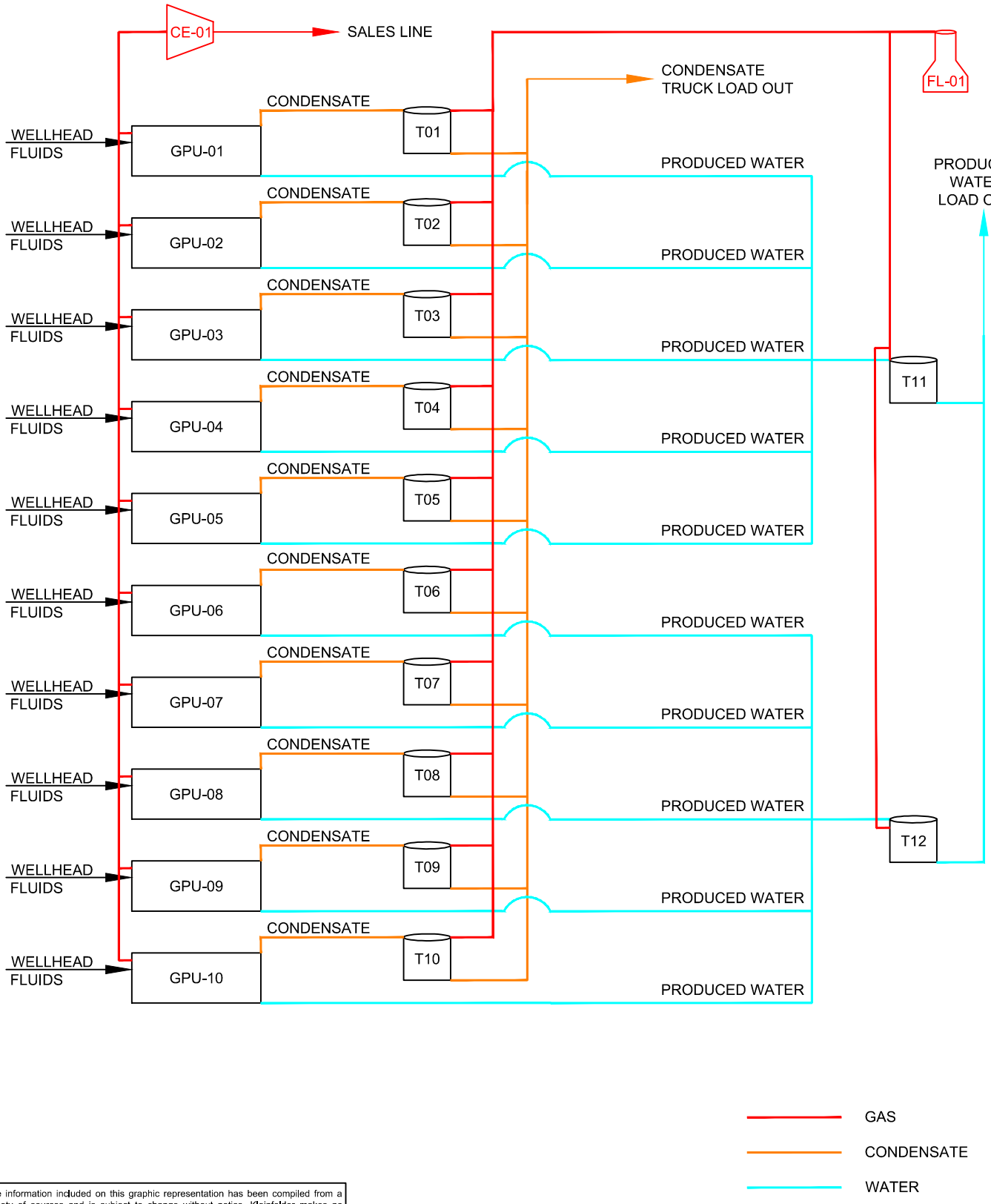
For lb/hr: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] = lb/hr

For TPY: [lb ÷ VMT] × [VMT ÷ trip] × [Trips ÷ Hour] × [Ton ÷ 2000 lb] = Tons/year

SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	0.15	0.65	0.15	0.65	0.04	0.17	0.04	0.17
2	0.15	0.65	0.15	0.65	0.04	0.17	0.04	0.17
3								
4								
5								
6								
7								
8								
TOTALS								

Attachment D.
Process Flow Diagram



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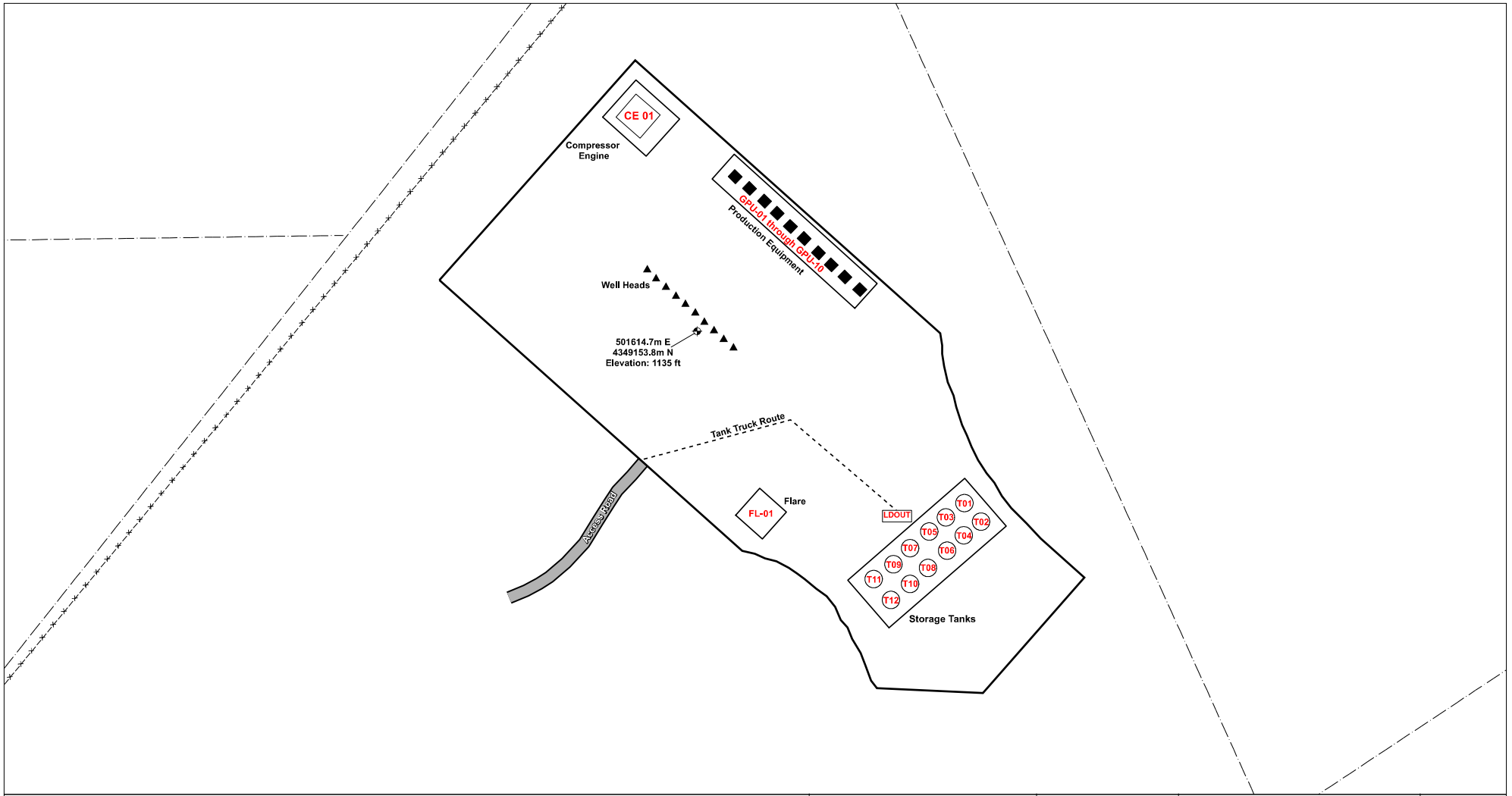
PROJECT NO.	20153889
DRAWN BY:	PAF
CHECKED BY:	KM
DATE:	12/31/2014
REVISED:	

ANTERO RESOURCES CORPORATION

Jackson Well Pad
Process Flow Diagram

1

Attachment E.
Plot Plan



0 50 100 200 Feet

Legend

- Well Pad
- Access Road
- Property Line
- Fence

N

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www.kleinfelder.com

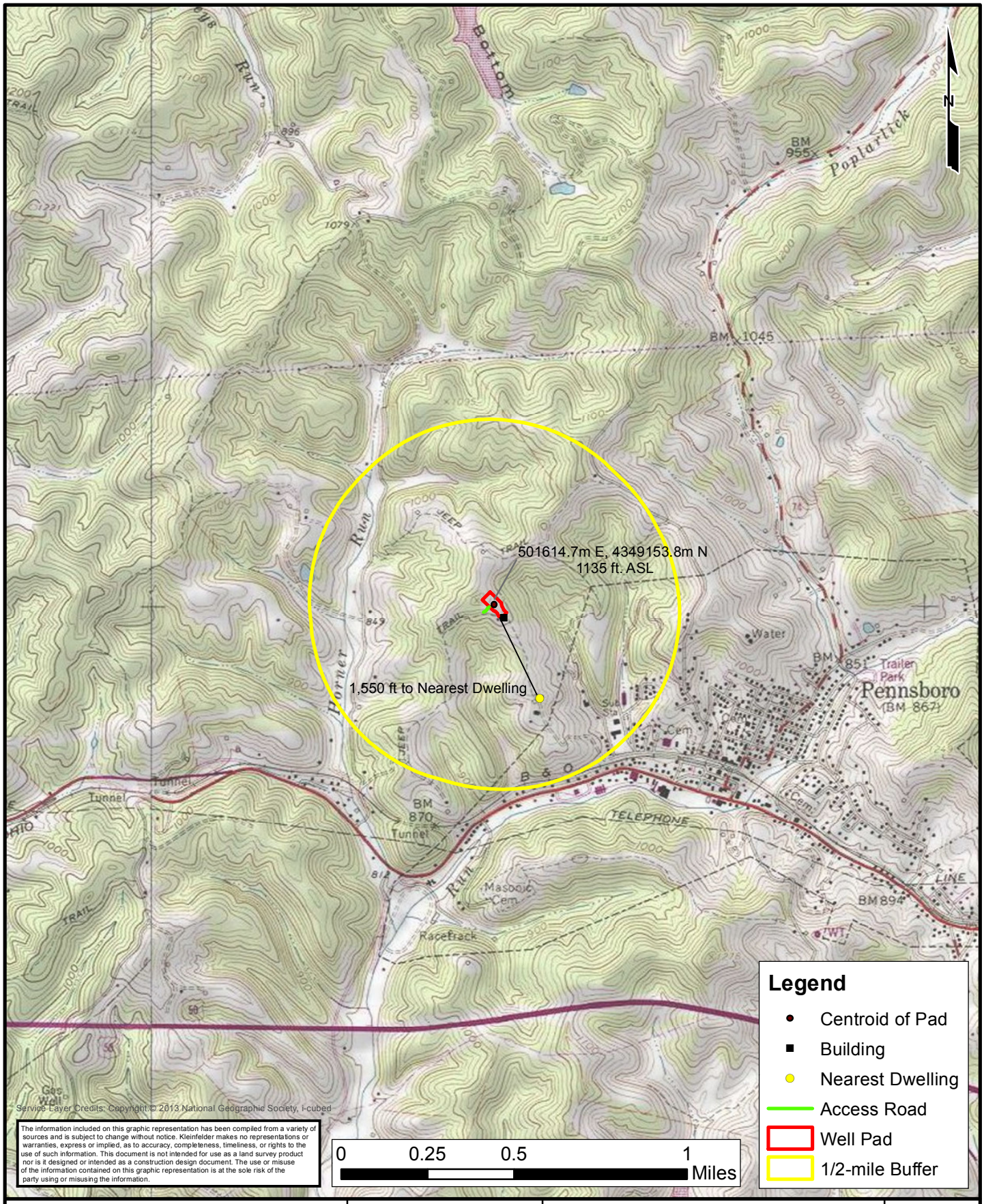
PROJECT NO.	20153889
DRAWN:	1/27/2015
DRAWN BY:	B. McDavid
CHECKED BY:	K. Meszaros
FILE NAME:	JacksonWellPad.mxd

Antero Resources Corporation

Jackson Well Pad
Ritchie County, West Virginia
Plot Plan

FIGURE
1

Attachment F.
Area Map



KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	20153889
DRAWN:	1/27/2015
DRAWN BY:	J. Weber
CHECKED BY:	K. Meszaros
FILE NAME:	AnteroJackson_ProjectLocation.mxd

Antero Resources Corporation

Jackson Well Pad
Ritchie County, West Virginia

FIGURE
1

Attachment G.
Emission Unit Data Sheets

Registration Section Applicability Form

General Permit G70-A Registration
Section Applicability Form

General Permit G70-A was developed to allow qualified applicants to seek registration for a variety of sources. These sources include natural gas well affected facilities, storage tanks, natural gas-fired compressor engines (RICE), natural gas producing units, natural gas-fired in-line heaters, pneumatic controllers, heater treaters, tank truck loading, glycol dehydration units, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

General Permit G70-A allows the registrant to choose which sections of the permit they are seeking registration under. Therefore, please mark which additional sections that you are applying for registration under. If the applicant is seeking registration under multiple sections, please select all that apply. Please keep in mind, that if this registration is approved, the issued registration will state which sections will apply to your affected facility.

Section 5	Natural Gas Well Affected Facility	☒
Section 6	Storage Vessels*	☒
Section 7	Gas Producing Units, In-Line Heaters, Heater Treaters, and Glycol Dehydration Reboilers	☒
Section 8	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO)	☐
Section 9	*Reserved*	☐
Section 10	Natural gas-fired Compressor Engine(s) (RICE) **	☒
Section 11	Tank Truck Loading Facility ***	☒
Section 12	Standards of Performance for Storage Vessel Affected Facilities (NSPS, Subpart OOOO)	☐
Section 13	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS, Subpart JJJJ)	☒
Section 14	Control Devices not subject to NSPS, Subpart OOOO	☒
Section 15	National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (40CFR63, Subpart ZZZZ)	☒
Section 16	Glycol Dehydration Units	☐
Section 17	Dehydration Units With Exemption from NESHAP Standard, Subpart HH § 63.764(d) (40CFR63, Subpart HH)	☐
Section 18	Dehydration Units Subject to NESHAP Standard, Subpart HH and Not Located Within an UA/UC (40CFR63, Subpart HH)	☐
Section 19	Dehydration Units Subject to NESHAP Standard, Subpart HH and Located Within an UA/UC (40CFR63, Subpart HH)	☐

* *Applicants that are subject to Section 6 may also be subject to Section 12 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 14.*

** *Applicants that are subject to Section 10 may also be subject to the applicable RICE requirements of Section 13 and/or Section 15.*

*** *Applicants that are subject to Section 11 may also be subject to control device requirements of Section 14.*

Emission Units Table

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type[3] and Date of Change	Control Device[4]
T01	1E	Condensate Storage Tank #1	2015	400 bbl	New	FL-01 (1C)
T02	2E	Condensate Storage Tank #2	2015	400 bbl	New	FL-01 (1C)
T03	3E	Condensate Storage Tank #3	2015	400 bbl	New	FL-01 (1C)
T04	4E	Condensate Storage Tank #4	2015	400 bbl	New	FL-01 (1C)
T05	5E	Condensate Storage Tank #5	2015	400 bbl	New	FL-01 (1C)
T06	6E	Condensate Storage Tank #6	2015	400 bbl	New	FL-01 (1C)
T07	7E	Condensate Storage Tank #7	2015	400 bbl	New	FL-01 (1C)
T08	8E	Condensate Storage Tank #8	2015	400 bbl	New	FL-01 (1C)
T09	9E	Condensate Storage Tank #9	2015	400 bbl	New	FL-01 (1C)
T10	10E	Condensate Storage Tank #10	2015	400 bbl	New	FL-01 (1C)
T11	11E	Produced Water Storage Tank #1	2015	400 bbl	New	FL-01 (1C)
T12	12E	Produced Water Storage Tank #2	2015	400 bbl	New	FL-01 (1C)
CE-01	13E	Compressor Engine	2015	24 hp	New	None
GPU-01	14E	Gas Production Unit Heater #1	2015	1.5 MMBtu/hr	New	None
GPU-02	15E	Gas Production Unit Heater #2	2015	1.5 MMBtu/hr	New	None
GPU-03	16E	Gas Production Unit Heater #3	2015	1.5 MMBtu/hr	New	None
GPU-04	17E	Gas Production Unit Heater #4	2015	1.5 MMBtu/hr	New	None
GPU-05	18E	Gas Production Unit Heater #5	2015	1.5 MMBtu/hr	New	None
GPU-06	19E	Gas Production Unit Heater #6	2015	1.5 MMBtu/hr	New	None
GPU-07	20E	Gas Production Unit Heater #7	2015	1.5 MMBtu/hr	New	None
GPU-08	21E	Gas Production Unit Heater #8	2015	1.5 MMBtu/hr	New	None
GPU-09	22E	Gas Production Unit Heater #9	2015	1.5 MMBtu/hr	New	None
GPU-10	23E	Gas Production Unit Heater #10	2015	1.5 MMBtu/hr	New	None
FL-01	24E/1C	Combustor	2015	17 MMBtu/hr	New	FL-01 (1C)
LDOUT	25E	Production Liquids Truck Loadout	2015	5,200 bbl/day	New	None

[1] For Emission Units (or Sources) use the following numbering system:1S, 2S, 3S,... or other appropriate designation.
[2] For Emission Points use the following numbering system:1E, 2E, 3E, ... or other appropriate designation.
[3] New, modification, removal
[4] For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

Natural Gas Well

NATURAL GAS WELL AFFECTED FACILITY DATA SHEET

Complete this data sheet if you are the owner or operator of a gas well affected facility for which construction, modification, or reconstruction commenced after August 23, 2011. This form must be completed for natural gas well affected facilities regardless of when flowback operations occur (or have occurred).

Please provide the API number(s) for each NG well at this facility:	
Wells have not been drilled yet and are expected to be completed in early 2016. At that time, the API of those wells will be provided.	

Note: This is the same API well number(s) provided in the well completion notification and as provided to the WVDEP, Office of Oil and Gas for the well permit. The API number may be provided on the application without the state code (047).

Every oil and gas well permitted in West Virginia since 1929 has been issued an API (American Petroleum Institute) number. This 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.

Storage Tanks

STORAGE VESSEL EMISSION UNIT DATA SHEET

Provide the following information for each new or modified bulk liquid storage tank.

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name **Production Storage Tanks**	2. Tank Name **Condensate Storage Tank #1 through Condensate Storage Tank #10**
3. Emission Unit ID number **T01 through T10**	4. Emission Point ID number **1E through 10E**
5. Date Installed or Modified *(for existing tanks)*	6. Type of change: ☒ New construction ☐ New stored material ☐ Other
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.) **None**	

II. TANK INFORMATION (required)

8. Design Capacity *(specify barrels or gallons)*. Use the internal cross-sectional area multiplied by internal height. **400 barrels**	
9A. Tank Internal Diameter (ft.) **12**	9B. Tank Internal Height (ft.) **20**
10A. Maximum Liquid Height (ft.) **19**	10B. Average Liquid Height (ft.) **10**
11A. Maximum Vapor Space Height (ft.) **1**	11B. Average Vapor Space Height (ft.) **10**
12. Nominal Capacity *(specify barrels or gallons)*. This is also known as "working volume. **380 barrels**	
13A. Maximum annual throughput (gal/yr) **613,200 per tank**	13B. Maximum daily throughput (gal/day) **1,680 per tank**
14. Number of tank turnovers per year **38.15 per tank**	15. Maximum tank fill rate (gal/min) **TBD**
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☒ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☒ Fixed Roof _**X**_ vertical ___ horizontal ___ flat roof ___ cone roof _**X**_ dome roof ___ other (describe) ☐ External Floating Roof ___ pontoon roof ___ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ___ vertical column support ___ self-supporting ☐ Variable Vapor Space ___ lifter roof ___ diaphragm ☐ Pressurized ___ spherical ___ cylindrical ☐ Underground ☐ Other (describe)	

III. TANK CONSTRUCTION AND OPERATION INFORMATION *(check which one applies)*

☐ Refer to enclosed TANKS Summary Sheets
☒ Refer to the responses to items 19 – 26 in section VII

IV. SITE INFORMATION *(check which one applies)*

☐ Refer to enclosed TANKS Summary Sheets
☒ Refer to the responses to items 27 – 33 in section VII

V. LIQUID INFORMATION *(check which one applies)*

☐ Refer to enclosed TANKS Summary Sheets
☒ Refer to the responses to items 34 – 39 in section VII

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):

☐ Does Not Apply
☐ Carbon Adsorption[1]
☒ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers)
☐ Condenser[1]
☐ Other[1] (describe)
☐ Rupture Disc (psig)
☐ Inert Gas Blanket of _____
☐ Conservation Vent (psig
Vacuum Setting Pressure Setting
☐ Emergency Relief Valve (psig)

[1] Complete appropriate Air Pollution Control Device Sheet

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name and CAS No.	**Flashing Loss**		**Breathing Loss**		**Working Loss**		**Total Emissions Loss**		**Estimation Method[1]**
	lb/hr	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	**lb/hr**	**tpy**	
VOC (controlled values) **per tank	0.23	1.01	0.02	0.07	Included in breathing loss		0.25	1.08	O – ProMax Simulation

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)
Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

SECTION VII (required if did not provide TANKS Summary Sheets)

TANK CONSTRUCTION AND OPERATION INFORMATION

19. Tank Shell Construction:
☒ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color: **Green**	20B. Roof Color: **Green**	20C. Year Last Painted: **NA**

21. Shell Condition (if metal and unlined):
☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ Yes ☒ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig): **-0.03 to 0.03 psig**

24. Is the tank a **Vertical Fixed Roof Tank**? ☒ Yes ☐ No	24A. If yes, for dome roof provide radius (ft): **6 feet**	24B. If yes, for cone roof, provide slop (ft/ft):

25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☒

25A. Year Internal Floaters Installed:

25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):

25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☒ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded		26B. For bolted decks, provide deck construction:	
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: **Charleston, West Virginia**			
28. Daily Avg. Ambient Temperature (°F): **54.98**		29. Annual Avg. Maximum Temperature (°F): **65.75**	
30. Annual Avg. Minimum Temperature (°F): **44.22**		31. Avg. Wind Speed (mph): **6.05**	
32. Annual Avg. Solar Insulation Factor (BTU/ft^2-day): **1,250.6**		33. Atmospheric Pressure (psia): **14.25**	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): **58.06**	34A. Minimum (°F): **53.60**	34B. Maximum (°F): **71.72**	
35. Avg. operating pressure range of tank (psig): **0**	35A. Minimum (psig): **-0.03**	35B. Maximum (psig): **0.03**	
36A. Minimum liquid surface temperature (°F): **53.60**		36B. Corresponding vapor pressure (psia): **4.82**	
37A. Avg. liquid surface temperature (°F): **62.51**		37B. Corresponding vapor pressure (psia): **6.43**	
38A. Maximum liquid surface temperature (°F): **71.72**		38B. Corresponding vapor pressure (psia): **8.04**	
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	**Condensate**		
39B. CAS number:			
39C. Liquid density (lb/gal):			
39D. Liquid molecular weight (lb/lb-mole):	**112.72**		
39E. Vapor molecular weight (lb/lb-mole):	**35.35**		
39F. Maximum true vapor pressure (psia):	**8.04**		
39G. Maxim Reid vapor pressure (psia):	**8.2**		
39H. Months Storage per year. From: To:	**January** **December**		

STORAGE VESSEL EMISSION UNIT DATA SHEET

Provide the following information for each new or modified bulk liquid storage tank.

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name **Production Storage Tanks**	2. Tank Name **Produced Water Storage Tank #1 and Produced Water Storage Tank #2**
3. Emission Unit ID number **T11 and T12**	4. Emission Point ID number **11E and 12E**
5. Date Installed or Modified *(for existing tanks)*	6. Type of change: ☒ New construction ☐ New stored material ☐ Other
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.) **None**	

II. TANK INFORMATION (required)

8. Design Capacity *(specify barrels or gallons)*. Use the internal cross-sectional area multiplied by internal height. **400 barrels**	
9A. Tank Internal Diameter (ft.) **12**	9B. Tank Internal Height (ft.) **20**
10A. Maximum Liquid Height (ft.) **19**	10B. Average Liquid Height (ft.) **10**
11A. Maximum Vapor Space Height (ft.) **1**	11B. Average Vapor Space Height (ft.) **10**
12. Nominal Capacity *(specify barrels or gallons)*. This is also known as "working volume. **380 barrels**	
13A. Maximum annual throughput (gal/yr) **36,792,000 per tank**	13B. Maximum daily throughput (gal/day) **100,800 per tank**
14. Number of tank turnovers per year **2,190 per tank**	15. Maximum tank fill rate (gal/min) **TBD**
16. Tank fill method ☐ Submerged ☒ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☒ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☒ Fixed Roof _**X**_ vertical ___ horizontal ___ flat roof ___ cone roof _**X**_ dome roof ___ other (describe) ☐ External Floating Roof ___ pontoon roof ___ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ___ vertical column support ___ self-supporting ☐ Variable Vapor Space ___ lifter roof ___ diaphragm ☐ Pressurized ___ spherical ___ cylindrical ☐ Underground ☐ Other (describe)	

III. TANK CONSTRUCTION AND OPERATION INFORMATION *(check which one applies)*

☐ Refer to enclosed TANKS Summary Sheets
☒ Refer to the responses to items 19 – 26 in section VII

IV. SITE INFORMATION *(check which one applies)*

☐ Refer to enclosed TANKS Summary Sheets

☒ Refer to the responses to items 27 – 33 in section VII

V. LIQUID INFORMATION *(check which one applies)*

☐ Refer to enclosed TANKS Summary Sheets

☒ Refer to the responses to items 34 – 39 in section VII

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):

☐ Does Not Apply
☐ Carbon Adsorption[1]
☒ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers)
☐ Condenser[1]
☐ Other[1] (describe)
☐ Rupture Disc (psig)
☐ Inert Gas Blanket of _____
☐ Conservation Vent (psig
Vacuum Setting Pressure Setting
☐ Emergency Relief Valve (psig)

[1] Complete appropriate Air Pollution Control Device Sheet

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name and CAS No.	Flashing Loss		Breathing Loss		Working Loss		Total Emissions Loss		Estimation Method[1]
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
VOC (controlled values) *per tank	0.07	0.30	0.002	0.01	Included in breathing loss		0.07	0.31	O – ProMax Simulation

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets and other modeling summary sheets if applicable.

SECTION VII (required if did not provide TANKS Summary Sheets)

TANK CONSTRUCTION AND OPERATION INFORMATION

19. Tank Shell Construction:
☒ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☐ Other (describe)

20A. Shell Color: **Green**	20B. Roof Color: **Green**	20C. Year Last Painted: **NA**

21. Shell Condition (if metal and unlined):
☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable

22A. Is the tank heated? ☐ Yes ☒ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?

23. Operating Pressure Range (psig): **-0.03 to 0.03 psig**

24. Is the tank a **Vertical Fixed Roof Tank**? ☒ Yes ☐ No	24A. If yes, for dome roof provide radius (ft): **6 feet**	24B. If yes, for cone roof, provide slop (ft/ft):

25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☒

25A. Year Internal Floaters Installed:

25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal

☐ Vapor mounted resilient seal ☐ Other (describe):			
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☒ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded		26B. For bolted decks, provide deck construction:	
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: **Charleston, West Virginia**			
28. Daily Avg. Ambient Temperature (°F): **54.98**		29. Annual Avg. Maximum Temperature (°F): **65.75**	
30. Annual Avg. Minimum Temperature (°F): **44.22**		31. Avg. Wind Speed (mph): **6.05**	
32. Annual Avg. Solar Insulation Factor (BTU/ft^2-day): **1,250.6**		33. Atmospheric Pressure (psia): **14.25**	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): **58.06**	34A. Minimum (°F): **53.60**	34B. Maximum (°F): **71.72**	
35. Avg. operating pressure range of tank (psig): **0**	35A. Minimum (psig): **-0.03**	35B. Maximum (psig): **0.03**	
36A. Minimum liquid surface temperature (°F): **53.60**		36B. Corresponding vapor pressure (psia): **0.22**	
37A. Avg. liquid surface temperature (°F): **62.51**		37B. Corresponding vapor pressure (psia): **0.30**	
38A. Maximum liquid surface temperature (°F): **71.72**		38B. Corresponding vapor pressure (psia): **0.37**	
39. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
39A. Material name and composition:	**Produced Water**		
39B. CAS number:			
39C. Liquid density (lb/gal):			
39D. Liquid molecular weight (lb/lb-mole):	**18.02**		
39E. Vapor molecular weight (lb/lb-mole):	**20.83**		
39F. Maximum true vapor pressure (psia):	**0.30**		
39G. Maxim Reid vapor pressure (psia):	**1**		
39H. Months Storage per year. From: To:	**January** **December**		

Compressor Engine

NATURAL GAS-FIRED COMPRESSOR ENGINE (RICE)
EMISSION UNIT DATA SHEET

Complete this section for any natural gas-fired reciprocating internal combustion engine.

Emission Unit (Source) ID No.[1]		CE-01		
Emission Point ID No. [2]		13E		
Engine Manufacturer and Model		Kubota DG972-E2		
Manufacturer's Rated bhp/rpm		24 hp/ 3600 rpm		
Source Status[3]		NS		
Date Installed/Modified/Removed[4]		Late 2015		
Engine Manufactured/Reconstruction Date[5]		2013		
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes		
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No)[6]		Yes		
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes		
Engine, Fuel and Combustion Data	Engine Type[7]	RB4S		
	APCD Type[8]	NA		
	Fuel Type[9]	RG		
	H_2S (gr/100 scf)	0		
	Operating bhp/rpm	24 hp/ 3600 rpm		
	BSFC (Btu/bhp-hr)	0.5 lb/hp-hr		
	Fuel throughput (ft^3/hr)	244		
	Fuel throughput ($MMft^3$/yr)	2.14		
	Operation (hrs/yr)	8760		
Reference[10]	Potential Emissions[11]	lbs/hr	tons/yr	
MD	NO_X	0.32	1.38	
AP	CO	1.03	4.50	
AP	VOC	0.01	0.04	
AP	SO_2	0.0002	0.001	
AP	PM_{10}	0.01	0.02	
AP	Formaldehyde	0.006	0.02	
MRR[12]	Proposed Monitoring:	Monitor compressor run time and operating parameters as defined by the manufacturer warranty.		
	Proposed Recordkeeping:	Record engine maintenance and engine run time.		
	Proposed Reporting:	Report as required under 40 CFR Part 60 Subparts JJJJ and Subpart OOOO		

Instructions for completing the Engine Emission Unit Data Sheet:

[1] Enter the appropriate Emission Unit (Source) identification number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the production pad. Multiple compressor engines should be designated CE-1S, CE-2S, etc. or other appropriate designation. Generator engines should be designated GE-1S, GE-2S, etc. or other appropriate designation. If more than three (3) engines exist, please use additional sheets.

[2] For Emission Points, use the following numbering system: 1E, 2E, etc. or other appropriate designation.

[3] Enter the Source Status using the following codes: NS = Construction of New Source (installation); ES = Existing Source; MS = Modification of Existing Source; and RS = Removal of Source

[4] Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.

[5] Enter the date that the engine was manufactured, modified or reconstructed.

[6] Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate. ***Provide a manufacturer's data sheet for all engines being registered and a manufacturer's EPA certification of conformity sheet.***

[7] Enter the Engine Type designation(s) using the following codes: LB2S = Lean Burn Two Stroke, RB4S = Rich Burn Four Stroke, and LB4S =Lean Burn Four Stroke.

[8] Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes: NSCR = Rich Burn & Non-Selective Catalytic Reduction, PSC = Rich Burn & Prestratified Charge, SCR = Lean Burn & Selective Catalytic Reduction, or CAT = Lean Burn & Catalytic Oxidation

[9] Enter the Fuel Type using the following codes: PQ = Pipeline Quality Natural Gas, or RG = Raw Natural Gas

[10] Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*. Codes: MD = Manufacturer's Data, AP = AP-42 Factors, GR = GRI-HAPCalc™ , or OT = Other _____ (please list)

[11] Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet as Attachment O*.

[12] Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the operation of this engine operation and associated air pollution control device. Include operating ranges and maintenance procedures required by the manufacturer to maintain the warranty.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2013 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Kubota Corporation**
(U.S. Manufacturer or Importer)

Certificate Number: DKBXS.9622HP-002

Effective Date: 11/20/2012

Expiration Date: 12/31/2013

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 11/20/2012

Revision Date: N/A

Manufacturer: Kubota Corporation
Engine Family: DKBXS.9622HP
Certificate Number: DKBXS.9622HP-002
Useful Life : 1000 Hours / 5 Years
Engine Class : Nonhandheld-Class II
Fuel : Natural Gas (CNG/LNG)
Emission Standards : NMHC + NOx (g/kW-hr) : 8
CO (g/kW-hr) : 610

Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547), 40 CFR Part 1054, 40 CFR Part 1068 and 40 CFR Part 60 (stationary only and combined stationary and mobile), and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued for the following small nonroad engine family, more fully described in the documentation required by 40 CFR Part 1054 and produced in the stated model year.

This certificate of conformity covers only those new small nonroad engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 1054 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 1054. This certificate of conformity does not cover small nonroad engines imported prior to the effective date of the certificate.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068.20 and 1068, Subpart E and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 1054. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 1054, 40 CFR Part 1068.

This certificate does not cover small nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

NATURAL GAS ENGINE

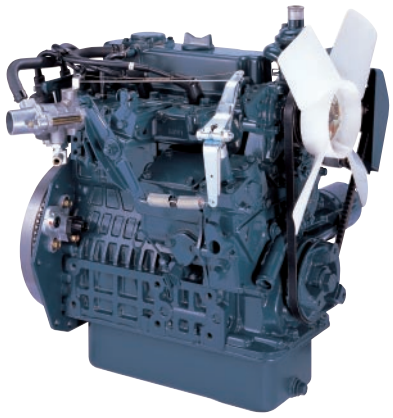
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2 EPA Tier

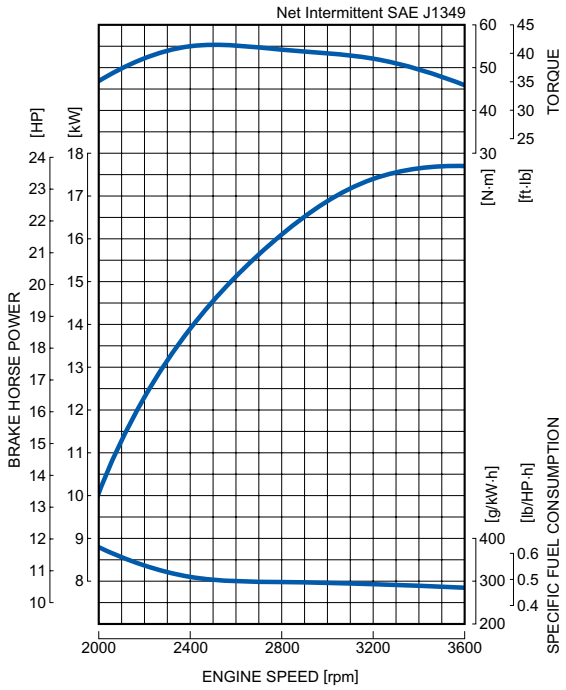
RATED POWER

17.6kW@3600rpm



Photograph may show non-standard equipment.

PERFORMANCE CURVE



FEATURES and BENEFITS

New Engine Series

- The Kubota DG Series offers a new solution to the increasing needs for natural gas engine. The diesel engine based Kubota DG Series gives users the same foot-print, reliability and durability of D902, WG972, and DF972 acknowledged as the world's top quality small industrial engines.
- Kubota offers SAE Flywheel Housing and Rear End Plate specifications for the DG972 engine. These options offer users flexible Power Take Off (PTO) choices.
- The Kubota DG Series is designed to endure use outdoors under severe environment. This series is equipped with a bypass breather tube to avoid freezing below zero.

Emission

- Kubota DG Series complies with EPA Tier 2 Emissions Regulations. EPA regulation is one of the most stringent emissions regulations in the world.

Best Fuel System

- Specialized for Natural Gas use, the DG972 engine eliminated the carburetor, regulator and a fuel filter parts, which are only necessary for Gasoline or LPG use. Also, Kubota adopts the best jet set and the ignition timing that provides the best engine performance in severe conditions.

Ease maintenance cost and time

- Mechanical governor system will contribute to lower maintenance cost and prevents users from having to deal with complicated electric maintenance. Moreover, water resistant spark plug caps are adopted for outdoor use.

DG972-E2

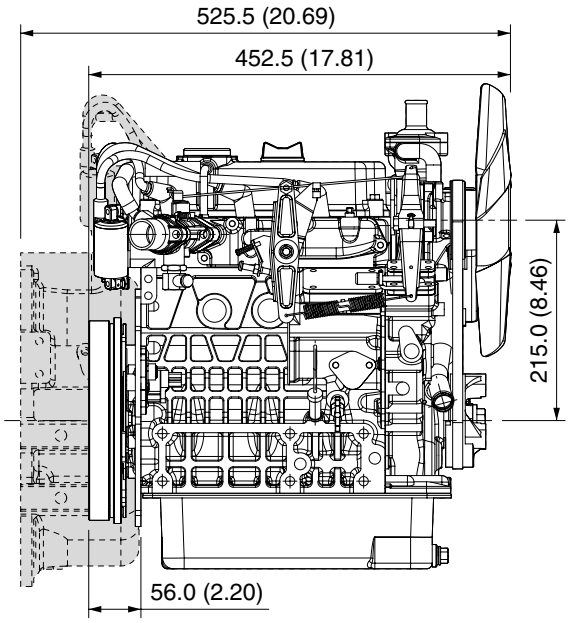
KUBOTA DG SERIES

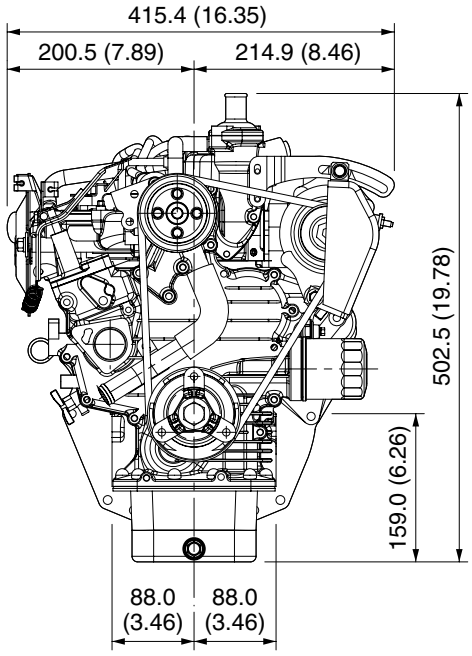
GENERAL SPECIFICATION

Model		DG972-E2
Emission Regulation		Tier 2
Type		Vertical 4-cycle Liquid Cooled Natural Gas
Number of Cylinders		3
Bore	mm (in)	74.5 (2.93)
Stroke	mm (in)	73.6 (2.9)
Displacement	L (cu.in)	0.962 (58.70)
Fuel		Natural Gas
Intake System		Naturally Aspirated
Maximum Speed	rpm	3600
Output: Net Intermittent	kW	17.6
	hp	23.6
	ps	23.9
Direction of Rotation		Counterclockwise Viewed on Flywheel
Oil Pan Capacity	L (gal)	3.7 (0.98)
Starter Capacity	V-kW	12-1.0
Alternator Capacity	V-A	12-40
Length	mm (in)	525.5 (20.69)*1 / 452.5 (17.81)*2
Width	mm (in)	415.4 (16.35)
Height (1)	mm (in)	502.5 (19.78)
Height (2)	mm (in)	159.0 (6.26)
Dry Weight	kg (lb)	72.0 (158.7)*1 / 95.4 (210.3)*2

*Specification is subject to change without notice.
*Output: Net Intermittent SAE J1349
*Dry weight is according to Kubota's standard specification.
When specification varies, the weight will vary accordingly.
*1 with SAE Flywheel and Housing
*2 with Rear End Plate

DIMENSIONS





Kubota

Your Driving Force
KUBOTA ENGINE

KUBOTA Corporation
2-47, Shikitsuhigashi 1-chome, Naniwa-ku, Osaka, 556-8601 Japan
Fax: 06-6648-3521
http://www.engine.kubota.co.jp

1334-01-COM '08.09. .STD

Gas Production Unit Heaters

NATURAL GAS FIRED FUEL BURNING UNITS
EMISSION DATA SHEET

Complete the information on this data for each Gas Producing Unit(s), Heater Treater(s), and in-line heater(s) at the production pad. Reboiler information should be entered on the Glycol Dehydration Emission Unit Data Sheet.

Emission Unit ID #[1]	Emission Point ID#[2]	Emission Unit Description (Manufacturer / Model #)	Year Installed/ Modified	Type[3] and Date of Change	Control Device[4]	Design Heat Input (mmBtu/hr)[5]	Fuel Heating Value (Btu/scf)[6]
GPU-01	14E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-02	15E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-03	16E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-04	17E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-05	18E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-06	19E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-07	20E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-08	21E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-09	22E	Gas Production Heater	2015	New	None	1.5	1,247.06
GPU-10	23E	Gas Production Heater	2015	New	None	1.5	1,247.06

[1] Enter the appropriate Emission Unit (or Sources) identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S…or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the *Glycol Dehydration Unit Data Sheet*.

[2] Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1,
LH-2, etc. For emission points, use 1E, 2E, 3E…or other appropriate designation.

[3] New, modification, removal

[4] Complete appropriate air pollution control device sheet for any control device.

[5] Enter design heat input capacity in mmBtu/hr.

[6] Enter the fuel heating value in Btu/standard cubic foot.

Tank Truck Loading

TANK TRUCK LOADING
EMISSION UNIT DATA SHEET

Furnish the following information for each new or modified bulk liquid transfer area or loading rack at the natural gas production pad. This form is to be used for bulk liquid transfer operations to tank trucks.

1. Emission Unit ID: **NA**	2. Emission Point ID: **NA**	3. Year Installed/ Modified: **2015**
4. Emission Unit Description: **Condensate and produced water loadout racks**		
5. Loading Area Data:		
5A. Number of pumps: **TBD**	5B. Number of liquids loaded: **2**	5C. Maximum number of tank trucks loading at one time: **1**
6. Describe cleaning location, compounds and procedure for tank trucks: **To be determined**		
7. Are tank trucks pressure tested for leaks at this or any other location? ☐ Yes ☒ No If YES, describe:		

8. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	**10**	**10**	**10**	**10**
days/week	**5**	**5**	**5**	**5**

9. Bulk Liquid Data *(add pages as necessary):*

Liquid Name	**Condensate**	**Produced Water**	
Max. daily throughput (1000 gal/day)	**16.8**	**201.6**	
Max. annual throughput (1000 gal/yr)	**6,132**	**73,584**	
Loading Method [1]	**BF**	**BF**	
Max. Fill Rate (gal/min)	**168**	**168**	
Average Fill Time (min/loading)	**50**	**50**	
Max. Bulk Liquid Temperature (^{o}F)	**62.51**	**62.51**	
True Vapor Pressure [2]	**6.43**	**0.30**	
Cargo Vessel Condition[3]	**U**	**U**	
Control Equipment or Method [4]	**None**	**None**	
Minimum collection efficiency (%)	**0**	**0**	
Minimum control efficiency (%)	**0**	**0**	

** Continued on next page*

Maximum Emission Rate	Loading (lb/hr)	**27.32**	**0.74**	
	Annual (ton/yr)	**9.97**	**3.24**	
Estimation Method [5] **EPA and ProMax outputs**				

Notes:

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets as Attachment "H"*):
CA = Carbon Adsorption
VB = Dedicated Vapor Balance (closed system)
ECD = Enclosed Combustion Device
F = Flare
TO = Thermal Oxidation or Incineration

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance
TM = Test Measurement based upon test data submittal
O = other (describe)

10. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING *Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation/air pollution control device.*

Monitor monthly and rolling twelve-month average of liquids loaded out.

RECORDKEEPING *Please describe the proposed recordkeeping that will accompany the monitoring.*

Record monthly and rolling twelve-month average of liquids loaded out.

REPORTING *Please describe the proposed frequency of reporting of the recordkeeping.*

Reporting will occur as directed by WVDAQ.

TESTING *Please describe any proposed emissions testing for this process equipment/air pollution control device.*

None.

11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty:

Attachment H.
Air Pollution Control Device Data Sheets

Combustor

AIR POLLUTION CONTROL DEVICE
Vapor Combustion Control Device Sheet

Complete this vapor combustion control device sheet for each enclosed combustion device, flare, thermal oxidizer, or completion combustion device that is located at the natural gas production pad for the purpose of thermally destructing waste gas to control emissions of regulated pollutants to the atmosphere.

IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS FORM BEFORE COMPLETING.

General Information

1. Control Device ID#: **1C**	2. Installation Date: **2015** ☒ New	
3. Maximum Rated Total Flow Capacity: **8,333** scfh **200,000** scfd	4. Maximum Design Heat Input: **17.0 MMBtu/hr**	5. Design Heat Content: **2,041** BTU/scf

Control Device Information

6. Select the type of vapor combustion control device being used: ☒ Enclosed Combustion Device

☐ Elevated Flare ☐ Ground Flare ☐ Thermal Oxidizer ☐ Completion Combustion Device

7. Manufacturer: **Abutec** Model No.: **200**	8. Hours of operation per year: **8,760**

9. List the emission units whose emissions are controlled by this vapor combustion control device:
(Emission Point ID#: 1E through 12E)

10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
T01	**Condensate Storage Tank #1**	**T07**	**Condensate Storage Tank #7**
T02	**Condensate Storage Tank #2**	**T08**	**Condensate Storage Tank #8**
T03	**Condensate Storage Tank #3**	**T09**	**Condensate Storage Tank #9**
T04	**Condensate Storage Tank #4**	**T10**	**Condensate Storage Tank #10**
T05	**Condensate Storage Tank #5**	**T11**	**Produced Water Storage Tank #1**
T06	**Condensate Storage Tank #6**	**T12**	**Produced Water Storage Tank #2**

If this vapor combustor controls emissions from more than six emission units, please attach additional pages.

11. Assist Type	12. Flare Height	13. Tip Diameter	14. Was the design per §60.18?
☐ Steam - ☐ Air - ☐ Pressure - ☒ Non -	**20** ft	**3.42** ft	☒Yes ☐No

Waste Gas Information

15. Maximum waste gas flow rate (scfm):	16. Heat value of waste gas stream (BTU/ft3)	17. Temperature of the emissions stream (°F)	18. Exit Velocity of the emissions stream (ft/s)
46.8	**1,635**	**900**	**1.0**

19. Provide an attachment with the characteristics of the waste gas stream to be burned. **– See ProMax output for Uncontrolled Flash Gas for condensate tanks and produced water tanks**

Pilot Information				
20. Type/Grade of pilot fuel:	21. Number of pilot lights:	22. Fuel flow rate to pilot flame per pilot (scf/hr):	23. Heat input per pilot (BTU/hr):	24. Will automatic re-ignition be used?
PQ	**1**	**15**	**1,247**	☒ Yes ☐ No

25. If automatic re-ignition will be used, describe the method:
SCADA integration with control panel for remote monitoring of pilot temperature.

26. Describe the method of controlling flame:
Flare is an enclosed combustor to reduce visible emissions. Continuous pilot ensures flame is always present.

27. Is pilot flame equipped with a monitor to detect the presence of the flame? ☒ Yes ☐ No	28. If yes, what type? ☒ Thermocouple ☐ Infra-Red ☐ Ultra Violet ☐ Camera with monitoring control room ☐ Other, describe:

29. Pollutant(s) Controlled	30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)
VOC	**100**	**98**
CH4	**100**	**98**

32. Has the control device been tested by the manufacturer and certified? **No. Tested by an independent third party.**

33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty: **Inlet pressure must be within the range of 2 oz/in3 to 120 psig.**

34. Additional Information Attached? ☒ **YES** ☐ **NO**

Please attach a copy of manufacturer's data sheet.
Please attach a copy of manufacturer's drawing.
Please attach a copy of the manufacturer's performance testing.

If any of the requested information is not available, please contact the manufacturer.

INSTRUCTIONS:
Vapor Combustion Control Device

This form assumes one vapor combustion control device emissions are being released from the emission point identification number (including the waste gas emissions and pilot emissions). If multiple vapor combustion control devices are being used at the oil and natural gas production facility, a vapor control device sheet must be completed for each device. The same form is being used for all types of vapor combustion control devices.

General Information

1. Enter the control device ID#(s) that has been assigned to this control device. A unique control device identification number should identify each control device located at the affected facility.
2. Enter the date that the control device was installed at the affected facility. Include the month, day, and year. If this is a new control device that has yet to be installed, check the "NEW" box.
3. Enter the maximum rated total flow rate of the vapor combustion device. This includes the flow rate of all materials to be burned including the pilot fuel and the waste gas.
4. Enter the maximum rated design heat input capacity of the vapor combustion device in terms of million British thermal units per hour (MMBtu/hr).
5. Enter the total design heat content of the pilot in terms of million British thermal units per hour (MMBtu/hr).

Control Device Information

6. Indicate the type of vapor combustion device that applies.
7. Enter the manufacturer and model number of the control device.
8. Enter the hours of operation that the control device is planned to be used. This should be the same basis as the emissions calculations.
9. Enter the emission point identification number.
10. Enter ALL of the emission units whose emissions will be controlled and then emitted from the control device.
11. Select whether the flare is steam-assisted, air-assisted, pressure-assisted, or non-assisted.
12. Enter the height of the stack in terms of feet.
13. Enter the tip diameter (in feet) of the top of the stack where the emissions are discharged.
14. Is the applicant having the combustion device designed per §60.18? Only flares required by an NSPS standard are required to be designed and operated in accordance with §60.18.

Waste Gas Information

The waste gas is the vapor emissions that are being controlled.

15. Enter the waste gas flow rate in cubic feet per minute that is being consumed.
16. Enter the heat content of the waste gas being combusted in units of BTU per cubic feet.
17. Enter the minimum temperature of the emissions stream (°F).
18. Enter the velocity in feet per second of the gas as it discharges from the top of the stack.
19. Provide the characterization of the waste gas stream that is being controlled. This could be a certificate of analysis of the natural gas from this facility or from a similar facility. This is the basis of the emissions calculations.

Pilot Information

20. Enter the type/grade(s) of fuel that will combusted in the combustion flare's pilot (examples: natural gas pipeline quality, propane, etc.).
21. How many pilot lights does the device have?
22. What is the fuel capacity for each pilot?
23. What is the heat input for each pilot?
24. Is the system designed with automatic re-ignition?
25. Describe the re-ignition method and system.
26. Describe the method of controlling the pilot flame.
27. Is the pilot flame equipped with a monitoring device?
28. What is the monitoring device for the pilot flame?

Control Information

29. Enter the types of pollutants that the control equipment controls (i.e., reduces). If numerous pollutants are controlled, indicate the different pollutants controlled in line with their respective control efficiencies.

30. What is the % capture efficiency of the collection system to the control device? In other words, what is the percentage of the waste gas stream will be controlled?

31. Enter the control efficiency of the control equipment for each pollutant being controlled. The manufacturer typically provides a manufacturer's minimum guarantee control efficiency. Provide the manufacturer's data sheet that documents the minimum guarantee.

32. Please answer if the control device had a performance test conducted by the manufacturer and if it is certified.

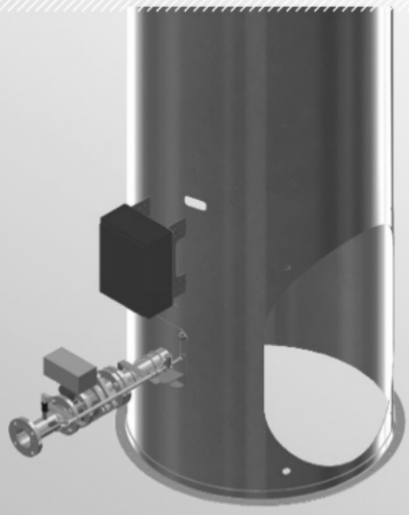
33. Describe the manufacturer's operating and maintenance requirements that the guaranteed control efficiency is based upon.

34. Please include any additional information associated with the control device you feel should be submitted with this application. Please attach a copy of the manufacturer's data sheet. Please include the manufacturer's performance testing.

ABUTEC 200

ABUTEC's newest combustion device, the ABUTEC 200, was developed with the largest exploration and production facilities in mind. Able to function at high capacity in even the most remote locations, the ABUTEC 200 is a state-of-the-art combustion solution.

The ABUTEC 200 is a reliable method of combusting even the largest amounts of vapors, and can become part of a customized system tailored to fit your location. Additionally, the ABUTEC 200 is easy to install, and can handle the toughest environmental conditions.



Key Features of the ABUTEC 200

- Quad O Compliant Ready
- Local Service Team availability
- Low Capital and Operating Costs
- Meets 40 CFR 60.18 regulations
- Flexible & Scalable System
- Scalable flow rates from 100-200 MSCFD
- Very High Turndown Ratio
- Stainless Steel Construction
- 99%+ Destruction Efficiency (Independent 3rd party tested)
- Inlet pressure as low as 2oz/in^2 and up to 120psig
- Capable of 18,414,800 BTU/hour
- TERO License from Three Affiliated Tribes
- Solar Panel functionality
- SCADA integration with control panel for remote monitoring

through innovation,

environmental responsibility,

and in-depth market knowledge.

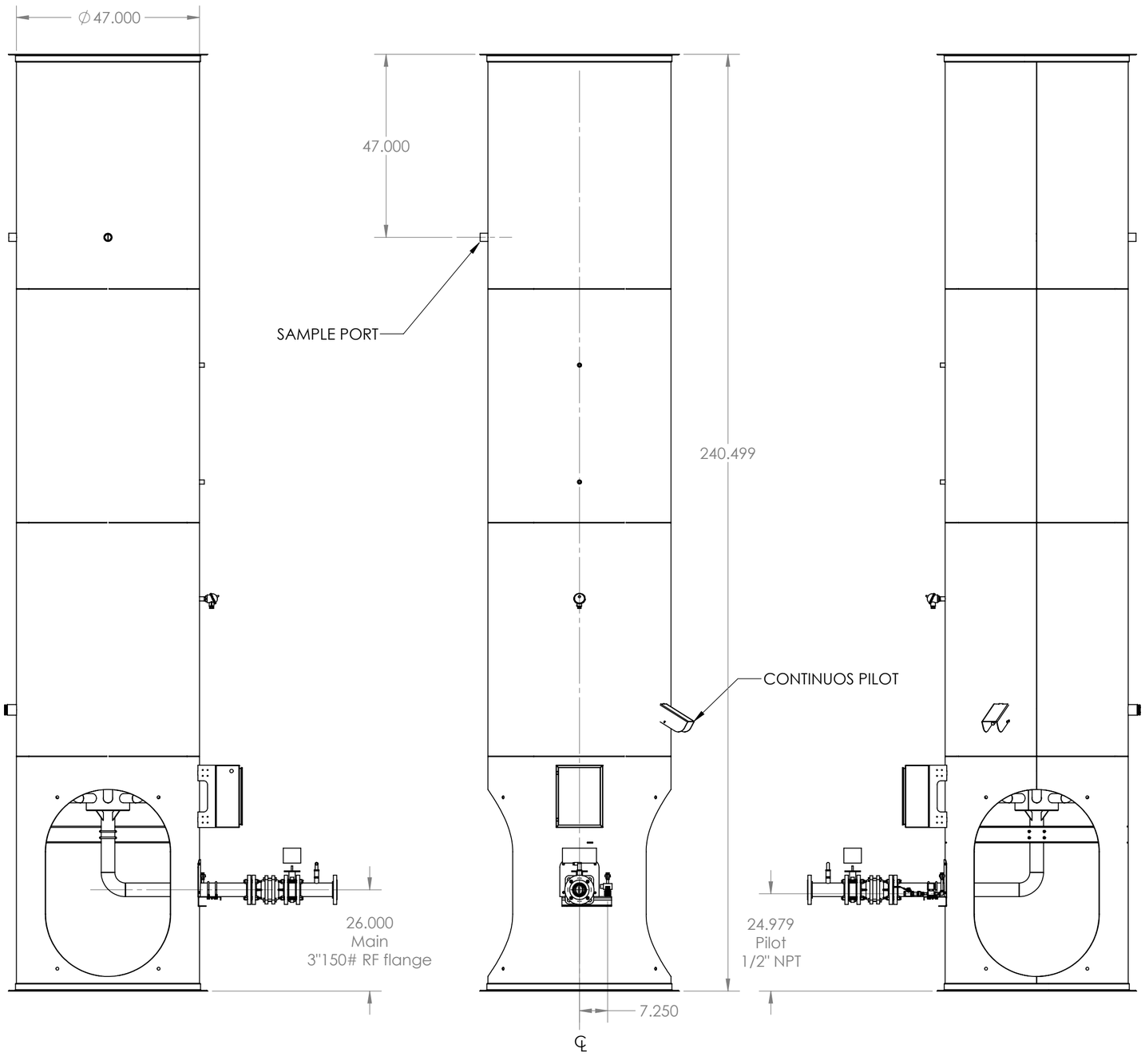
ABUTEC 200

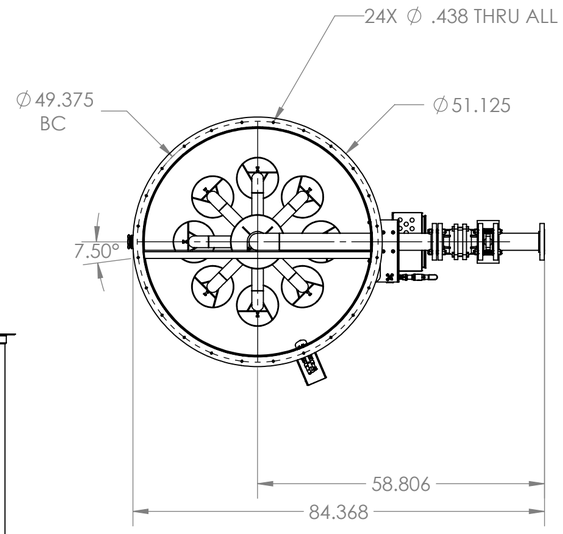
ENGINEERED SOLUTIONS

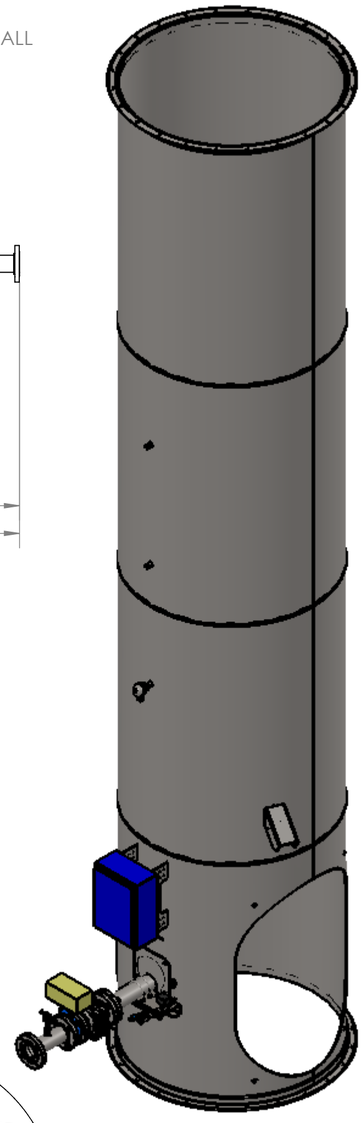
ABOUT ABUTEC

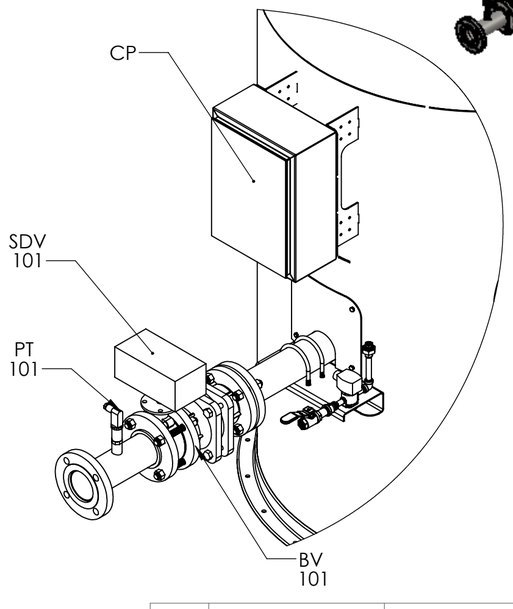
General Arrangement Drawing

NOTE: This drawing is intended for your review and approval of the general arrangement for project ABUTEC 200.Some dimensions are subject to change during the final engineering phase of this project. "As Built" drawings will be provided at engineering completion.









MATERIAL	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	
DRAWN	J.PHILLIPS
CHECKED	S.EGAN
ENG APPR.	HvP

Advanced Burner Technologies

TITLE:

ABUTEC-200

SIZE	DWG. NO.	REV
B	ABUTEC-200 GAD	
SCALE: 1:24	WEIGHT: 1690.48	SHEET 1 OF 1

Attachment I.
Supporting Emission Calculations

Emission Calculations

EMISSIONS SUMMARY TOTAL

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**

UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Storage Tanks															
Condensate Tanks	---	---	---	---	123.18	539.53	---	---	---	---	---	---	3.37	14.75	3,019
Produced Water Tanks	---	---	---	---	7.07	30.95	---	---	---	---	---	---	0.00	0.00	2,370
Engines															
Compressor Engine	0.32	1.38	1.03	4.50	0.01	0.04	0.0002	0.001	0.01	0.02	0.01	0.02	0.01	0.04	142
Gas Production Units															
GPU Heaters	1.84	8.05	1.54	6.76	0.10	0.44	0.01	0.05	0.14	0.61	0.14	0.61	0.03	0.15	7,704
Combustors															
Combustor and Pilot	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	28.06	13.21	---	---	---	---	---	---	0.75	0.27	74
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	0.86	3.77	---	---	---	---	---	---	---	---	53
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.04	0.17	0.004	0.02	---	---	---
Total Facility PTE =	**2.15**	**9.43**	**2.57**	**11.26**	**159.27**	**587.93**	**0.01**	**0.05**	**0.18**	**0.80**	**0.15**	**0.65**	**4.16**	**15.21**	**13,362**

CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO_2		PM-10		PM-2.5		HAPs		CO_2e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
Storage Tanks															
Condensate Tanks	---	---	---	---	2.46	10.79	---	---	---	---	---	---	0.07	0.29	61
Produced Water Tanks	---	---	---	---	0.14	0.62	---	---	---	---	---	---	0.00	0.00	48
Engines															
Compressor Engine	0.32	1.38	1.03	4.50	0.01	0.04	0.0002	0.001	0.01	0.02	0.01	0.02	0.01	0.04	142
Gas Production Units															
GPU Heaters	1.84	8.05	1.54	6.76	0.10	0.44	0.01	0.05	0.14	0.61	0.14	0.61	0.03	0.15	7,704
Combustors															
Combustor and Pilot	0.31	1.37	1.70	7.44	0.0001	0.0004	0.00001	0.00005	0.0001	0.001	0.0001	0.001	0.00003	0.0002	2,366
Hydrocarbon Loading															
Truck Loadout	---	---	---	---	28.06	13.21	---	---	---	---	---	---	0.75	0.27	74
Fugitive Emissions															
Component Leak Emissions	---	---	---	---	0.86	3.77	---	---	---	---	---	---	---	---	53
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.04	0.17	0.004	0.02	---	---	---
Total Facility PTE =	**2.47**	**10.81**	**4.27**	**18.70**	**31.63**	**28.87**	**0.01**	**0.05**	**0.18**	**0.80**	**0.15**	**0.65**	**0.86**	**0.76**	**10,448**

Condensate Storage Tank Flashing Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Condensate Tanks**
Emission Unit ID:	**T01 through T10**

Number of Condensate Storage Tanks: **10** tanks
Individual Tank Throughput: **40** bbl/day-tank

	Condensate Flashing Emissions per Tank				Total Condensate Flashing Emissions			
Component	**Uncontrolled Flashing Emissions [1] (lb/hr)**	**Uncontrolled Flashing Emissions (tons/yr)**	**Controlled Flashing Emissions [2] (lb/hr)**	**Controlled Flashing Emissions [2] (tons/yr)**	**Uncontrolled Flashing Emissions (lb/hr)**	**Uncontrolled Flashing Emissions (tons/yr)**	**Controlled Flashing Emissions [2] (lb/hr)**	**Controlled Flashing Emissions [2] (tons/yr)**
Methane	2.59	11.34	0.05	0.23	25.90	113.44	0.52	2.27
Ethane	4.84	21.21	0.10	0.42	48.42	212.09	0.97	4.24
Propane	5.16	22.60	0.10	0.45	51.61	226.03	1.03	4.52
i-Butane	1.11	4.87	0.02	0.10	11.12	48.70	0.22	0.97
n-Butane	2.55	11.15	0.05	0.22	25.47	111.55	0.51	2.23
i-Pentane	0.86	3.76	0.02	0.08	8.58	37.59	0.17	0.75
n-Pentane	0.96	4.18	0.02	0.08	9.55	41.83	0.19	0.84
Cyclohexane	0.21	0.91	0.004	0.02	2.07	9.08	0.04	0.18
n-Hexane	0.28	1.25	0.01	0.02	2.85	12.46	0.06	0.25
Benzene	0.01	0.02	0.0001	0.0005	0.05	0.23	0.001	0.00
n-Heptane	0.29	1.25	0.01	0.02	2.85	12.49	0.06	0.25
Toluene	0.01	0.05	0.0002	0.001	0.12	0.54	0.002	0.01
n-Octane	0.12	0.50	0.00	0.01	1.15	5.05	0.02	0.10
Ethylbenzene	0.004	0.02	0.0001	0.0004	0.04	0.19	0.001	0.004
m-Xylene	0.01	0.04	0.0002	0.001	0.10	0.43	0.002	0.01
Nonane	0.02	0.08	0.000	0.002	0.18	0.78	0.004	0.02
Decane	0.001	0.004	0.00002	0.0001	0.009	0.04	0.0002	0.001
Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrogen	0.02	0.07	0.02	0.07	0.15	0.67	0.15	0.67
Oxygen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Dioxide	0.02	0.09	0.02	0.094	0.21	0.94	0.21	0.94
VOC Subtotal	11.58	50.70	0.23	1.01	115.75	507.00	2.32	10.14
HAP Subtotal	0.32	1.39	0.01	0.03	3.16	13.86	0.06	0.28
CO2e Subtotal	64.77	283.70	1.32	5.77	647.72	2,837.01	13.16	57.66
Total	19.04	83.41	0.42	1.83	190.44	834.14	4.17	18.26

Notes:

1. Flashing emissions calculated by ProMax 3.2. Flash gas is stream Uncontrolled Flash Gas of the associated ProMax simulation.
2. Tanks are controlled by a combustor with a minimum 98% control efficiency.

Produced Water Storage Tank Flashing Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Produced Water Tanks**
Emission Unit ID:	**T11 and T12**

Number of Produced Water Storage Tanks: **2** tanks
Individual Tank Throughput: **2,400** bbl/day-tank

	Produced Water Flashing Emissions per Tank				Total Produced Water Flashing Emissions			
Component	**Uncontrolled Flashing Emissions [1] (lb/hr)**	**Uncontrolled Flashing Emissions (tons/yr)**	**Controlled Flashing Emissions [2] (lb/hr)**	**Controlled Flashing Emissions [2] (tons/yr)**	**Uncontrolled Flashing Emissions (lb/hr)**	**Uncontrolled Flashing Emissions (tons/yr)**	**Controlled Flashing Emissions [2] (lb/hr)**	**Controlled Flashing Emissions [2] (tons/yr)**
Methane	10.79	47.28	0.22	0.95	21.59	94.56	0.43	1.89
Ethane	3.81	16.70	0.08	0.33	7.63	33.41	0.15	0.67
Propane	1.79	7.82	0.04	0.16	3.57	15.65	0.07	0.31
i-Butane	0.30	1.30	0.006	0.03	0.60	2.61	0.01	0.05
n-Butane	0.63	2.77	0.013	0.06	1.26	5.54	0.03	0.11
i-Pentane	0.17	0.75	0.003	0.01	0.34	1.50	0.007	0.03
n-Pentane	0.22	0.95	0.004	0.02	0.44	1.91	0.009	0.04
Cyclohexane	0.32	1.39	0.006	0.028	0.63	2.78	0.01	0.06
n-Hexane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Heptane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Octane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
m-Xylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nonane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Decane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water	0.40	1.75	0.40	1.75	0.80	3.50	0.80	3.50
Nitrogen	0.14	0.63	0.14	0.63	0.29	1.26	0.29	1.26
Oxygen	0.02	0.07	0.02	0.07	0.03	0.13	0.03	0.13
Carbon Dioxide	0.03	0.13	0.03	0.13	0.06	0.27	0.06	0.27
VOC Subtotal	3.42	14.99	0.07	0.30	6.84	29.98	0.14	0.60
HAP Subtotal	0.00	0.00	0.000	0.000	0.00	0.00	0.000	0.00
CO2e Subtotal	269.90	1,182.18	5.43	23.78	539.81	2,364.35	10.86	47.55
Total	18.62	81.56	0.95	4.16	37.24	163.12	1.90	8.32

Notes:

1. Flashing emissions calculated by ProMax 3.2. Flash gas is stream Uncontrolled Flash Gas of the associated ProMax simulation.
2. Tanks are controlled by a combustor with a minimum 98% control efficiency.
3. All Hazardous Air Pollutants (HAP) in the produced water are below detection thresholds.

Storage Tank Working and Breathing Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Condensate, Settling, and Produced Water Tanks**
Emission Unit ID:	**T01 through T12**

TANK DESCRIPTION	Uncontrolled VOC Emissions[1] (tons/yr)	Uncontrolled Benzene Emissions[3] (tons/yr)	Uncontrolled Toluene Emissions[3] (tons/yr)	Uncontrolled Ethylbenzene Emissions[3] (tons/yr)	Uncontrolled Xylenes Emissions[3] (tons/yr)	Uncontrolled n-Hexane Emissions[3] (tons/yr)	Uncontrolled HAP Emissions[3] (tons/yr)	Uncontrolled CH_4 Emissions[2] (tons/yr)	Uncontrolled CO_2e Emissions (tons/yr)
400 bbl Hydrocarbon Storage Tank (T01)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T02)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T03)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T04)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T05)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T06)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T07)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T08)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T09)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Hydrocarbon Storage Tank (T10)	3.25	0.001	0.003	0.001	0.003	0.08	0.09	0.73	18.19
400 bbl Produced Water Storage Tank (T11)	0.48	0.000	0.000	0.000	0.000	0.000	0.000	0.11	2.70
400 bbl Produced Water Storage Tank (T12)	0.48	0.000	0.000	0.000	0.000	0.000	0.000	0.11	2.70
TOTAL	**33.50**	**0.01**	**0.03**	**0.01**	**0.03**	**0.80**	**0.89**	**7.49**	**187.26**

TANK DESCRIPTION	Controlled VOC Emissions[4] (tons/yr)	Controlled Benzene Emissions[4] (tons/yr)	Controlled Toluene Emissions[4] (tons/yr)	Controlled Ethylbenzene Emissions[4] (tons/yr)	Controlled Xylenes Emissions[4] (tons/yr)	Controlled n-Hexane Emissions[4] (tons/yr)	Controlled HAP Emissions[4] (tons/yr)	Controlled CH_4 Emissions[4] (tons/yr)	Controlled CO_2e Emissions[4] (tons/yr)
400 bbl Hydrocarbon Storage Tank (T01)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T02)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T03)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T04)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T05)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T06)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T07)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T08)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T09)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Hydrocarbon Storage Tank (T10)	0.07	0.00003	0.0001	0.00002	0.0001	0.002	0.002	0.01	0.36
400 bbl Produced Water Storage Tank (T11)	0.01	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.05
400 bbl Produced Water Storage Tank (T12)	0.01	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.05
TOTAL	**0.67**	**0.0003**	**0.001**	**0.0002**	**0.001**	**0.02**	**0.02**	**0.15**	**3.75**

Notes:

1. Uncontrolled VOC emissions retrieved from ProMax simulation for associated tank (see diagrams).
2. CO2e emissions estimated using ratio of methane to VOCs of ProMax simulation where 14% of the vent gas by weight is methane and 61% by weight are VOCs.
3. Speciated and total HAP emissions of the condensate are estimated using ratio of individual HAPs to VOCs of ProMax simulation with the percent by weight of the vent gas of the HAPs and 61% by weight are VOCs.
4. Tanks are controlled by a combustor with a minimum 98% control efficiency.
5. All Hazardous Air Pollutants (HAP) in the produced water are below detection thresholds.

Compressor Engine Emission Calculations

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Compressor Engine**

Source Information-Per Engine

Emission Unit ID:	CE-01	
Engine Make/Model	Kubota DG972-E2	
Service	Compression	
Controls - Y or N / Type	Y	NSCR/AFRC
Site Horsepower Rating[1]	24	hp
Fuel Consumption (BSFC)[1]	0.50	lb/(hp-hr)
Heat Rating[2]	0.28	MMBtu/hr
Fuel Consumption[2]	1.94	MMscf/yr
Fuel Consumption[2]	221	scf/hr
Fuel Heating Value	1,247	Btu/scf
Operating Hours	8,760	hrs/yr

Notes:

1. Values from Kubota specification sheet

2. Calculated values. Assumes natural gas has a heating value of 23,000 Btu/lb

Potential Emissions

	Uncontrolled					***Controlled***					
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(lb/MMBtu)	**(g/kW-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(lb/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
NOx[4]	---	8.0	0.32	---	1.38	---	8.0	0.32	---	1.38	Emissions certification
CO[4]	3.72	---	1.03	---	4.50	3.72	---	1.03	---	4.50	AP-42, Chapter 3.2, Table 3.2-3
VOC	2.96E-02	---	0.01	---	0.04	2.96E-02	---	0.01	---	0.04	AP-42, Chapter 3.2, Table 3.2-3
SO_2	5.88E-04	---	0.0002	---	0.001	5.88E-04	---	0.0002	---	0.001	AP-42, Chapter 3.2, Table 3.2-3
PM_{10}	1.94E-02	---	0.01	---	0.02	1.94E-02	---	0.01	---	0.02	AP-42, Chapter 3.2, Table 3.2-3
$PM_{2.5}$	1.94E-02	---	0.01	---	0.02	1.94E-02	---	0.01	---	0.02	AP-42, Chapter 3.2, Table 3.2-3
1,1,2,2-Tetrachloroethane	2.53E-05	---	6.98E-06	0.06	3.06E-05	2.53E-05	---	6.98E-06	0.06	3.06E-05	AP-42, Chapter 3.2, Table 3.2-3
1,3-Butadiene	6.63E-04	---	1.83E-04	1.60	8.01E-04	6.63E-04	---	1.83E-04	1.60	8.01E-04	AP-42, Chapter 3.2, Table 3.2-3
Acetaldehyde	2.79E-03	---	7.70E-04	6.75	3.37E-03	2.79E-03	---	7.70E-04	6.75	3.37E-03	AP-42, Chapter 3.2, Table 3.2-3
Acrolein	2.63E-03	---	7.26E-04	6.36	3.18E-03	2.63E-03	---	7.26E-04	6.36	3.18E-03	AP-42, Chapter 3.2, Table 3.2-3
Benzene	1.58E-03	---	4.36E-04	3.82	1.91E-03	1.58E-03	---	4.36E-04	3.82	1.91E-03	AP-42, Chapter 3.2, Table 3.2-3
Ethylbenzene	2.48E-05	---	6.84E-06	0.06	3.00E-05	2.48E-05	---	6.84E-06	0.06	3.00E-05	AP-42, Chapter 3.2, Table 3.2-3
Formaldehyde	2.05E-02	---	5.66E-03	49.56	2.48E-02	2.05E-02	---	5.66E-03	49.56	2.48E-02	AP-42, Chapter 3.2, Table 3.2-3
Methanol	3.06E-03	---	8.45E-04	7.40	3.70E-03	3.06E-03	---	8.45E-04	7.40	3.70E-03	AP-42, Chapter 3.2, Table 3.2-3
Methylene Chloride	4.12E-05	---	1.14E-05	0.10	4.98E-05	4.12E-05	---	1.14E-05	0.10	4.98E-05	AP-42, Chapter 3.2, Table 3.2-3
PAH	1.41E-04	---	3.89E-05	0.34	1.70E-04	1.41E-04	---	3.89E-05	0.34	1.70E-04	AP-42, Chapter 3.2, Table 3.2-3
Toluene	5.58E-04	---	1.54E-04	1.35	6.75E-04	5.58E-04	---	1.54E-04	1.35	6.75E-04	AP-42, Chapter 3.2, Table 3.2-3
Xylenes	1.95E-04	---	5.38E-05	0.47	2.36E-04	1.95E-04	---	5.38E-05	0.47	2.36E-04	AP-42, Chapter 3.2, Table 3.2-3
Other HAPs[3]	2.10E-04	---	5.79E-05	0.51	2.54E-04	2.10E-04	---	5.79E-05	0.51	2.54E-04	AP-42, Chapter 3.2, Table 3.2-3
Total HAPS			0.01	78.4	0.04			0.01	78.4	0.04	
Pollutant	**Emission Factor**		**Estimated Emissions[2]**			**Emission Factor**		**Estimated Emissions[2]**			**Source of Emissions Factors**
	(kg/MMBtu)	**(g/kW-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	**(kg/MMBtu)**	**(g/bhp-hr)**	**(lb/hr)**	**(lb/yr)**	**(tpy)**	
CO_2	53.06	---	32.4	---	142	53.06	---	32.4	---	142	40 CFR Part 98, Subpart C, Table C-1
CH_4	0.001	---	0.001	---	0.003	0.001	---	0.001	---	0.003	40 CFR Part 98, Subpart C, Table C-2
N_2O	0.0001	---	0.0001	---	0.0003	0.0001	---	0.0001	---	0.0003	40 CFR Part 98, Subpart C, Table C-2
CO_2e	---	---	32.4	---	142	---	---	32.4	---	142	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

3. Other HAPs include those HAPs listen in AP-42 below the detection thresholds.

4. Calculated emission level will not exceed the emissions certification of this engine.

Example Calculations

lb/hr = (g/kW-hr) * (hp) * (1 lb/453.6 g) * (1 kW/1.341 hp) or (lb/MMBtu) * (MMBtu/hr)

tpy = (lb/hr) * (1 ton/2000 lb) * (hrs/yr) or (MMscf/yr) * (Btu/scf) * (lb/MMBtu) *(1 ton/2000 lb)

Natural Gas Fueled Gas Production Unit Heater Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Location:	**Ritchie County, West Virginia**
Source Description:	**Gas Production Unit Heaters**

Source Information

Emission Unit ID:	GPU-01 through GPU-10	
Source Description:	Gas Production Unit Heaters	
Number of Heaters	10	heaters
Hours of Operation	8,760	hr/yr
Design Heat Rate	1.5	MMBtu/hr per Heater
Heater Efficiency	0.8	
Fuel Heat Value[1]	1,247	Btu/scf
Fuel Use	13.2	MMscf/yr per Heater

[1] Average gas heating value of field.

Emission Calculations per GPU Heater

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	0.18	0.81	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.15	0.68	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.01	0.04	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.01	0.06	AP-42 Ch. 1.4 Table 1.4-2
$PM_{2.5}$	7.6	0.01	0.06	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.001	0.005	AP-42 Ch. 1.4 Table 1.4-2
Total HAPs (including HCHO)	1.88	0.003	0.02	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	175.9	770	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.003	0.015	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0003	0.0015	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	176.08	771	40 CFR Part 98, Subpart A, Table A-1

Emission Calculations for all Heaters

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO_X	100	1.84	8.05	AP-42 Ch. 1.4 Table 1.4-1
CO	84	1.54	6.76	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.10	0.44	AP-42 Ch. 1.4 Table 1.4-2
PM_{10}	7.6	0.14	0.61	AP-42 Ch. 1.4 Table 1.4-2
$PM_{2.5}$	7.6	0.14	0.61	AP-42 Ch. 1.4 Table 1.4-2
SO_2	0.6	0.01	0.05	AP-42 Ch. 1.4 Table 1.4-2
Total HAPs (including HCHO)	1.88	0.03	0.15	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	**Emission Factor (kg/MMBtu)**	**Emissions (lb/hr)**	**Emissions (tpy)**	**Emission Factor Source**
Carbon Dioxide	53.06	1,758.9	7,704	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.03	0.15	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.003	0.015	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	1,758.9	7,704	40 CFR Part 98, Subpart A, Table A-1

Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)} * \text{Heater Efficiency}}$$

$$\text{Emissions (tons/yr)} = \frac{\text{Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr)}}{\text{2,000 (lbs/ton)}}$$

Combustor Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Combustor for Storage Tank Vapors**
Emission Unit ID:	**FL-01**

Combusted Gas Emissions

Condensate Vent Gas to Flare Rate[1]:	2,124	scf/hr
Condensate Vent Gas Heating Value[2]:	2,041	Btu/scf
Produced Water Vent Gas to Flare Rate[1]:	683.1	scf/hr
Produced Water Vent Gas Heating Value[2]:	1,228	Btu/scf
Total Vent Gas to Flare:	2,807	scf/hr
Average Gas Heating Value:	1,635	Btu/scf
Hours of Operation:	8,760	hr/yr

Pollutant	Emission Factor[3] (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	N/A - Smokeless Design		
Nitrogen Oxides (NO_x)	0.068	0.31	1.37
Carbon Monoxide (CO)	0.37	1.70	7.44

1. Calculated flow based on flashing, working, and breathing emissions from ProMax simulation.
2. Gas heating values calculated from ProMax simulation.
3. Emission Factors from Table 13.5-1 of AP-42 Section 13.5 (Sept 1991)

Pilot Emissions

Pilot Heating Value:	1,247	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage[4]:	1.50E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)[5]	7.6	1.39E-04	6.10E-04
Nitrogen Oxides (NOx)	100	1.83E-03	8.03E-03
Sulfur Dioxide (SO_2)[5]	0.6	1.10E-05	4.82E-05
Carbon Monoxide (CO)[5]	84	1.54E-03	6.75E-03
Volatile Organic Compounds (VOC)[5]	5.5	1.01E-04	4.42E-04
Total HAPs[5,6]	1.88	3.45E-05	1.51E-04

4. Pilot gas flow rate of 15 scf/hr
5. Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).
6. Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

Total Flare Emissions

Pollutant	Total Potential Emission Rate (tons/year)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	6.10E-04
Nitrogen Oxides (NOx)	1.37
Sulfur Dioxide (SO_2)	4.82E-05
Carbon Monoxide (CO)	7.44
Volatile Organic Compounds (VOC)	4.42E-04
Total HAPs	1.51E-04

Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	540.26	2,366	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.01	0.04	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.001	0.004	40 CFR Part 98, Subpart C, Table C-2
CO_2e	----	540.26	2,366	40 CFR Part 98, Subpart A, Table A-1

Truck Loading Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Production Liquids Truck Loadout**
Emission Unit ID:	**LDOUT**

AP - 42, Chapter 5.2 $L_L = 12.46 \times S \times P \times M / T$

L_L = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)
S = Saturation Factor
P = True Vapor Pressure of the Loaded Liquid (psia)
M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)
T = Temperature of Loaded Liquid (ºR)

VOC Emissions (tpy) = $\dfrac{L_L \text{ (lbs VOC/1000 gal)} * 42 \text{ gal/bbl} * 365 \text{ days/year} * \text{production (bbl/day)}}{1000 \text{ gal} * 2000 \text{ lbs/ton}}$

								Uncontrolled		
Source	**S[1]**	**P (psia)[2]**	**M[3]**	**T (ºF)[4]**	**T (ºR)**	**L_L (lb/1000 gal)**	**Loading bbl/day**	**VOC (tpy)**	**HAP[5,7] (tpy)**	**CO2e[6] (tpy)**
Condensate	0.6	6.4	35	63	522.18	3.25	400	**9.97**	**0.27**	**55.7**
Produced Water	0.6	0.3	21	63	522.18	0.09	4,800	**3.24**	**0.00**	**18.1**

Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
2. True vapor pressure is estimated from ProMax working and breathing report of respective liquids.
3. Molecular weight liquid vapor is estimated from ProMax simulation working and breathing report for vapor off of the respective tanks.
4. Temperature based on ProMax simulation for the respective liquids (the annual average temperature of Charleston, West Virginia).
5. HAP emissions estimated assuming 2% by weight of the vent gas are HAPs and 61% by weight are VOCs (per ProMax simulation).
6. CO2e emissions estimated assuming 14% of the vent gas by weight is methane and 61% by weight are VOCs (per ProMax simulation).
7. All Hazardous Air Pollutants (HAP) in the produced water are below detection thresholds.

Assume 1 truck loaded per hour, 200 bbl truck, for short term emissions

								Uncontrolled		
Source	**S[1]**	**P (psia)[2]**	**M[3]**	**T (ºF)[4]**	**T (ºR)**	**L_L (lb/1000 gal)**	**Loading bbl/hr**	**VOC (lb/hr)**	**HAP[5,7] (lb/hr)**	**CO2e[6] (lb/hr)**
Condensate	0.6	6.4	35	63	522.18	3.25	200	**27.32**	**0.75**	**152.7**
Produced Water	0.6	0.3	21	63	522.18	0.09	200	**0.74**	**0.00**	**4.1**

Component Fugitive Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Fugitive Emissions - Component Leaks**

VOC Fugitive Emissions

Equipment Type and Service	Number of Units [1]	Hours of Operation (hours/yr)	THC Emission Factor[2] (kg/hr-unit)	VOC Weight Fraction[3]	THC Emissions (tpy)	VOC Emissions (tpy)
Flanges - Gas Service	80	8,760	3.90E-04	0.19	0.30	0.06
Valves - Gas Service	185	8,760	4.50E-03	0.19	8.06	1.56
Connectors - Gas Service	527	8,760	2.00E-04	0.19	1.02	0.20
Open-Ended Lines - Gas Service	10	8,760	2.00E-03	0.19	0.19	0.04
Other - Gas Service	4	8,760	8.80E-03	0.19	0.34	0.07
Flanges - Liquid Service	40	8,760	1.10E-04	0.61	0.04	0.03
Valves - Liquid Service	93	8,760	2.50E-03	0.61	2.25	1.37
Connectors - Liquid Service	264	8,760	2.10E-04	0.61	0.54	0.33
Open-Ended Lines - Liquid Service	5	8,760	1.40E-03	0.61	0.07	0.04
Other - Liquid Service	2	8,760	7.50E-03	0.61	0.15	0.09
Total Emissions (tons/yr)					**12.96**	**3.77**

1) Component counts estimated from 40 CFR Part 98 Subpart W Table W-1B based on equipment at the facility.

2) API average emission factors are for oil and gas production operations - Table 2.4, EPA Protocol for Equipment Leak Emission Estimates - 1995.

3) Gas and liquid weight fractions from representative analyses from nearby facility.

GHG Fugitive Emissions

Equipment Type	Number of Units [4]	Hours of Operation (hours/yr)	Emission Factor[5] (scf/hr-unit)	CH_4 Concentration[6]	CO_2 Concentration[6]	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Flanges	120	8,760	0.003	0.98	0.011	0.06	0.002	1.48
Valves	278	8,760	0.027	0.98	0.011	1.23	0.04	30.81
Connectors	791	8,760	0.003	0.98	0.011	0.39	0.01	9.74
Open-Ended Lines	15	8,760	0.061	0.98	0.011	0.15	0.005	3.76
Other	6	8,760	0.300	0.98	0.011	0.30	0.01	7.39
Total Emissions (tons/yr)						**2.12**	**0.07**	**53.17**

4) Component counts estimated from 40 CFR Part 98 Subpart W Table W-1B based on equipment at the facility.

5) Emission factors from 40 CFR Part 98 Subpart W, Table W1-A; Gas service where available, else light crude service

6) CH_4 and CO_2 concentrations as defined in 40 CFR Part 98.233(r)

Fugitive Dust Emissions

Company:	**Antero Resources Corporation**
Facility Name:	**Jackson Well Pad**
Facility Location:	**Ritchie County, West Virginia**
Source Description:	**Fugitive Dust Emissions**

Gravel Access Road	Loaded Truck Weight[1]	Trips per year[2]	Trips per day[2]	Distance per round trip (truck in and out)[3]		VMT per year[4]
	tons			feet	miles	miles
Condensate Tank Truck	40.00	365	1.0	500	0.09	35
Produced Water Tank Truck	40.00	2,190	6.0	500	0.09	207
Pick-Up Trucks	3.00	730	2.0	500	0.09	69

Equation Parameter	PM-10/PM-2.5	PM-Total
E, annual size-specific emission factor for PM_{10} & $PM_{2.5}$ (upaved industrial roads) extrapolated for natural mitigation[6]	**see table below**	**see table below**
k, Particle size multiplier for particle size range (PM_{10}), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**1.5**	**4.9**
k, Particle size multiplier for particle size range ($PM_{2.5}$), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	**0.15**	
s, surface material silt content, (%) (Source: AP-42 Table 13.2.2-1)	**4.8**	**4.8**
W, mean weight (tons) of the vehicles traveling the road	**31.78**	**31.78**
a, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.9**	**0.7**
b, constant for PM_{10} and $PM_{2.5}$ on industrial roads (Source: AP-42 Table 13.2.2-2)	**0.45**	**0.45**
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.2-1.	**160**	**160**

$$E = \left[k \left(\frac{s}{12} \right)^{a} \times \left(\frac{W}{3} \right)^{b} \right] \times (365 - P/365)$$

Source of Equation: AP-42 Section 13.2.2

PM_{10} Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM_{10} Emissions (tpy)
1.07	311.08	0.17

$PM_{2.5}$ Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled $PM_{2.5}$ Emissions (tpy)
0.107	311.08	0.02

PM- Total Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)[4]	Annual Uncontrolled PM-Total Emissions (tpy)
4.19	311.08	0.65

Table Notes:

1. Loaded truck weight for tanker trucks is based on typical weight limit for highway vehicles. Loaded truck weight for pick-up trucks is based on typical weight for mid-sized pick-up gasoline trucks.
2. Based on production, it's assumed a maximum of one condensate truck (200 bbl truck) and six produced water trucks (200 bbl truck) will be onsite per day. Also, it is assumed 2 pick up trucks carrying onsite personnel will be onsite per day.
3. Distance per round trip is based on the proposed site layout. The one way distance is measured as 250 feet for the gravel access road.
4. VMT/yr = Trips/yr x Roundtrip Distance
5. Hourly emissions determined from tons per year calculation using 2,000 lb/ton and 8,760 hours per year.

Facility Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	76.929	16.04	12.34	0.584
Ethane	14.638	30.07	4.40	0.208
Propane	4.718	44.10	2.08	0.099
i-Butane	0.570	58.12	0.33	0.016
n-Butane	1.245	58.12	0.72	0.034
i-Pentane	0.267	72.15	0.19	0.009
n-Pentane	0.340	72.15	0.25	0.012
Hexanes	0.507	86.18	0.44	0.021
Nitrogen	0.792	28.01	0.22	0.011
Carbon Dioxide	0.205	44.01	0.09	0.004
Water	0.292	18.02	0.05	0.002
Totals	100.5		21.11	1.00

Heating Value (Btu/scf)	1,247.06
Molecular weight	21.11
VOC weight fraction	0.1899
Methane weight fraction	0.5844
THC weight fraction	0.9827
VOC of THC wt fraction	0.1932
CH4 of THC wt fraction	0.5947

1. Representative sample from a nearby well (Hendershot 1H)
2. Gas heating value is average value representative of the field.

Gas Evolved from Flashed Liquid

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	29.968	16.04	4.81	0.136
Ethane	29.892	30.07	8.99	0.254
Propane	21.724	44.10	9.58	0.271
i-Butane	3.551	58.12	2.06	0.058
n-Butane	8.133	58.12	4.73	0.134
i-Pentane	2.208	72.15	1.59	0.045
n-Pentane	2.457	72.15	1.77	0.050
Hexanes	0.457	86.18	0.39	0.011
Heptanes	0.528	100.20	0.53	0.015
Octanes	0.187	114.23	0.21	0.006
Nonanes	0.026	128.26	0.03	0.001
Decanes +	0.001	179.40	0.00	0.00005
n-Hexane	0.613	86.18	0.53	0.015
Benzene	0.013	78.11	0.01	0.0003
Toluene	0.025	92.14	0.02	0.001
Ethylbenzene	0.008	106.17	0.01	0.0002
Xylenes	0.017	106.16	0.02	0.001
Nitrogen	0.102	28.01	0.03	0.001
Carbon Dioxide	0.090	44.01	0.04	0.001
Water	0.000	18.02	0.00	0.000
Totals	100.00		35.36	1.00

Molecular weight	35.36
VOC weight fraction	0.6079
Methane weight fraction	0.1359
THC weight fraction	0.9981
VOC of THC wt fraction	0.6091
CH4 of THC wt fraction	0.1362
Benzene of THC wt fraction	0.0003
Toluene of THC wt fraction	0.0006
E-benzene of THC wt fraction	0.0002
Xylene of THC wt fraction	0.0005
n-Hexane of THC wt fraction	0.0150

* Stream "Uncontrolled Flash Gas" of ProMax simulation for the Condensate Storage Tanks.

ProMax 3.2 Simulation

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

Simulation Report

Project: Jackson Well Pad.pmx

Licensed to Kleinfelder, Inc. and Affiliates

Client Name: Antero Resources Corporation
Location: West Virginia
Job: Jackson Well Pad

ProMax Filename: W:\20153889 - WV General Permits\Task 1 - Jackson General Permit\Attachment I\Jackson Well Pad.pmx
ProMax Version: 3.2.13330.0
Simulation Initiated: 1/23/2015 12:04:53 PM

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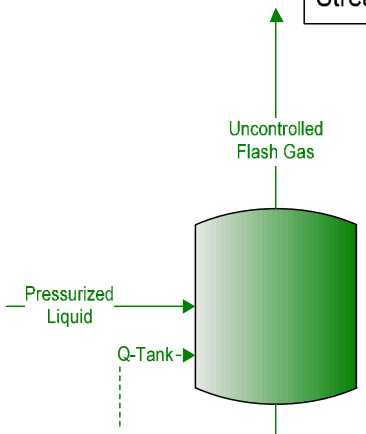
Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

Stream Uncontrolled Flash Gas C3+ Mass Flow =50.7 ton/yr

Stream Uncontrolled Flash Gas C3+ Mass Flow =11.58 lb/h



Properties	Condensate	
API Gravity (Total)	63.31	

Properties	Condensate	
Std Liquid Volumetric Flow (Total)	40*	bbl/d

Tank loss calculations for "Condensate".
Total working and breathing losses from the Vertical Cylinder are 3.253 ton/yr.

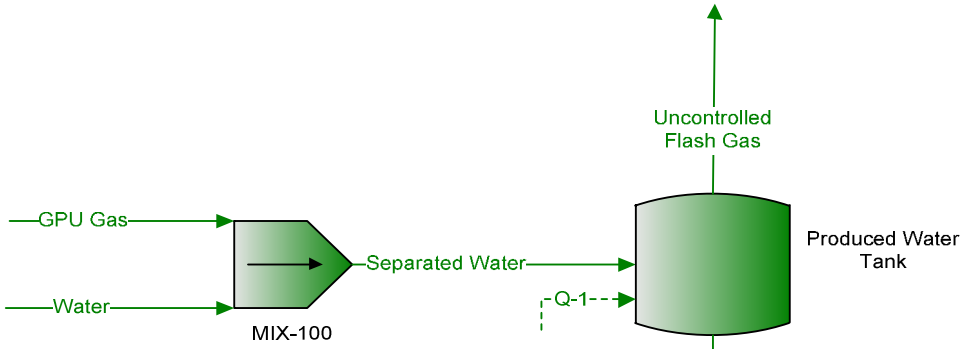
Process Streams		Condensate	Pressurized Liquid	Uncontrolled Flash Gas
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	Condensate Tank	--	Condensate Tank
	To Block:	--	Condensate Tank	--
Mole Fraction		%	%	%
Carbon Dioxide		0.00184203	0.013*	0.0901337
Nitrogen		0.000161934	0.013*	0.101748
Methane		0.157617	3.925*	29.9684
Ethane		1.10274	4.741*	29.8918
Propane		3.25273	5.587*	21.7235
Isobutane		1.47006	1.733*	3.55070
n-Butane		4.96796	5.368*	8.13343
Isopentane		3.74642	3.552*	2.20798
n-Pentane		5.75588	5.339*	2.45717
Cyclohexane		5.25535	4.649*	0.457392
n-Heptane		15.4177	13.536*	0.528264
n-Octane		19.0383	16.656*	0.187304
n-Nonane		8.67390	7.581*	0.0258930
Benzene		0.112643	0.1*	0.0126014
Toluene		0.860638	0.755*	0.0247374
Ethylbenzene		0.900871	0.788*	0.00773907
m-Xylene		2.45050	2.143*	0.0173061
n-Hexane		5.35190	4.753*	0.612901
2,2,4-Trimethylpentane		0	0*	0
Oxygen		0	0*	0
Water		0	0*	0
Decanes +		21.4828	18.768*	0.000911644
Molar Flow		lbmol/h	lbmol/h	lbmol/h
Carbon Dioxide		6.85996E-05	0.000554172*	0.000485573
Nitrogen		6.03065E-06	0.000554172*	0.000548142
Methane		0.00586988	0.167317*	0.161448
Ethane		0.0410675	0.202102*	0.161035
Propane		0.121136	0.238166*	0.117030
Isobutane		0.0547469	0.0738754*	0.0191285
n-Butane		0.185014	0.228831*	0.0438168
Isopentane		0.139522	0.151417*	0.0118950
n-Pentane		0.214357	0.227594*	0.0132374
Cyclohexane		0.195716	0.198181*	0.00246409
n-Heptane		0.574175	0.577021*	0.00284589
n-Octane		0.709014	0.710023*	0.00100905
n-Nonane		0.323028	0.323168*	0.000139492
Benzene		0.00419498	0.00426286*	6.78868E-05
Toluene		0.0320514	0.0321846*	0.000133267
Ethylbenzene		0.0335497	0.0335914*	4.16923E-05
m-Xylene		0.0912599	0.0913532*	9.32322E-05
n-Hexane		0.199312	0.202614*	0.00330185
2,2,4-Trimethylpentane		0	0*	0
Oxygen		0	0*	0
Water		0	0*	0
Decanes +		0.800049	0.800054*	4.91126E-06

Mass Fraction	%	%	%
Carbon Dioxide	0.000719158	0.00555750*	0.112212
Nitrogen	4.02426E-05	0.00353752*	0.0806298
Methane	0.0224314	0.611646*	13.6000
Ethane	0.294153	1.38477*	25.4259
Propane	1.27241	2.39312*	27.0975
Isobutane	0.757980	0.978431*	5.83795
n-Butane	2.56154	3.03071*	13.3727
Isopentane	2.39788	2.48938*	4.50639
n-Pentane	3.68402	3.74178*	5.01496
Cyclohexane	3.92362	3.80060*	1.08892
n-Heptane	13.7049	13.1752*	1.49738
n-Octane	19.2923	18.4814*	0.605236
n-Nonane	9.86895	9.44476*	0.0939422
Benzene	0.0780553	0.0758764*	0.0278445
Toluene	0.703466	0.675736*	0.0644761
Ethylbenzene	0.848449	0.812638*	0.0232420
m-Xylene	2.30790	2.21000*	0.0519737
n-Hexane	4.09141	3.97869*	1.49409
2,2,4-Trimethylpentane	0	0*	0
Oxygen	0	0*	0
Water	0	0*	0
Decanes +	34.1897	32.7062*	0.00462649
Mass Flow	**lb/h**	**lb/h**	**lb/h**
Carbon Dioxide	0.00301903	0.0243888*	0.0213698
Nitrogen	0.000168939	0.0155243*	0.0153553
Methane	0.0941672	2.68418*	2.59002
Ethane	1.23486	6.07702*	4.84217
Propane	5.34158	10.5021*	5.16051
Isobutane	3.18201	4.29380*	1.11179
n-Butane	10.7534	13.3001*	2.54673
Isopentane	10.0663	10.9245*	0.858207
n-Pentane	15.4656	16.4207*	0.955060
Cyclohexane	16.4714	16.6788*	0.207376
n-Heptane	57.5335	57.8186*	0.285164
n-Octane	80.9896	81.1048*	0.115263
n-Nonane	41.4300	41.4479*	0.0178906
Benzene	0.327677	0.332980*	0.00530276
Toluene	2.95316	2.96544*	0.0122790
Ethylbenzene	3.56180	3.56623*	0.00442627
m-Xylene	9.68861	9.69851*	0.00989800
n-Hexane	17.1758	17.4603*	0.284538
2,2,4-Trimethylpentane	0	0*	0
Oxygen	0	0*	0
Water	0	0*	0
Decanes +	143.529	143.530*	0.000881079

Process Streams		Condensate	Pressurized Liquid	Uncontrolled Flash Gas
Properties	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	Condensate Tank	--	Condensate Tank
	To Block:	--	Condensate Tank	--
Property	**Units**			
Temperature	°F	53.938*	67*	53.938
Pressure	psia	14.6959*	145.696*	14.6959
Mole Fraction Vapor	%	0	0.331272	100
Mole Fraction Light Liquid	%	100	99.6687	0
Mole Fraction Heavy Liquid	%	0	0	0
Molecular Weight	lb/lbmol	112.724	102.946	35.3505
Mass Density	lb/ft^3	45.4793	42.1943	0.0954022
Molar Flow	lbmol/h	3.72414	4.26286	0.538725
Mass Flow	lb/h	419.802	438.846	19.0442
Vapor Volumetric Flow	ft^3/h	9.23061	10.4006	199.620
Liquid Volumetric Flow	gpm	1.15083	1.29670	24.8877
Std Vapor Volumetric Flow	MMSCFD	0.0339181	0.0388246	0.00490651
Std Liquid Volumetric Flow	sgpm	1.16667*	1.25263	0.0859661
Compressibility		0.00660855	0.0628929	0.987960
Specific Gravity		0.729197		1.22056
API Gravity		63.3099		
Enthalpy	Btu/h	-364432	-386776	-22332.5
Mass Enthalpy	Btu/lb	-868.106	-881.348	-1172.66
Mass Cp	Btu/(lb*°F)	0.475771	0.489140	0.410436
Ideal Gas CpCv Ratio		1.05052	1.05409	1.15981
Dynamic Viscosity	cP	0.643417		0.00870105
Kinematic Viscosity	cSt	0.883198		5.69367
Net Ideal Gas Heating Value	Btu/ft^3	5672.61	5192.30	1871.98
Net Liquid Heating Value	Btu/lb	18938.7	18983.0	19959.8
Gross Ideal Gas Heating Value	Btu/ft^3	6093.89	5581.71	2041.11
Gross Liquid Heating Value	Btu/lb	20356.9	20418.4	21775.3

Stream Uncontrolled Flash Gas C3+ Mass Flow =3.42 lb/h

Stream Uncontrolled Flash Gas C3+ Mass Flow =14.99 ton/yr



Properties	Produced Water	
Std Liquid Volumetric Flow(Total)	2400	bbl/d

Tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.4835 ton/yr.

Produced Water

Properties	Produced Water	
API Gravity(Total)	10.016	

Process Streams		GPU Gas	Produced Water	Separated Water	Uncontrolled Flash Gas	Water
Composition	**Status:**	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	--	Produced Water Tank	MIX-100	Produced Water Tank	--
	To Block:	MIX-100	--	Produced Water Tank	--	MIX-100
Mole Fraction		%	%	%	%	%
Carbon Dioxide		0.1614*	4.05991E-05	7.65496E-05	0.0782491	0*
Nitrogen		0.5726*	7.01110E-06	0.000271576	0.575554	0*
Methane		76.9291*	0.00188415	0.0364863	75.2772	0*
Ethane		14.6375*	0.000420136	0.00694235	14.1892	0*
Propane		4.7175*	0.000154443	0.00223744	4.53161	0*
Isobutane		0.5696*	6.70081E-06	0.000270153	0.573133	0*
n-Butane		1.2445*	3.09401E-05	0.000590248	1.21678	0*
Isopentane		0.2668*	4.72845E-06	0.000126539	0.264998	0*
n-Pentane		0.3397*	5.85258E-06	0.000161115	0.337771	0*
Cyclohexane		0.507*	4.65235E-05	0.000240463	0.421951	0*
n-Heptane		0*	0	0	0	0*
n-Octane		0*	0	0	0	0*
n-Nonane		0*	0	0	0	0*
Benzene		0*	0	0	0	0*
Toluene		0*	0	0	0	0*
Ethylbenzene		0*	0	0	0	0*
m-Xylene		0*	0	0	0	0*
n-Hexane		0*	0	0	0	0*
2,2,4-Trimethylpentane		0*	0	0	0	0*
Oxygen		0.0543*	1.32813E-06	2.57537E-05	0.0531379	0*
Water		0*	99.9974	99.9526	2.48046	100*
Decanes +		0*	0	0	0	0*
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Carbon Dioxide		0.00148860*	0.000789135	0.00148860	0.000699463	0*
Nitrogen		0.00528111*	0.000136276	0.00528111	0.00514483	0*
Methane		0.709520*	0.0366226	0.709520	0.672897	0*
Ethane		0.135002*	0.00816629	0.135002	0.126836	0*
Propane		0.0435097*	0.00300195	0.0435097	0.0405077	0*
Isobutane		0.00525344*	0.000130245	0.00525344	0.00512320	0*
n-Butane		0.0114781*	0.000601390	0.0114781	0.0108767	0*
Isopentane		0.00246071*	9.19081E-05	0.00246071	0.00236880	0*
n-Pentane		0.00313307*	0.000113758	0.00313307	0.00301931	0*
Cyclohexane		0.00467608*	0.000904289	0.00467608	0.00377179	0*
n-Heptane		0*	0	0	0	0*
n-Octane		0*	0	0	0	0*
n-Nonane		0*	0	0	0	0*
Benzene		0*	0	0	0	0*
Toluene		0*	0	0	0	0*
Ethylbenzene		0*	0	0	0	0*
m-Xylene		0*	0	0	0	0*
n-Hexane		0*	0	0	0	0*
2,2,4-Trimethylpentane		0*	0	0	0	0*
Oxygen		0.000500811*	2.58153E-05	0.000500811	0.000474996	0*
Water		0*	1943.67	1943.70	0.0221727	1943.70*
Decanes +		0*	0	0	0	0*

Mass Fraction	%	%	%	%	%
Carbon Dioxide	0.338400*	9.91788E-05	0.000186988	0.165317	0*
Nitrogen	0.764183*	1.09020E-05	0.000422262	0.774002	0*
Methane	58.7952*	0.00167781	0.0324882	57.9729	0*
Ethane	20.9685*	0.000701239	0.0115865	20.4817	0*
Propane	9.91031*	0.000378024	0.00547611	9.59265	0*
Isobutane	1.57722*	2.16185E-05	0.000871518	1.59915	0*
n-Butane	3.44601*	9.98205E-05	0.00190415	3.39503	0*
Isopentane	0.917054*	1.89367E-05	0.000506733	0.917830	0*
n-Pentane	1.16763*	2.34386E-05	0.000645192	1.16988	0*
Cyclohexane	2.03278*	0.000217336	0.00112325	1.70473	0*
n-Heptane	0*	0	0	0	0*
n-Octane	0*	0	0	0	0*
n-Nonane	0*	0	0	0	0*
Benzene	0*	0	0	0	0*
Toluene	0*	0	0	0	0*
Ethylbenzene	0*	0	0	0	0*
m-Xylene	0*	0	0	0	0*
n-Hexane	0*	0	0	0	0*
2,2,4-Trimethylpentane	0*	0	0	0	0*
Oxygen	0.0827777*	2.35902E-06	4.57402E-05	0.0816260	0*
Water	0*	99.9967	99.9447	2.14518	100*
Decanes +	0*	0	0	0	0*
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Carbon Dioxide	0.0655125*	0.0347294	0.0655125	0.0307830	0*
Nitrogen	0.147942*	0.00381757	0.147942	0.144124	0*
Methane	11.3824*	0.587517	11.3824	10.7949	0*
Ethane	4.05939*	0.245553	4.05939	3.81383	0*
Propane	1.91859*	0.132373	1.91859	1.78621	0*
Isobutane	0.305342*	0.00757015	0.305342	0.297771	0*
n-Butane	0.667131*	0.0349541	0.667131	0.632177	0*
Isopentane	0.177537*	0.00663106	0.177537	0.170906	0*
n-Pentane	0.226047*	0.00820750	0.226047	0.217839	0*
Cyclohexane	0.393536*	0.0761045	0.393536	0.317432	0*
n-Heptane	0*	0	0	0	0*
n-Octane	0*	0	0	0	0*
n-Nonane	0*	0	0	0	0*
Benzene	0*	0	0	0	0*
Toluene	0*	0	0	0	0*
Ethylbenzene	0*	0	0	0	0*
m-Xylene	0*	0	0	0	0*
n-Hexane	0*	0	0	0	0*
2,2,4-Trimethylpentane	0*	0	0	0	0*
Oxygen	0.0160253*	0.000826058	0.0160253	0.0151993	0*
Water	0*	35015.8	35016.2	0.399447	35016.2*
Decanes +	0*	0	0	0	0*

Process Streams		GPU Gas	Produced Water	Separated Water	Uncontrolled Flash Gas	Water
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	--	Produced Water Tank	MIX-100	Produced Water Tank	--
	To Block:	MIX-100	--	Produced Water Tank	--	MIX-100
Property	**Units**					
Temperature	°F	4211.49	70*	69.6909	70	67*
Pressure	psia	145.696*	14.6959*	145.696	14.6959	145.696*
Mole Fraction Vapor	%	100	0	0.0228343	100	0
Mole Fraction Light Liquid	%	0	100	99.9772	0	100
Mole Fraction Heavy Liquid	%	0	0	0	0	0
Molecular Weight	lb/lbmol	20.9904	18.0154	18.0167	20.8310	18.0153
Mass Density	lb/ft^3	0.0609170	62.2742	60.4920	0.0540640	62.3107
Molar Flow	lbmol/h	0.922304	1943.73	1944.62	0.893893	1943.70
Mass Flow	lb/h	19.3595	35017.0	35035.6	18.6207	35016.2
Vapor Volumetric Flow	ft^3/h	317.801	562.303	579.177	344.419	561.961
Liquid Volumetric Flow	gpm	39.6220	70.1053	72.2091	42.9406	70.0627
Std Vapor Volumetric Flow	MMSCFD	0.0084*	17.7027	17.7109	0.00814124	17.7025
Std Liquid Volumetric Flow	sgpm	0.112432	70.0055	70.1124	0.106931	70*
Compressibility		1.00147	0.000747935	0.00763850	0.996162	0.00745286
Specific Gravity		0.724740	0.998480		0.719237	0.999066
API Gravity			10.0161			9.99589
Enthalpy	Btu/h	59038.5	-2.39107E+08	-2.39139E+08	-31912.6	-2.39198E+08
Mass Enthalpy	Btu/lb	3049.59	-6828.30	-6825.59	-1713.83	-6831.05
Mass Cp	Btu/(lb*°F)	1.43614?	0.983152	0.982987	0.475974	0.983154
Ideal Gas CpCv Ratio		1.07052	1.32584	1.32581	1.25161	1.32599
Dynamic Viscosity	cP	0.0500679	0.995648		0.0105274	1.03668
Kinematic Viscosity	cSt	51.3098	0.998106		12.1560	1.03863
Net Ideal Gas Heating Value	Btu/ft^3	1144.00	0.0309808	0.542581	1112.99	0
Net Liquid Heating Value	Btu/lb	20619.9	-1059.07	-1047.78	20192.5	-1059.76
Gross Ideal Gas Heating Value	Btu/ft^3	1260.86	50.3428	50.8841	1228.06	50.31
Gross Liquid Heating Value	Btu/lb	22732.6	0.715653	12.5612	22288.7	0

Representative Analyses

Representative Analyses Discussion

Hydrocarbon Liquid Sample – Blanche No. 1H

The Blanche No. 1H hydrocarbon liquid was used as a representative sample for the Jackson Well Pad. Both sites are located in wet gas areas within the Marcellus formation. The Blanche No. 1H is of the same field as the wells planned for the Jackson Well Pad and in the same county (Ritchie). The API and RVP of the condensate are expected to be similar to the wells of the Jackson Well Pad.

Gas Sample – Hendershot 1H

The Hendershot 1H gas sample was used as a representative sample for the Jackson Well Pad. Both sites are located in wet gas areas within the Marcellus formation. The Hendershot 1H gas sample is of the same field as the wells planned for the Jackson Well Pad and in the same county (Ritchie). The heating value of the Hendershot 1H gas sample (1,250 Btu/scf) is expected to be similar to the wells of the proposed Jackson Well Pad.

November 5, 2014

FESCO, Ltd.
1100 FESCO Avenue - Alice, Texas 78332

For: Antero Resources Appalachian Corp.
1615 Wynkoop Street
Denver, Colorado 80202

Sample: Blanche No. 1H
First Stage Separator Hydrocarbon Liquid
Sampled @ 131 psig & 67 °F

Date Sampled: 10/14/14 Job Number: 45835.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.013	0.003	0.003
Carbon Dioxide	0.013	0.005	0.006
Methane	3.925	1.445	0.619
Ethane	4.741	2.755	1.401
Propane	5.587	3.344	2.421
Isobutane	1.733	1.232	0.990
n-Butane	5.300	3.630	3.027
2,2 Dimethylpropane	0.068	0.057	0.049
Isopentane	3.552	2.822	2.518
n-Pentane	5.339	4.205	3.785
2,2 Dimethylbutane	0.181	0.164	0.153
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.359	0.320	0.304
2 Methylpentane	2.458	2.217	2.082
3 Methylpentane	1.651	1.464	1.398
n-Hexane	4.753	4.246	4.025
Heptanes Plus	60.327	72.091	77.221
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity	0.7505	(Water=1)
°API Gravity	57.04	@ 60°F
Molecular Weight	130.3	
Vapor Volume	18.29	CF/Gal
Weight	6.25	Lbs/Gal

Characteristics of Total Sample:

Specific Gravity	0.7006	(Water=1)
°API Gravity	70.46	@ 60°F
Molecular Weight	101.8	
Vapor Volume	21.85	CF/Gal
Weight	5.84	Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
Processor: XGdjv
Cylinder ID: W-2878

David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.013	0.005	0.006
Nitrogen	0.013	0.003	0.003
Methane	3.925	1.445	0.619
Ethane	4.741	2.755	1.401
Propane	5.587	3.344	2.421
Isobutane	1.733	1.232	0.990
n-Butane	5.368	3.687	3.075
Isopentane	3.552	2.822	2.518
n-Pentane	5.339	4.205	3.785
Other C-6's	4.649	4.165	3.937
Heptanes	13.536	13.131	13.047
Octanes	16.656	17.262	17.819
Nonanes	7.581	9.064	9.453
Decanes Plus	18.768	29.576	33.084
Benzene	0.100	0.061	0.077
Toluene	0.755	0.549	0.683
E-Benzene	0.788	0.661	0.822
Xylenes	2.143	1.786	2.236
n-Hexane	4.753	4.246	4.025
2,2,4 Trimethylpentane	0.000	0.000	0.000
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity	0.7006	(Water=1)
°API Gravity	70.46	@ 60°F
Molecular Weight	101.8	
Vapor Volume	21.85	CF/Gal
Weight	5.84	Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity	0.7837	(Water=1)
Molecular Weight	179.4	

Characteristics of Atmospheric Sample:

°API Gravity	63.35	@ 60°F
Reid Vapor Pressure (ASTM D-5191)	8.18	psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-------	W-2878*	POS-089
Pressure, PSIG	131	131	129
Temperature, °F	67	70	70

* Sample used for analysis

TOTAL EXTENDED REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.013	0.003	0.003
Carbon Dioxide	0.013	0.005	0.006
Methane	3.925	1.445	0.619
Ethane	4.741	2.755	1.401
Propane	5.587	3.344	2.421
Isobutane	1.733	1.232	0.990
n-Butane	5.300	3.630	3.027
2,2 Dimethylpropane	0.068	0.057	0.049
Isopentane	3.552	2.822	2.518
n-Pentane	5.339	4.205	3.785
2,2 Dimethylbutane	0.181	0.164	0.153
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.359	0.320	0.304
2 Methylpentane	2.458	2.217	2.082
3 Methylpentane	1.651	1.464	1.398
n-Hexane	4.753	4.246	4.025
Methylcyclopentane	0.809	0.622	0.669
Benzene	0.100	0.061	0.077
Cyclohexane	0.891	0.659	0.737
2-Methylhexane	2.962	2.992	2.917
3-Methylhexane	2.525	2.518	2.486
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.233	1.213	1.202
n-Heptane	5.116	5.128	5.037
Methylcyclohexane	3.180	2.777	3.068
Toluene	0.755	0.549	0.683
Other C-8's	9.490	10.049	10.278
n-Octane	3.985	4.436	4.473
E-Benzene	0.788	0.661	0.822
M & P Xylenes	0.925	0.780	0.965
O-Xylene	1.218	1.006	1.271
Other C-9's	5.133	6.071	6.368
n-Nonane	2.448	2.993	3.085
Other C-10's	4.801	6.239	6.664
n-decane	1.380	1.841	1.930
Undecanes(11)	3.806	5.076	5.498
Dodecanes(12)	2.290	3.299	3.623
Tridecanes(13)	1.614	2.493	2.776
Tetradecanes(14)	1.040	1.721	1.942
Pentadecanes(15)	0.749	1.327	1.515
Hexadecanes(16)	0.475	0.899	1.035
Heptadecanes(17)	0.396	0.793	0.922
Octadecanes(18)	0.341	0.720	0.842
Nonadecanes(19)	0.281	0.617	0.726
Eicosanes(20)	0.203	0.464	0.549
Heneicosanes(21)	0.180	0.432	0.514
Docosanes(22)	0.170	0.426	0.509
Tricosanes(23)	0.140	0.363	0.437
Tetracosanes(24)	0.123	0.330	0.399
Pentacosanes(25)	0.096	0.267	0.325
Hexacosanes(26)	0.095	0.275	0.336
Heptacosanes(27)	0.081	0.244	0.299
Octacosanes(28)	0.071	0.221	0.271
Nonacosanes(29)	0.076	0.242	0.299
Triacontanes(30)	0.061	0.201	0.249
Hentriacontanes Plus(31+)	0.298	1.087	1.422
Total	100.000	100.000	100.000

October 30, 2014

FESCO, Ltd.
1100 Fesco Avenue - Alice, Texas 78332

For: Antero Resources Appalachian Corp.
1615 Wynkoop Street
Denver, Colorado 80202

Date Sampled: 10/14/14

Date Analyzed: 10/25/14

Sample: Blanche No. 1H

Job Number: J45835

FLASH LIBERATION OF HYDROCARBON LIQUID		
	First Stage Separator HC Liquid	Stock Tank
Pressure, psig	131	0
Temperature, °F	67	70
Gas Oil Ratio (1)	------	130
Gas Specific Gravity (2)	------	1.295
Separator Volume Factor (3)	1.0893	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.9180
Oil API Gravity at 60 °F	63.35
Reid Vapor Pressure, psi (5)	8.18

Quality Control Check			
	Sampling Conditions	Test Samples	
Cylinder No.	------	W-2878*	POS-089
Pressure, psig	131	131	129
Temperature, °F	67	70	70

(1) - Scf of flashed vapor per barrel of stock tank oil
(2) - Air = 1.000
(3) - Separator volume / Stock tank volume
(4) - Fraction of first stage separator liquid
(5) - Absolute pressure at 100 deg F
Analyst: T. G.
* Sample used for flash study
Base Conditions: 14.85 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

October 28, 2014

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

For: Antero Resources Appalachian Corp.
1615 Wynkoop Street
Denver, Colorado 80202

Sample: Blanche No. 1H
Gas Evolved from Hydrocarbon Liquid Flashed
From 131 psig & 67 °F to 0 psig & 70 °F

Date Sampled: 10/14/14 Job Number: 45835.001

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.049	
Carbon Dioxide	0.109	
Methane	28.471	
Ethane	28.709	7.738
Propane	21.448	5.956
Isobutane	3.755	1.238
n-Butane	8.599	2.732
2-2 Dimethylpropane	0.083	0.032
Isopentane	2.464	0.908
n-Pentane	2.635	0.963
Hexanes	2.181	0.906
Heptanes Plus	1.497	0.656
Totals	100.000	21.129

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity	3.496	(Air=1)
Molecular Weight	99.94	
Gross Heating Value	5352	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity	1.295	(Air=1)
Compressibility (Z)	0.9870	
Molecular Weight	37.01	
Gross Heating Value		
Dry Basis	2179	BTU/CF
Saturated Basis	2142	BTU/CF

*Hydrogen Sulfide tested in laboratory by: Stain Tube Method (GPA 2377)
Results: 0.063 Gr/100 CF, 1.0 PPMV or 0.0001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR
Processor: IM
Cylinder ID: FL-6S

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2286
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.049		0.037
Carbon Dioxide	0.109		0.130
Methane	28.471		12.340
Ethane	28.709	7.738	23.322
Propane	21.448	5.956	25.552
Isobutane	3.755	1.238	5.896
n-Butane	8.599	2.732	13.503
2,2 Dimethylpropane	0.083	0.032	0.162
Isopentane	2.464	0.908	4.803
n-Pentane	2.635	0.963	5.136
2,2 Dimethylbutane	0.073	0.031	0.170
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.126	0.052	0.293
2 Methylpentane	0.665	0.278	1.548
3 Methylpentane	0.399	0.164	0.929
n-Hexane	0.918	0.380	2.137
Methylcyclopentane	0.081	0.028	0.184
Benzene	0.020	0.006	0.042
Cyclohexane	0.108	0.037	0.245
2-Methylhexane	0.185	0.087	0.501
3-Methylhexane	0.180	0.083	0.487
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.183	0.080	0.490
n-Heptane	0.260	0.121	0.704
Methylcyclohexane	0.162	0.066	0.430
Toluene	0.033	0.011	0.082
Other C8's	0.181	0.085	0.539
n-Octane	0.044	0.023	0.136
Ethylbenzene	0.001	0.000	0.003
M & P Xylenes	0.010	0.004	0.029
O-Xylene	0.001	0.000	0.003
Other C9's	0.036	0.018	0.123
n-Nonane	0.006	0.003	0.021
Other C10's	0.005	0.003	0.019
n-Decane	0.001	0.001	0.004
Undecanes (11)	0.000	0.000	0.000
Totals	100.000	21.129	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity	1.295	(Air=1)
Compressibility (Z)	0.9870	
Molecular Weight	37.01	
Gross Heating Value		
Dry Basis	2179	BTU/CF
Saturated Basis	2142	BTU/CF

GAS ANALYTICAL SERVICES

C6+ Gas Analysis Report

Gas Analytical

Report Date: Oct 20, 2014 8:28a

Client:	Antero Resources	Date Sampled:	Oct 16, 2014 12:00a
Site:	Hendershot 1H	Analysis Date:	Oct 17, 2014 3:09p
Field No:	9998	Collected By:	Burl Barker
Meter:		Date Effective:	Oct 16, 2014 12:00a
Source Laboratory	Clarksburg (Bridgeport), WV	Sample Pressure (PSI):	141.0
Lab File No:	**117647.CHR**	Sample Temp (°F):	66
Sample Type:	Spot	Field H2O (PPM):	No Test
Reviewed By:		Field H2S (PPM):	No Test

Component	Mol %	Gal/MSCF
Methane	76.9291	
Ethane	14.6375	3.89
Propane	4.7175	1.30
I-Butane	0.5696	0.19
N-Butane	1.2445	0.39
I-Pentane	0.2668	0.10
N-Pentane	0.3397	0.12
Nitrogen	0.5726	
Oxygen	0.0543	
CO2	0.1614	
Hexanes+	0.5070	0.21
TOTAL	100.0000	6.19

Analytical Results at Base Conditions (Real)		
BTU/SCF (Dry):	1,271.2478	BTU/ft³
BTU/SCF (Saturated):	1,250.0002	BTU/ft³
PSIA:	14.73	PSI
Temperature (°F):	60.00	°F
Z Factor (Dry):	0.99637	
Z Factor (Saturated):	0.99594	

Analytical Results at Contract Conditions (Real)		
BTU/SCF (Dry):	1,271.2478	BTU/ft³
BTU/SCF (Saturated):	1,250.0002	BTU/ft³
PSIA:	14.7300	PSI
Temperature (°F):	60.0000	°F
Z Factor (Dry):	0.99637	
Z Factor (Saturated):	0.99594	

Calculated Specific Gravities			
Ideal Gravity:	0.7263	Real Gravity:	0.7287
Molecular Wt:	21.0362	lb/lbmol	

Gross Heating Values are Based on:
GPA 2145-09, 2186
Compressibility is Calculated using AGA-8.

Source	Date	Notes

<MDL = Less than Method Detection Limits, NG = Not Given, NT = Not Tested

Attachment J.
Public Notice

AIR QUALITY PERMIT NOTICE
Notice of Application – Jackson Well Pad

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a General Permit Registration for an upstream natural gas well pad located north of Collins Avenue near Pennsboro, in Ritchie County, West Virginia. The latitude and longitude coordinates are: 39.2918N, 80.9813W. The expected start-up of operations is February 2016.

The applicant estimates the potential to discharge the following Regulated Air Pollutants will be:

Pollutant	Emission Rate (tons per year)
Nitrogen Oxides (NOx)	10.81
Carbon Monoxide (CO)	18.70
Volatile Organic Compounds (VOC)	28.87
Particulate Matter less than 10 µm (PM_{10})	0.80
Particulate Matter less than 2.5 µm ($PM_{2.5}$)	0.65
Sulfur Dioxide (SO_2)	0.05
Formaldehyde	0.03
Benzene	0.01
Toluene	0.01
Ethylbenzene	0.01
Xylenes	0.01
Carbon Dioxide equivalent (CO_2e)	10,448

Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.
Dated the 2nd day of February 2015.

By: Antero Resources Corporation
Barry Schatz
Air Permitting & Compliance Manager
1615 Wynkoop Street
Denver, CO 80202

Attachment N.
Material Safety Data Sheets

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas **US GHS**

SYNONYMS: **CNG, Natural Gas, Methane.**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Dry Field Natural Gas**
PRODUCT CODES: **CAS Reg. No. 68410-63-9**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Flammable Gas – Category 1.
Gases Under Pressure – Gas.
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

Extremely flammable gas.
Contains gas under pressure, may explode if heated.
May cause damage to central nervous and respiratory systems.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Do not breathe fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.

Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

Storage

Protect from sunlight. Store in a well-ventilated place.
Store in a secure area.

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
74-82-8	Methane	95.01
78-84-0	Ethane	3.99
74-98-6	Propane	0.32
106-97-8	Butanes	0.07
109-66-0	Pentanes	0.02
110-54-3	Hexanes	0.01
7727-37-9	Nitrogen	0.35
124-38-9	Carbon Dioxide	0.19
7782-44-7	Oxygen	0.03

Because natural gas is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes

In case of freeze burn, cover eyes to protect from light. Flush eyes with running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. In case of blistering, frostbite or freeze burns, seek immediate medical attention.

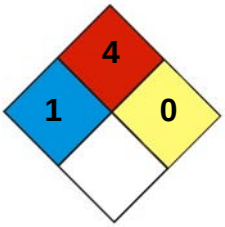
First Aid: Ingestion

Risk of ingestion is extremely low. However, if oral exposure occurs, seek immediate medical assistance.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: **1** Flammability: **4** Instability: **0** (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.
Forms a flammable mixture with air. If released, the resulting vapors will disperse with the prevailing wind. If a source of ignition is present where the vapor exists at a 5 – 15% concentration in air, the vapor will burn along the flame front toward the source of the fuel.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

Any extinguisher suitable for Class B fires, dry chemical, fire fighting foam, CO2, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

Gas fires should not be extinguished unless flow of gas can be immediately stopped. Shut off gas source and allow gas to burn out. If spill or leak has not ignited, determine

if water spray may assist in dispersing gas or vapor to protect personnel attempting to stop leak. Use water to cool equipment, surfaces and piping exposed to fire and excessive heat. For large fire, the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Isolate area, particularly around piping. Let the fire burn unless leak can be stopped. Concentrate fire-fighting efforts on objects / materials ignited by the initial fire. Withdraw immediately in the event of a rising sound from a venting safety device.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH-approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Stop the source of the release, if safe to do so.

Materials and Methods for Clean-Up

Consider the use of water spray to disperse gas vapors. Do not use water spray to direct gas vapors toward sewer or drainage systems. Isolate the area until gas has dispersed. Ventilate and gas test area before entering.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Cooling effect of expanding gas from leak may present frostbite / freeze burn hazard. Wear flame retardant (FR) clothing around un-ignited leak. Wear fire protective clothing around an active fire.

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use only in well ventilated areas.

Storage Procedures

Natural gas will be contained in the pipeline. Keep away from flame, sparks, excessive temperatures and open flames. Empty pipeline segments may contain explosive residues from natural gas liquids. Do not cut, heat, weld or expose containers to sources of ignition sections of pipeline unless the sections have been purged of natural gas residues.

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Methane (74-82-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Propane (74-98-6)

ACGIH: 2500 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Butane (106-97-8)

ACGIH: 800 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Pentanes (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

Hexanes (110-54-3)

ACGIH: 50 ppm TWA (listed under n-Hexane)

Nitrogen (7727-37-9)

Simple Asphyxiant

Carbon Dioxide (124-38-9)

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)

N/A – Necessary for life

Engineering Measures

Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere. CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Use cold-impervious, insulating flame-retardant (FR) gloves where contact with pressurized gas may occur.

Personal Protective Equipment: Eyes

Where there is a possibility of pressurized gas contact, wear splash-proof safety goggles and faceshield.

Personal Protective Equipment: Skin and Body

Where contact with pressurized gas may occur, wear flame-retardant (FR) and a faceshield.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Colorless	**Odor:**	Odorless to slight petroleum odor
Physical State:	Gas	**pH:**	ND
Vapor Pressure:	40 atm @ -187°F (-86°C)	**Vapor Density:**	0.6
Boiling Point:	-259°F (-162°C)	**Melting Point:**	ND
Solubility (H2O):	3.5%	**Specific Gravity:**	0.4 @ -263°F (-164°C)

Evaporation Rate:	ND	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	Flammable Gas
Flash Point Method:	N/A		
Lower Flammability Limit: (LFL):	3.8 – 6.5	**Upper Flammability Limit: (UFL):**	13-17
Auto Ignition:	900-1170°F (482-632°C)	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Methane and ethane, the main components of natural gas, are considered practically inert in terms of physiological effects. At high concentrations these materials act as simple asphyxiants and may cause death due to lack of oxygen.

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

Butanes (106-97-8)
Inhalation LC50 Rat 658 g/m3 4h

Pentanes (109-66-0)
Inhalation LD50 Rat 364 g/m3 4h

Hexanes (110-54-3)
Inhalation LC50 Rat > 20 mg/l 4h

Nitrogen (7727-37-9)
Simple Asphyxiant

Carbon Dioxide (124-38-9)
Inhalation LC50 Human 100,000 ppm 1minute

Oxygen (7782-44-7)
N/A – Necessary for life

Potential Health Effects: Skin Corrosion Property / Stimulativeness
This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity
This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information
This product is not reported to have any carcinogenic effects.

B: Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity
This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure
This product may cause damage to the heart.

Specified Target Organ General Toxicity: Repeated Exposure
This product is not reported to have any specific target organ repeat effects.

Aspiration Respiratory Organs Hazard
This product is not reported to have any aspiration hazard effects.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep gas and vapors out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

No ecotoxicity data are available for this product's components.

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents / container in accordance with local / regional / national / international regulations.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

UN #: 1971 **Hazard Class:** 2.1

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A.
n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

n-hexane is listed under CERCLA (40 CFR 302.4). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
---	---	X	X	---

SARA Section 313 – Supplier Notification

This product contains one chemical (n-Hexane) that is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-know act (EPCRA) of 1986 and of 40 CFR 372. However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

State Regulations

Component Analysis – State

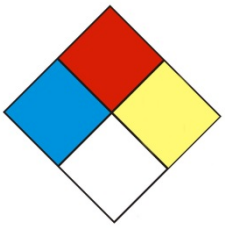
The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Methane	74-82-8	No	No	Yes	Yes	Yes	No
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Pentanes	109-66-0	Yes	No	Yes	Yes	Yes	Yes
Hexanes	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
Nitrogen	7727-37-9	No	No	No	No	No	No
Carbon Dioxide	124-38-9	Yes	No	Yes	Yes	Yes	Yes
Oxygen	7782-44-7	No	No	No	No	No	No

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Natural Gas Condensate **US GHS**

SYNONYMS: **Drips; Condensate; Field Condensate; Gas Well Condensate; High Pressure Inlet Liquids; Lease Condensate; Natural Gas Liquids; Pipeline Liquids**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Natural Gas Condensate**
PRODUCT CODES: **64741-47-5**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Flammable Liquids – Category 2.
Acute Toxicity Inhalation – Category 3
Germ Cell Mutagenicity – Category 1B
Carcinogenicity – Category 1A
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 3
Specific Target Organ Systemic Toxicity (STOT) – Repeat Exposure Category 1
Aspiration Toxicity – Category 1
Toxic to the Aquatic Environment Acute – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor.
Toxic if inhaled.
May cause genetic defects.
May cause cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs (liver, kidneys, blood, nervous system, and skin) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Do not breathe gas/mist/vapors/spray.
Do not handle until all safety precautions have been read and understood.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.

Response

If on SKIN (or hair): Wash with plenty of soap and water. Remove / Take off all contaminated clothing immediately. Rinse skin with water/shower.
If INHALED: Remove victim to fresh air and keep comfortable for breathing. Call a poison center/doctor if the victim feels unwell.
If SWALLOWED: Immediately call a poison center or doctor / physician. Do not Induce vomiting.
If exposed or concerned: Get medical advice/attention.
In case of fire: Use water spray, fog or fire-fighting foam.

Storage

Store in a well-ventilated place. Keep cool.
Store in a secure area.

Disposal

Dispose of contents/containers in accordance with local/regional/national/international regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
111-65-9	Octanes	25 - 95
142-82-5	Heptanes	25 - 95
110-54-3	Hexanes as n-Hexane	25 - 95
109-66-0	Pentanes as n-Pentane	5 - 70
106-97-8	N-butane	0 - 45
74-98-6	Propane	0 - 15
78-84-0	Ethane	0 - 5
71-43-2	Benzene	< 1
108-88-3	Toluene	< 1
1330-20-7	m-,o-,p-Xylene	< 1

Because natural gas condensate is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes

Flush eyes with clean running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Wash contaminated clothing before reuse.

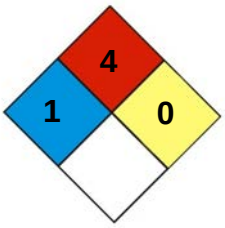
First Aid: Ingestion (swallowing)

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation (breathing)

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: 1 **Flammability:** 4 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.
Extremely flammable. Vapors may be ignited rapidly when exposed to heat, spark, open flame, or other source of ignition (e.g., static electricity, pilot lights, mechanical / electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Flammable vapors can burn in the open or explode in confined spaces. Vapors are heavier than air, and may travel distances to an ignition source and flash back. Runoff to sewer systems may cause fire or explosion.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, firefighting foam, water spray, carbon dioxide (CO_2), or other gaseous extinguishing agents. Use caution when applying CO2 in confined spaces.

LARGE FIRES: Water spray, fog or fire-fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full face piece and full protective clothing.

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8). Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of

ignition and hot metal surfaces away from spill/release if safe to do so.

The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons downwind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Prevention of Secondary Hazards

None

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use non-sparking tools. Use only outdoors or in well ventilated areas. Wear protective gloves / clothing and eye / face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Storage Procedures

Store only in approved containers. Bond and ground containers. Keep away from flame, sparks, excessive temperatures and open flames. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Octanes (111-65-9)

ACGIH: 300 ppm TWA (listed under Octane, all isomers)

Heptanes (142-82-5)

ACGIH: 400 ppm TWA (listed under n-Heptane)

n-Hexane (110-54-3)

ACGIH: 20 ppm TWA (listed under n-Hexane)

n-Pentane (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

n-Butane (106-97-8)

ACGIH: 600 ppm TWA (listed under n-Butane)

Propane (74-98-6)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases C1-C4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases C1-C4)

Benzene (71-43-2)

ACGIH: 0.5 ppm (TWA); NIOSH: 0.1 ppm (TWA); OSHA 1 ppm (TWA)

Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

m-, o-, p-Xylene (1330-20-7)

ACGIH: 100 ppm TWA (listed under Xylene o, m & p isomers)

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory

Use a NIOSH-approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere (oxygen content less than 19.5 percent). A respiratory program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant the use of a respirator.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29 CFR 1910.1028 – Benzene).

CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Eye protection that meets or exceeds ANSI Z.87.1 is recommended. Depending on conditions of use, a face shield may be necessary.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use gasoline or solvents (naphtha, kerosene, etc.) for washing this product from

exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Colorless to straw yellow	**Odor:**	Aromatic, Gasoline;
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	110 – 200 psia (Reid VP) @ 100°F/37.8°C	**Vapor Density (air = 1):**	> 1
Boiling Point:	Approx. 85 - 437°F (39 – 200°C)	**Melting Point:**	ND
Solubility (H2O):	Insoluble to slightly soluble	**Specific Gravity:**	AP 0.62-0.76 (varies)
Evaporation Rate:	High	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	-40°F -40°C
Flash Point Method:	Tag Closed Cup (TCC)		
Lower Flammability Limit: (LFL):	ND (NFPA Gasoline 1.4)	**Upper Flammability Limit: (UFL):**	ND (NFPA Gasoline 7.6)
Auto Ignition:	AP 480°F (250°C)	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from ignition sources and high temperatures.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B. Component Analysis – LD50/LC50

Octanes (111-65-9)
Inhalation LC50 rat = 118,000 mg/m3 / 4H

Heptanes (142-82-5)
Inhalation LC50 rat = 103,000 mg/m3 / 4H

Hexanes as n-Hexane (110-53-3)
Inhalation LC50 rat = 48,000 ppm / 4H

Pentanes as n-Pentane (109-66-0)
Inhalation LC50 rat = 364,000 mg/m3 / 4H

Butanes as n-Butane (106-97-8)
Inhalation LC50 rat 658,000 mg/l / 4H

Propane (74-98-6)
Inhalation LC50 Rat > 800,000 ppm / 0.25H

Ethane (74-84-0)
Inhalation LC50 Rat 658,000 mg/l / 4H

Benzene (71-43-2)
Inhalation LC50 Rat 44,700 mg/m3 /

Toluene (108-88-3)
Inhalation LD50 Rat 12/5 mg/l / 4H

m-, o-, p-Xylene (1330-20-7)
Inhalation LC50 Rat 5000 ppm / 4H

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion (swallowing)

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation (breathing)

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

Respiratory Organs Sensitization / Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

May cause genetic defects. Some crude oils and crude oil fractions have been positive in mutagenicity studies.

Carcinogenicity

A: General Product Information

May cause cancer.

This product contains benzene, although at very low concentrations. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Exposure to light hydrocarbons in the same boiling range as this product have been associated in animal studies with effects to the central nervous system, peripheral nervous system, liver, and kidneys. The significance of these animal models to predict similar human response is uncertain. Observing good work practices and personal hygiene procedures (Sections 7 and 8) can minimize potential risks to humans.

B: Component Carcinogenicity

Benzene (71-43-2)

ACGIH:	A1 - Confirmed Human Carcinogen
OSHA:	5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH:	potential occupational carcinogen
NTP:	Known Human Carcinogen (Select Carcinogen)

IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

May cause damage to organs (liver, kidneys, blood, nervous system and skin) through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

Benzene (71-43-2)

Test and Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [static]
48 Hr EC50 Daphnia magna	10 mg/L

Natural Gas condensates (68919-39-1)

Test and Species	Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L
24 Hr EC50 Daphnia magna	170 mg/L

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.
This material, if discarded should be fully characterized for ignitability (D001), reactivity (D003) and benzene (D018) prior to disposal (40 CFR261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material. Do not dispose of by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Petroleum Products, n.o.s. (condensate)

UN #: 1268 **Hazard Class:** 3

Additional Info.: Dependent on the product's properties, the shipper may also elect to classify as Gasoline UN1203 or Petroleum Crude Oil UN1267 - reference 49 CFR 172.101 for further description (e.g., packing group determination).

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Benzene (71-43-2)

SARA 313: 0.1% de minimis concentration

CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

SARA SECTION 313 – SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION PERCENT BY WEIGHT
Benzene (71-43-2)	<0.1 to 2

Canadian Regulatory Information

DSL/NDSL Inventory	This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.
Workplace Hazardous Materials Information System	B2 - Flammable Liquid D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material D2A: Material Causing Other Toxic Effects Very Toxic D2B - Material Causing Other Toxic Effects - Toxic Material

European Union Regulatory Information

Labeling	Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives. Contains: Low Boiling Point Naphtha
Symbol	**F+** Extremely Flammable **T** Toxic **N** Dangerous for the Environment
Risk Phrases	R12-45-38-65-67-51/53 Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Vapors may cause drowsiness and dizziness. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Phrases	S16-53-45-2-23-24-29-43-62 Keep away from sources of ignition – No smoking. Avoid exposure – obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/dry powder/CO2. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

State Regulations

Component Analysis – State

The following components appear on one or more of the following state hazardous substances lists

Component	CAS	CA	MA	MN	NJ	PA	RI
Octanes	111-65-9	Yes	No	Yes	Yes	Yes	Yes
Heptanes	142-82-5	Yes	No	Yes	Yes	Yes	Yes
n-Hexane	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
n-Pentane	109-66-0	Yes	No	Yes	Yes	Yes	Yes
n-Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	Yes
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	Yes
m-, o-, p-Xylene	1330-20-7	Yes	Yes	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

WARNING! This product contains a chemical known to the state of California to cause Reproductive / developmental effects.

Component Analysis – WHMIS IDL

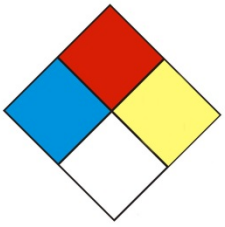
The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Benzene	71-43-2	0.1%

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Slight
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 29, 2014

Date of Last Revision: March 4, 2014

End of Sheet

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

SYNONYMS: **Produced Brine Water, Brine, Brine Water, Formation Water**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Produced Water**
PRODUCT CODES: **Mixture**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS
Symbol(s)

Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

Wear protective gloves/protective clothing/eye protection/face protection.

Response

If on SKIN (or hair): Rinse skin with water / shower. Remove / Take off all contaminated clothing immediately.

If in EYES: Rinse cautiously with water for at least fifteen (15) minutes. Remove Contact Lenses, if present and easy to do. Continue rinsing.

If EYE irritation persists, get medical advice / attention.

Storage
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
7732-18-5	Water	80
7647-14-5	Sodium Chloride	20

Because brine water is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes
Flush eyes with clean running water for at least fifteen (15) minutes. If irritation or redness develops from exposure, following flushing, seek medical attention.

First Aid: Skin
First aid is not required, normally. However, it is a good practice to wash any chemical from the skin.

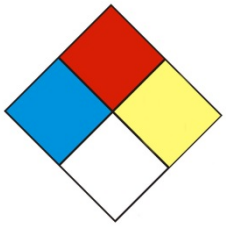
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

First Aid: Inhalation (Breathing)
Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

Most important symptoms and effects

None known or anticipated.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: 1 Flammability: 0 Instability: 0 (0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe)

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

No unusual fire or explosion hazards are expected. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media

The material is non-flammable. Use extinguishing agent suitable for the type of surrounding fire.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from the immediate hazard area if it can be done safely. Cool equipment exposed to fire with water, if it can be done safely.

Hazardous Combustion Products

None Anticipated. See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios of this material. However, local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Emergency Measures

The material is not considered hazardous. Nevertheless, evacuate nonessential personnel and secure the area. Stay upwind and uphill, if possible.

Personal Precautions and Protective Equipment

Stay upwind and away from the spill/release. Avoid direct contact with the material. For large spillages, notify persons downstream of the spill/release. Isolate the immediate hazard area and keep unauthorized personnel out. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking or absorbents, if possible. Do not flush down sewer or drainage systems. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If a spill occurs on water, notify appropriate authorities and advise shipping of any hazard.

Prevention of Secondary Hazards

None

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29 CFR 1910.146. Do not wear contaminated clothing or shoes.

Storage Procedures

Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well ventilated areas. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Personal Protective Equipment: Respiratory

Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR

1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

Personal Protective Equipment: Skin and Hands

The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals.

Personal Protective Equipment: Eyes

Safety glasses or goggles that meet or exceed ANSI Z-87.1 are recommended where there is a possibility of splashing or spraying.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove contaminated clothing and launder before reuse.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Clear to Brown	**Odor:**	Salty
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	< 0.36 psia @ 70°F / 21.1°C	**Vapor Density:**	> 1
Boiling Point:	212°F / 100°C	**Melting Point:**	2.4°F / -16.5°C
Solubility (H2O):	Complete	**Specific Gravity:**	1.1 @ 68°F / 20°C
Evaporation Rate:	Variable	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	ND
Flash Point Method:	ND		
Lower Flammability Limit: (LFL):	ND	**Upper Flammability Limit: (UFL):**	ND
Auto Ignition:	ND	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will react with alkali and alkaline metals to form flammable hydrogen gas.

Conditions to Avoid

Avoid contact with alkali metals (lithium, sodium, potassium), alkaline metals (beryllium, magnesium, calcium, strontium, and barium), and metallic hydrides like lithium aluminum hydride.

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Not expected to be a skin sensitizer.

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion

Ingestion may result in nausea, vomiting, diarrhea, abdominal cramps, and dehydration (thirst).

Potential Health Effects: Inhalation

No information available on the mixture. However, none of the components have been classified for respiratory sensitization (or are below the concentration threshold for classification).

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity multiple exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.

This material, if discarded as produced, is not a RCRA "listed" hazardous waste, and is not believed to exhibit characteristics of hazardous waste. Consult state and local regulations regarding the proper disposal of this material. Do not dispose of brine water by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate should not be considered a RCRA hazardous waste but must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

* * * Section 15 – REGULATORY INFORMATION * * *

CERCLA/SARA – Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372,

CERCLA/SARA – Section 313 and 40 CFR 372):
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

State Regulations

Component Analysis

The following components appear on one or more of the following state hazardous substances list.

California Proposition 65:
This material does not contain any chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

National Chemical Inventories:
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.

U.S. Export control classification Number: EAR99.

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	0
Reactivity	0

HMIS® Hazard Rating	Health	1	Slight
	Fire	0	Minimal
	Physical	0	Minimal

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet

Attachment O.
Emissions Summary Sheets

G70-A EMISSIONS SUMMARY SHEET

Emission Point ID No.	Emission Point Type[1]	Emission Unit Vented Through This Point		Air Pollution Control Device		All Regulated Pollutants - Chemical Name/CAS[2]	Maximum Potential Uncontrolled Emissions[3]		Maximum Potential Controlled Emissions[4]		Emission Form or Phase	Est. Method Used[5]
		ID No.	Source	ID No.	Device Type	*(Speciate VOCs & HAPS)*	lb/hr	ton/yr	lb/hr	ton/yr	*(At exit conditions, Solid, Liquid or Gas/Vapor)*	
1E	Upward Vertical Stack	T01	Condensate Storage Tank #1	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
2E	Upward Vertical Stack	T02	Condensate Storage Tank #2	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
3E	Upward Vertical Stack	T03	Condensate Storage Tank #3	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE

4E	Upward Vertical Stack	T04	Condensate Storage Tank #4	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
5E	Upward Vertical Stack	T05	Condensate Storage Tank #5	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
6E	Upward Vertical Stack	T06	Condensate Storage Tank #6	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
7E	Upward Vertical Stack	T07	Condensate Storage Tank #7	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
8E	Upward Vertical Stack	T08	Condensate Storage Tank #8	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE

9E	Upward Vertical Stack	T09	Condensate Storage Tank #9	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
10E	Upward Vertical Stack	T10	Condensate Storage Tank #10	1C	Combustor – 98% control	VOC Benzene Toluene Ethylbenzene Xylenes n-Hexane Total HAPs CO2e	12.32 0.006 0.01 0.005 0.01 0.31 0.34 68.92	53.95 0.02 0.06 0.02 0.05 1.37 1.48 302	0.25 1E-4 2E-4 1E-4 2E-4 0.01 0.01 1.33	1.08 5E-4 0.001 4E-4 0.001 0.02 0.03 6.13	Gas/Vapor	EE
11E	Upward Vertical Stack	T11	Produced Water Storage Tank #1	1C	Combustor – 98% control	VOC Total HAPs CO2e	3.53 <0.001 270.5	15.47 <0.001 1185	0.07 <0.001 5.44	0.31 <0.001 23.83	Gas/Vapor	EE
12E	Upward Vertical Stack	T12	Produced Water Storage Tank #2	1C	Combustor – 98% control	VOC Total HAPs CO2e	3.53 <0.001 270.5	15.47 <0.001 1185	0.07 <0.001 5.44	0.31 <0.001 23.83	Gas/Vapor	EE
13E	Upward Vertical Stack	CE-01	Compressor Engine	---	---	NOx CO VOC PM-10 SO2 Formaldehyde Total HAPs CO2e	0.32 1.03 0.01 0.01 0.0002 0.006 0.01 32.4	1.38 4.50 0.04 0.02 0.001 0.025 0.04 142	0.32 1.03 0.01 0.01 0.0002 0.006 0.01 32.4	1.38 4.50 0.04 0.02 0.001 0.025 0.04 142	Gas/Vapor	EE

14E	Upward Vertical Stack	GPU-01	Gas Production Unit Heater #1	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
15E	Upward Vertical Stack	GPU-02	Gas Production Unit Heater #2	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
16E	Upward Vertical Stack	GPU-03	Gas Production Unit Heater #3	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
17E	Upward Vertical Stack	GPU-04	Gas Production Unit Heater #4	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
18E	Upward Vertical Stack	GPU-05	Gas Production Unit Heater #5	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE

19E	Upward Vertical Stack	GPU-06	Gas Production Unit Heater #6	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
20E	Upward Vertical Stack	GPU-07	Gas Production Unit Heater #7	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
21E	Upward Vertical Stack	GPU-08	Gas Production Unit Heater #8	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
22E	Upward Vertical Stack	GPU-09	Gas Production Unit Heater #9	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE
23E	Upward Vertical Stack	GPU-10	Gas Production Unit Heater #10	---	---	NOx CO VOC PM-10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	0.18 0.15 0.01 0.01 0.001 0.003 176.1	0.81 0.68 0.04 0.06 0.005 0.02 771	Gas/Vapor	EE

24E	Upward Vertical Stack	FL-01	Combustor	1C	Combustor – 98% control	NOx CO VOC PM-10 SO2 Total HAPs CO2e	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	0.31 1.70 9.1E-5 1.3E-4 1.0E-5 3.1E-5 540.1	1.37 7.44 0.0004 0.0006 4.4E-5 0.0001 2365	Gas/Vapor	EE
25E	Relief Vent	LDO UT	Production Liquids Truck Loadout	---	---	VOC Total HAPs CO2e	28.06 0.75 156.90	13.21 0.27 73.90	28.06 0.75 156.90	13.21 0.27 73.90	Gas/Vapor	EE

The EMISSION SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSIONS SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

[1] Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

[2] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases

[3] Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[4] Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

[5] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; M = modeling; O = other (specify).

G70-A FUGITIVE EMISSIONS SUMMARY SHEET

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS [1]	Maximum Potential Uncontrolled Emissions [2]		Maximum Potential Controlled Emissions [3]		Est. Method Used [4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	PM-10 PM-2.5	--- ---	--- ---	--- ---	--- ---	EE
Unpaved Haul Roads	PM-10 PM-2.5	0.04 0.004	0.17 0.02	0.04 0.004	0.17 0.02	EE
Loading/Unloading Operations						
Equipment Leaks	VOC CO2e	Does not apply	3.77 53.2	Does not apply	3.77 53.2	EE
Blowdown Emissions						
Other						

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.
[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; M = modeling; O = other (specify).

Attachment R.
Authority of Corporation

Attachment R
AUTHORITY OF CORPORATION
OR OTHER BUSINESS ENTITY (DOMESTIC OR FOREIGN)

TO: The West Virginia Department of Environmental Protection, Division of Air Quality

DATE: January 23, 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 80-0162034

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

Further, the corporation or the business entity certifies as follows:

(1) Barry Schatz (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.

President or Other Authorized Officer
(Vice President, Secretary, Treasurer or other official in charge of a principal business function of the corporation or the business entity)

(If not the President, then the corporation or the business entity must submit certified minutes or bylaws stating legal authority of other authorized officer to bind the corporation or the business entity).

Secretary

Name of Corporation or business entity