



October 13, 2015

Reference No. 082715

Mr. Jay Fedczak
Assistant Director of Permitting
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, West Virginia 25304

Dear Mr. Jay Fedczak:

**Re: G70-A General Permit Registration Application
Lockhart Heirs West Well Pad
Antero Resources Corporation**

GHD Services Inc. (GHD) would like to submit this General Permit Registration application that we prepared on behalf of Antero Resources Corporation for an oil and gas facility identified as Lockhart Heirs West Well Pad.

Enclosed are the following documents:

- Original copy of the G70-A General Permit Registration Application
- Two CD copies of the G70-A General Permit Registration Application
- The application fee with check no. 428600 in the amount of \$1,500.00

Please let us know if you have any questions or require additional information.

Sincerely,

GHD

A handwritten signature in black ink, appearing to read "Manuel Bautista", is written over a light blue horizontal line.

Manuel Bautista

MB/ma/227

Encl.

cc: Barry Schatz, Antero Resources Corporation
Elizabeth McLaughlin, Antero Resources Corporation



General Permit Application G70-A

Construction of new oil and natural gas production facility

Lockhart Heirs West Well Pad

Antero Resources Corporation

GHD Services, Inc.
6320 Rothway, Suite 100 Houston Texas 77040
082715 | Report No 227 | October 2015

Table of Contents

G70-A General Permit Application

Attachment A	Current Business Certificate
Attachment B	Process Description
Attachment C	Description of Fugitive Emissions
Attachment D	Process Flow Diagram
Attachment E	Plot Plan
Attachment F	Area Map
Attachment G	Emission Unit Data Sheets/G70-A Section Applicability Form
Attachment H	Air Pollution Control Device Data Sheet
Attachment I	Emission Calculations
Attachment J	Class I Legal Advertisement
Attachment K	Electronic Submittal
Attachment L	General Permit Modification Application Fee
Attachment M	Siting Criteria Waiver
Attachment N	Material Safety Data Sheets
Attachment O	Emissions Summary Sheet
Attachment P	Other Supporting Documentation Not Described Above



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*

☒ CONSTRUCTION ☐ MODIFICATION ☐ RELOCATION ☐ CLASS I ADMINISTRATIVE UPDATE
☐ CLASS II ADMINISTRATIVE UPDATE

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

- | | |
|---|---|
| <input type="checkbox"/> G10-D – Coal Preparation and Handling | <input type="checkbox"/> G40-C – Nonmetallic Minerals Processing |
| <input type="checkbox"/> G20-B – Hot Mix Asphalt | <input type="checkbox"/> G50-B – Concrete Batch |
| <input type="checkbox"/> G30-D – Natural Gas Compressor Stations | <input type="checkbox"/> G60-C – Class II Emergency Generator |
| <input type="checkbox"/> G33-A – Spark Ignition Internal Combustion Engines | <input type="checkbox"/> G65-C – Class I Emergency Generator |
| <input type="checkbox"/> G35-A – Natural Gas Compressor Stations (Flare/Glycol Dehydration Unit) | <input checked="" type="checkbox"/> 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
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3. Applicant's mailing address: 1615 Wynkoop Street _____ Denver, CO, 80202 _____	4. Applicant's physical address: 1132 Oxford Rd. Pullman, WV 26421 _____
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5. If applicant is a subsidiary corporation, please provide the name of parent corporation: N/A

6. **WV BUSINESS REGISTRATION.** Is the applicant a resident of the State of West Virginia? ☐ 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 and Oil Production facility	8a. Standard Industrial Classification Classification (SIC) code: 1311 AND 8b. North American Industry 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: Lockhart Heirs West Well Pad	12A. Address of primary operating site: Mailing: <u>N/A</u> Physical: <u>1132 Oxford Rd. Pullman, WV 26421</u>	
13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO — IF YES, please explain: <u>Antero is leasing the mineral rights for this site</u> — 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 . From the nearest road: From US-50W, turn left onto WV-74 S and follow for 7.4 miles. Turn left onto Main St, and in 0.2 miles continue onto Harrisville-Pullman Oxford. The facility will be on the left.		
15A. Nearest city or town: Pullman	16A. County: Ritchie County	17A. UTM Coordinates: Northing (KM): 4337.8485 Easting (KM): 506.219 Zone: 17 N
18A. Briefly describe the proposed new operation or change (s) to the facility: Construction of new oil and natural gas production facility		19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: 39.189861 Longitude: -80.927987

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

11B. Name of 1 st alternate operating site: 	12B. Address of 1 st alternate operating site: Mailing: _____ Physical: _____ 	
13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input type="checkbox"/> YES <input type="checkbox"/> 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 2 nd alternate operating site: _____ _____	12C. Address of 2 nd alternate operating site: Mailing: _____ Physical: _____ _____	
13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input type="checkbox"/> YES <input type="checkbox"/> 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: <u>05/01/2016</u> <input type="checkbox"/> 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: <u>06/01/2016</u>
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 _____ Days per week _____ Weeks per year _____ Percentage of operation _____		

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.

- ☒ ATTACHMENT A : CURRENT BUSINESS CERTIFICATE
- ☒ ATTACHMENT B: PROCESS DESCRIPTION
- ☒ ATTACHMENT C: DESCRIPTION OF FUGITIVE EMISSIONS
- ☒ ATTACHMENT D: PROCESS FLOW DIAGRAM
- ☒ ATTACHMENT E: PLOT PLAN
- ☒ ATTACHMENT F: AREA MAP
- ☒ ATTACHMENT G: EQUIPMENT DATA SHEETS AND REGISTRATION SECTION APPLICABILITY FORM
- ☒ ATTACHMENT H: AIR POLLUTION CONTROL DEVICE SHEETS
- ☒ ATTACHMENT I: EMISSIONS CALCULATIONS
- ☒ ATTACHMENT J: CLASS I LEGAL ADVERTISEMENT
- ☒ ATTACHMENT K: ELECTRONIC SUBMITTAL
- ☒ ATTACHMENT L: GENERAL PERMIT REGISTRATION APPLICATION FEE
- ☒ ATTACHMENT M: SITING CRITERIA WAIVER
- ☒ ATTACHMENT N: MATERIAL SAFETY DATA SHEETS (MSDS)
- ☒ ATTACHMENT O: EMISSIONS SUMMARY SHEETS
- ☒ 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) _____
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 Barry Schatz, Senior Environmental & Regulatory Manager

(please print or type)

Signature _____

(please use blue ink)

Authorized Representative (if applicable)

Date

Applicant's Name Antero Resources Corporation

Phone & Fax _____

303-357-7276

Phone

303-357-7315

Fax

Email bschatz@anteroresources.com

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).

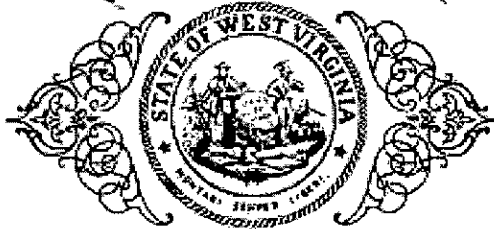
Secretary

Name of Corporation or business entity

Attachment A

Current 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

FILED

JUN 10 2013

Natalie E. Tennant
Secretary of State
1900 Kanawha Blvd E
Bldg 1, Suite 157-K
Charleston, WV 25305



IN THE OFFICE OF
PENNEY BARKER, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381

Website: www.wvsos.com
E-mail: business@wvsos.com

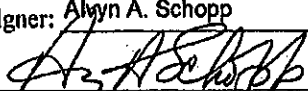
Office Hours: Monday – Friday
8:30 a.m. – 5:00 p.m. ET

FILE ONE ORIGINAL
(Two if you want a filed
stamped copy returned to you)
FEE: \$25.00

APPLICATION FOR
AMENDED CERTIFICATE
OF AUTHORITY

**** In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby ****
applies for an Amended Certificate of Authority and submits the following statement:

1. Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
2. Date Certificate of Authority was issued in West Virginia: 6/25/2008
3. Corporate name has been changed to: Antero Resources Corporation
(Attach one Certified Copy of Name Change as filed in home State of Incorporation.)
4. Name the corporation elects to use in WV: Antero Resources Corporation
(due to home state name not being available)
5. Other amendments:
(attach additional pages if necessary)

6. Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)
Alvyn A. Schopp (303) 367-7310
Contact Name Phone Number
7. Signature Information (See below *Important Legal Notice Regarding Signature):
Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person
Signature:  Date: June 10, 2013

***Important Legal Notice Regarding Signature:** Per West Virginia Code §31D-1-129. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

Delaware

PAGE 1

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "ANTERO RESOURCES APPALACHIAN CORPORATION", CHANGING ITS NAME FROM "ANTERO RESOURCES APPALACHIAN CORPORATION" TO "ANTERO RESOURCES CORPORATION", FILED IN THIS OFFICE ON THE TENTH DAY OF JUNE, A.D. 2013, AT 9:37 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.

4520810 8100

130754186

You may verify this certificate online
at corp.delaware.gov/authver.shtml




Jeffrey W. Bullock, Secretary of State
AUTHENTICATION: 0496546

DATE: 06-10-13

AMENDMENT TO THE
AMENDED AND RESTATED
CERTIFICATE OF INCORPORATION
OF
ANTERO RESOURCES APPALACHIAN CORPORATION

Antero Resources Appalachian Corporation (the "Corporation"), a corporation organized and existing under the laws of the State of Delaware, hereby certifies as follows:

1. The original Certificate of Incorporation of the Corporation was filed under the name Antero Resources Barnett Corporation with the filing of the original Certificate of Incorporation of the Corporation with the Secretary of State of the State of Delaware on March 18, 2008.

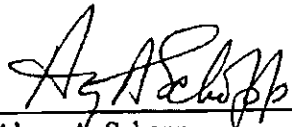
2. This Amendment to the Amended and Restated Certificate of Incorporation has been duly adopted and approved in accordance with Sections 242 of the General Corporation Law of the State of Delaware.

3. Article FIRST of the Amended and Restated Certificate of Incorporation is hereby amended to read in its entirety as follows:

FIRST. The name of the Corporation is Antero Resources Corporation.

IN WITNESS WHEREOF, the Corporation has caused this Certificate of Amendment to be executed by its duly authorized officer on the 10th day of June, 2013.

ANTERO RESOURCES APPALACHIAN CORPORATION

By: 
Name: Alvyn A. Schopp
Title: Vice President of Accounting &
Administration / Treasurer

Attachment B

Process Description

Attachment B

Process Description

Lockhart Heirs West Well Pad

Antero Resources Corporation

Ritchie County, West Virginia

A mixture of condensate, water, and entrained gas from the condensate and gas wells enters the facility through a series of line heaters (LH001-008) and gas production units (H001-H008) which are 3-phase separators where the gas, condensate, and produced water are separated. The line heaters and GPUs are fueled by a slip stream of the separated gas. The separated gas from the three phase separators is metered and sent to the sales gas pipeline. The separated water flow to the produced water storage tanks (TANKPW001-002). The separated condensate is then sent to two phase low pressure separators where gas is further separated from the condensate. The separated gas is routed to the compressor (ENG001), compressed, and sent to the sales gas line. The condensate from the two phase separators flow to the condensate storage tanks (TANKCOND001-010). The line heaters are only used during the first several months from start of production and will be removed once production has normalized.

The facility has ten (10) tanks (TANKCOND001-010) on site to store condensate and two (2) tanks (TANKPW001-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to up to four enclosed combustors (EC001-004) to control the emissions. The enclosed combustor(s) that will be used to control emissions are designed to achieve a VOC destruction efficiency of 98 percent.

Condensate and produced water are transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump condensate (L001) and produced water (L002) from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

Emissions from the facility's emission sources were calculated using the extended analysis of the condensate and gas from Prunty No. 1H, one of the wells in the Lockhart Heirs Pad. These extended analyses are considered representative of the materials from Lockhart Heirs West Well Pad, being in the same Marcellus rock formation.

Lockhart Heirs West Well Pad calculation of potential to emit included all of the emission sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the John Campbell North Well Pad. This is approximately 0.63 miles south of the facility.

Attachment C

Description of Fugitive Emissions

Attachment C

Description of Fugitive Emissions

Lockhart Heirs West Well Pad

Antero Resources Corporation

Ritchie County, West Virginia

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

Equipment Leaks

Equipment includes valves, flanges, and connectors installed in various process equipments such as gas production unit heaters, compressors, pipelines, and separators. Emissions are assumed to be occurring throughout the year. Detailed calculations are shown on Table 4.

Pneumatic Control Valves

Pneumatic control valves are part of the gas production unit heaters. These are intermittent low bleed valves and their emissions are assumed to be occurring throughout the year. Detailed calculations are shown on Table 5.

Loading Operations

Loading emissions occur when condensate and produced water are transferred out of the well site via tanker trucks. Fugitive emissions were estimated using AP-42 loading loss formula, $L = 12.46 \cdot \text{SPM}/T$, and Bryan & Engineering (BR&E) software known as Promax. Detailed calculations are shown in Table 8.

Haul Road Emissions

Haul road emissions are emitted when tanker trucks or service vehicles enter the Facility. The Facility is flat and unpaved. Detailed calculations are shown on Table 12.

Attachment C/O: G70-A Emissions Summary Sheet
Fugitive Emissions Data 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	n/a					
Unpaved Haul Roads	PM, PM10, PM2.5	2.6944	4.2997	1.3472	2.1499	MB
Loading/Unloading Operations	VOCs	10.1372	9.2518	10.1372	9.2518	MB
	hexane (110543)	0.0237	0.0216	0.0237	0.0216	
	CO2 Equivalent CO2 (124389), CH4	3.3950	3.9557	3.3950	3.9557	
Equipment Leaks (Components)	Benzene (71432)	Does not apply	0.0229	Does not apply	0.0229	MB
	Toluene (108883)		0.0709		0.0709	
	Ethyl benzene (100414)		0.0560		0.0560	
	Hexane (110543)		0.9596		0.9596	
	o,m,p-xylenes (95476,108383,106423)		0.1723		0.1723	
	CO2 Equivalent CO2 (124389)), CH4		282.8590		282.8590	
	VOCs		13.3250		13.3250	
	TAPs (benzene)		0.0229		0.0229	
Equipment Leaks (PCVs)	hexane (110543)	0.0109	0.0477	0.0109	0.0477	MB
	CO2 Equivalent CO2 (124389)), CH4	7.2262	31.6506	7.2262	31.6506	
	VOCs	0.0916	0.4012	0.0916	0.4012	

1 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS2, VOCs, H2S, Inorganics, Lead, Organics, O3, NO, NO2, SO2, SO3, all applicable Greenhouse Gases (including CO2 and methane), etc. DO NOT LIST H2, H2O, N2, O2, 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).

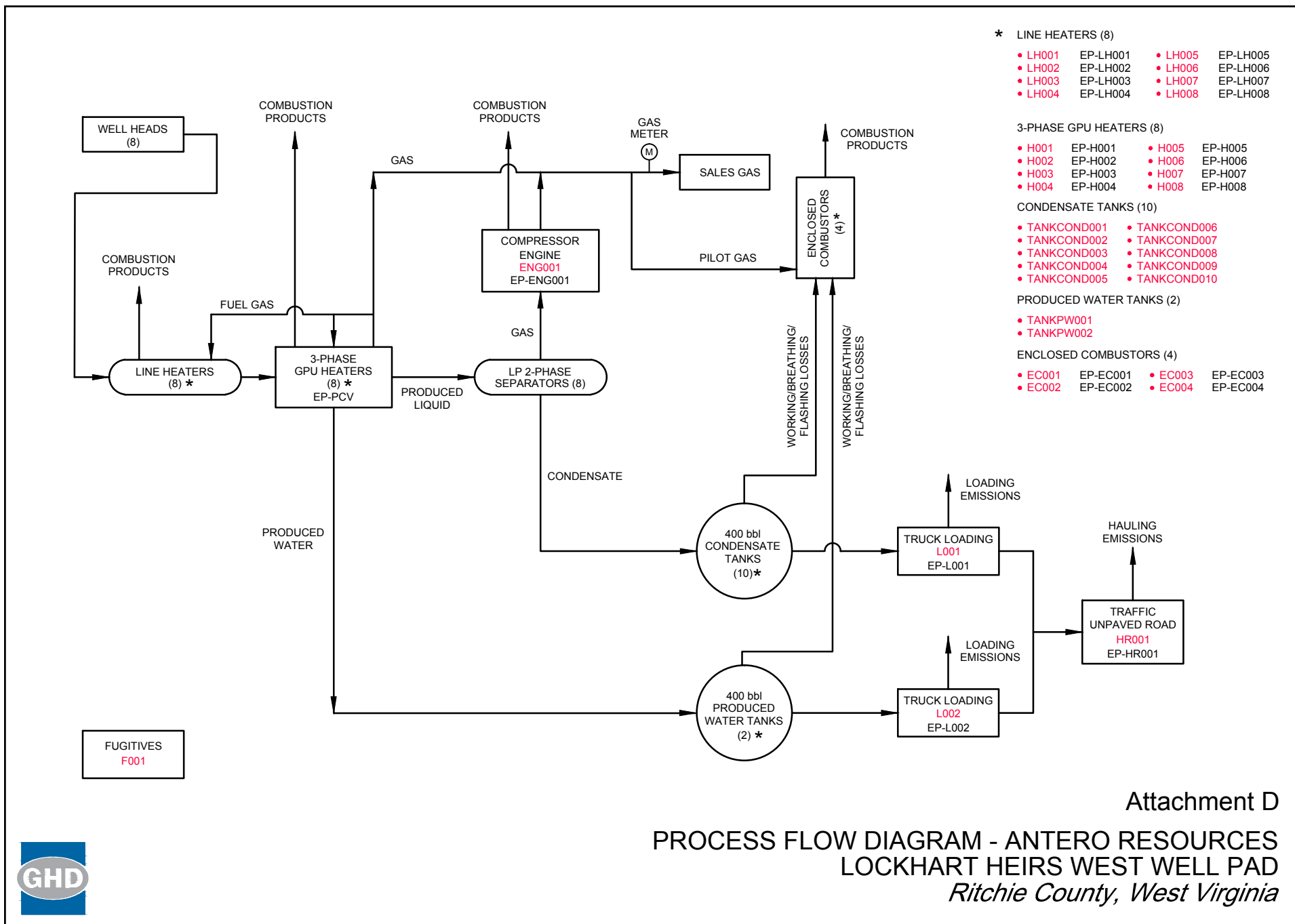
4 Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

Attachment C: 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)				
	heavy liquid VOC ⁸				
	Non-VOC ⁹				
Valves (10)	Gas VOC	400		First attempt within 5 days of detection and final repair within 15 days	6,624.61
	Light Liquid VOC	416		First attempt within 5 days of detection and final repair within 15 days	19,528.73
	Heavy Liquid VOC	--			--
	Non-VOC	--			--
Safety Relief Valves (11)	Gas VOC	See Valves		First attempt within 5 days of detection and final repair within 15 days	see Valves
	Non VOC	See Valves		First attempt within 5 days of detection and final repair within 15 days	see Valves
Open-ended Lines (12)	VOC				
	Non-VOC				
Sampling Connections (13)	VOC				
	Non-VOC				
Compressors	VOC				
	Non-VOC				
Flanges	VOC	104		First attempt within 5 days of detection and final repair within 15 days	149.27
	Non-VOC			First attempt within 5 days of detection and final repair within 15 days	632.40
Other	VOC	472		First attempt within 5 days of detection and final repair within 15 days	347.42
	Non-VOC				1,471.85

Attachment D

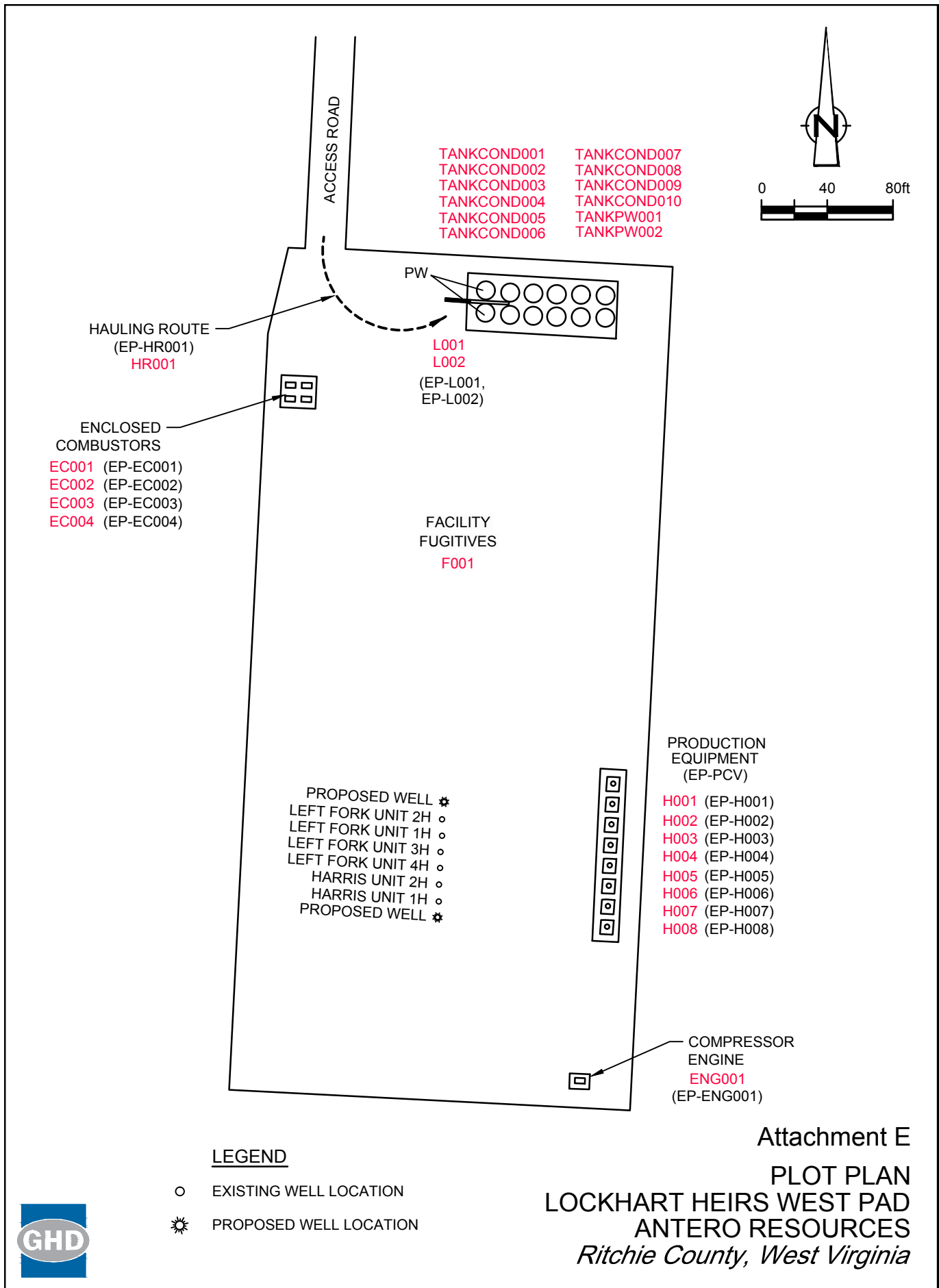
Process Flow Diagram



Attachment D
 PROCESS FLOW DIAGRAM - ANTERO RESOURCES
 LOCKHART HEIRS WEST WELL PAD
Ritchie County, West Virginia

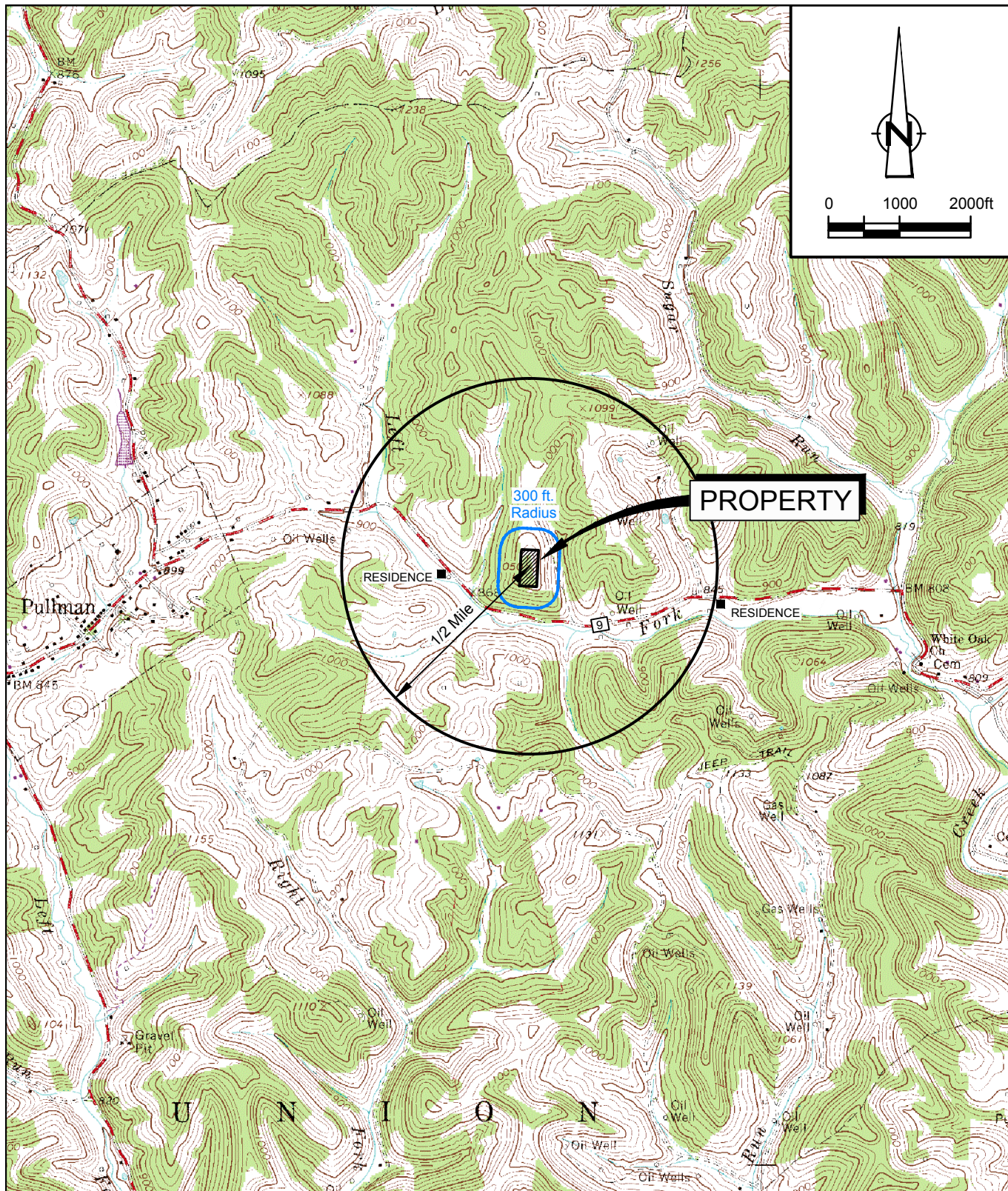


Attachment E Plot Plan



Attachment F

Area Map



SOURCE: USGS QUADRANGLE MAP;
PULLMAN, WEST VIRGINIA

SITE COORDINATES: LAT. 39.189861, LONG. -80.927987
SITE ELEVATION: 1021 ft AMSL



Attachment F
AREA MAP
LOCKHART HEIRS WEST WELL PAD
ANTERO RESOURCES
Ritchie County, West Virginia

Attachment G

G70-A Section Applicability Form/ Emission Unit Data Sheets

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

* 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.

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:	
47-085-10204-00	
47-085-10205-00	
47-085-10206-00	
5 wells are not permitted	

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.

Attachment G: Emission Units Data Sheet
(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
H001, H002, H003, H004, H005, H006, H007, H008	EP-H001, EP-H002, EP-H003, EP-H004, EP-H005, EP-H006, EP-H007, EP-H008	Gas Production Unit Heaters	2016	1.5 MMBtu/hr (each)	New	N/A
LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008	EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008	Line Heaters	2016	2.0 MMBtu/hr (each)	New	N/A
F001	F001	Fugitives	2016	N/A	New	N/A
TANKCOND001-010	EP-EC001, EP-EC002, EP-EC003, EP-EC004,	Condensate Tank F/W/B	2016	400 bbl each	New	EC001, EC002, EC003, EC004,
TANKPW001-002	EP-EC001, EP-EC002, EP-EC003, EP-EC004,	PW Tank F/W/B	2016	400 bbl each	New	EC001, EC002, EC003, EC004,
L001	EP-L001	Loading (Condensate)	2016	200 bbl capacity (each)	New	N/A
L002	EP-L002	Loading (Water)	2016	200 bbl capacity (each)	New	N/A
HR001	EP-HR001	Haul Truck	2016	40 ton capacity	New	N/A
EC001, EC002, EC003, EC004,	EP-EC001, EP-EC002, EP-EC003, EP-EC004,	Enclosed Combustor	2016	90scf/min	New	EC001, EC002, EC003, EC004,
PCV	EP-PCV	Pneumatic CV	2016	6.6 scf/day/PCV	New	N/A
ENG001	EP-ENG001	Compressor Engine	2016	24 HP	New	N/A

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.

Attachment G: Storage Vessel Emission Unit Data Sheet (Condensate)

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name COND TANK	2. Tank Name TANKCOND001-010
3. Emission Unit ID number TANKCOND001-010	4. Emission Point ID number EP-EC001, EP-EC002, EP-EC003, EP-EC004,
5. Date Installed or Modified (for existing tanks) 2016	6. Type of change: New
7A. Description of Tank Modification (if applicable) NA	
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbls	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 20
10A. Maximum Liquid Height (ft.) 18	10B. Average Liquid Height (ft.) 10
11A. Maximum Vapor Space Height (ft.) 18	11B. Average Vapor Space Height (ft.) 10
12. Nominal Capacity (specify barrels or gallons) . This is also known as "working volume." 400bbls	
13A. Maximum annual throughput (gal/yr) 18,396,000	13B. Maximum daily throughput (gal/day) 50,400
14. Number of tank turnovers per year 110	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method: Splash Fill	
17. Is the tank system a variable vapor space system? 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): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical horizontal <input checked="" type="checkbox"/> flat roof cone roof 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

Attachment G: Storage Vessel Emission Unit Data Sheet (Condensate)

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

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply):			
Does Not Apply		Rupture Disc (psig)	
Carbon Adsorption ¹		Inert Gas Blanket of _____	
<input checked="" type="checkbox"/> Vent to Vapor Combustion Device ¹ (vapor combustors, flares, thermal oxidizers) Condenser ¹			
Conservation Vent (psig)			
Other ¹ (describe)		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	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
	Please see Tables 6 and 7							

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: Steel			
20A. Shell Color: Green		20B. Roof Color: Green	
		20C. Year Last Painted: 2016	
21. Shell Condition (if metal and unlined): No Rust			
22A. Is the tank heated? No		22B. If yes, operating temperature:	
		22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): 0			
24. Is the tank a Vertical Fixed Roof Tank ? Yes		24A. If yes, for dome roof provide radius (ft):	
		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			
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:			
26D. Deck seam length (ft.):		26E. Area of deck (ft2):	
		26F. For column supported	
		26G. For column supported	

Attachment G: Storage Vessel Emission Unit Data Sheet (Condensate)

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

SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: West Union, WV			
28. Daily Avg. Ambient Temperature (°F): 51.7		29. Annual Avg. Maximum Temperature (°F): 63.8	
30. Annual Avg. Minimum Temperature (°F): 39.5		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft ² -day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7	34A. Minimum (°F): 39.5	34B. Maximum (°F): 63.8	
35. Avg. operating pressure range of tank (psig): 0	35A. Minimum (psig): 0	35B. Maximum (psig): 0	
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia):	1.0758
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia):	1.4176
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia):	1.8401
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:	mix of HC		
39C. Liquid density (lb/gal):	5.93		
39D. Liquid molecular weight (lb/lb-mole):	108.7		
39E. Vapor molecular weight (lb/lb-mole):	44.18		
39F. Maximum true vapor pressure (psia):	2.1856		
39G. Max Reid vapor pressure (psi):	3.41000		
39H. Months Storage per year. From:	year round		
To:			

Attachment G: Storage Vessel Emission Unit Data Sheet (Produced Water)

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

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name PWTANK	2. Tank Name TANKPW001-002
3. Emission Unit ID number TANKPW001-002	4. Emission Point ID number EP-EC001, EP-EC002, EP-EC003, EP-EC004,
5. Date Installed or Modified (for existing tanks) 2016	6. Type of change: New
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. No	
7C. Provide any limitations on source operation affecting emissions. (production variation, etc.)	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400bbls	
9A. Tank Internal Diameter (ft.) 12	9B. Tank Internal Height (ft.) 20
10A. Maximum Liquid Height (ft.) 18	10B. Average Liquid Height (ft.) 10
11A. Maximum Vapor Space Height (ft.) 18	11B. Average Vapor Space Height (ft.) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume." 400bbls	
13A. Maximum annual throughput (gal/yr) 36,792,000	13B. Maximum daily throughput (gal/day) 100,800
14. Number of tank turnovers per year 1095	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method Splash Fill	
17. Is the tank system a variable vapor space system? 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): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical horizontal <input checked="" type="checkbox"/> flat roof cone roof 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

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

40. Emission Control Devices (check as many as apply):			
Does Not Apply	Rupture Disc (psig)		
Carbon Adsorption ¹	Inert Gas Blanket of _____		
<input checked="" type="checkbox"/> Vent to Vapor Combustion Device ¹ (vapor combustors, flares, thermal oxidizers) Condenser ¹			
Conservation Vent (psig)			
Other ¹ (describe)	Vacuum Setting	Pressure Setting Emergency Relief Valve (psig)	
¹ Complete appropriate Air Pollution Control Device Sheet			

[illegible]**SECTION VII (required if did not provide TANKS Summary Sheets)**

19. Tank Shell Construction: Steel			
20A. Shell Color: Green		20B. Roof Color: Green	
20C. Year Last Painted: 2016			
21. Shell Condition (if metal and unlined): No Rust			
22A. Is the tank heated? No		22B. If yes, operating temperature:	
		22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): 0			
24. Is the tank a Vertical Fixed Roof Tank ? Yes		24A. If yes, for dome roof provide radius (ft):	
		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 (<i>check one</i>): Metallic (mechanical) shoe seal Liquid mounted resilient seal			
25C. Is the Floating Roof equipped with a secondary seal? Yes No			
25D. If yes, how is the secondary seal mounted? (<i>check one</i>) 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:			
26D. Deck seam length (ft.):		26E. Area of deck (ft ²):	
		26F. For column supported	
		26G. For column supported	

Attachment G: Storage Vessel Emission Unit Data Sheet (Produced Water)

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

SITE INFORMATION:			
27. Provide the city and state on which the data in this section are based: West Union, WV			
28. Daily Avg. Ambient Temperature (°F): 51.7		29. Annual Avg. Maximum Temperature (°F): 63.8	
30. Annual Avg. Minimum Temperature (°F): 39.5		31. Avg. Wind Speed (mph): 5.9	
32. Annual Avg. Solar Insulation Factor (BTU/ft ² -day): 1030.235999		33. Atmospheric Pressure (psia): 14.8	
LIQUID INFORMATION:			
34. Avg. daily temperature range of bulk liquid (°F): 51.7	34A. Minimum (°F): 39.5	34B. Maximum (°F): 63.8	
35. Avg. operating pressure range of tank (psig): 0	35A. Minimum (psig): 0	35B. Maximum (psig): 0	
36A. Minimum liquid surface temperature (°F): 39.5		36B. Corresponding vapor pressure (psia): 0.1839	
37A. Avg. liquid surface temperature (°F): 51.7		37B. Corresponding vapor pressure (psia): 0.2599	
38A. Maximum liquid surface temperature (°F): 63.8		38B. Corresponding vapor pressure (psia): 0.3604	
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:	mix of HC and water		
39C. Liquid density (lb/gal):	8.33		
39D. Liquid molecular weight (lb/lb-mole):	18.0157		
39E. Vapor molecular weight (lb/lb-mole):	18.3920		
39F. Maximum true vapor pressure (psia):	0.4472		
39G. Max Reid vapor pressure (psi):	1.02409		
39H. Months Storage per year. From:	year round		
To:			

Attachment G: 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
H001	EP-H001	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H002	EP-H002	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H003	EP-H003	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H004	EP-H004	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H005	EP-H005	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H006	EP-H006	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H007	EP-H007	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
H008	EP-H008	Gas Production Unit Heater	2016	New	--	1.50	1,247.06
LH001	EP-LH001	Line Heater	2016	New	--	2.00	1,247.06
LH002	EP-LH002	Line Heater	2016	New	--	2.00	1,247.06
LH003	EP-LH003	Line Heater	2016	New	--	2.00	1,247.06
LH004	EP-LH004	Line Heater	2016	New	--	2.00	1,247.06
LH005	EP-LH005	Line Heater	2016	New	--	2.00	1,247.06
LH006	EP-LH006	Line Heater	2016	New	--	2.00	1,247.06
LH007	EP-LH007	Line Heater	2016	New	--	2.00	1,247.06
LH008	EP-LH008	Line Heaters	2016	New	--	2.00	1,247.06
ENG001	EP-ENG001	Compressor Engine (Kubota)	2016	New	--	24HP	1,247.06
EC001	EP-EC001	Enclosed Combustor (Cimarron 48")	2016	New	EC001	12	1,247.06
EC002	EP-EC002	Enclosed Combustor (Cimarron 48")	2016	New	EC002	12	1,247.06
EC003	EP-EC003	Enclosed Combustor (Cimarron 48")	2016	New	EC003	12	1,247.06
EC004	EP-EC004	Enclosed Combustor (Cimarron 48")	2016	New	EC004	12	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.

Attachment G: 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.		ENG001	
Emission Point ID No.		EP-ENG001	
Engine Manufacturer and Model		Engine (Kubota DG972-E2)	
Manufacturer's Rated bhp/rpm		24 HP @ 3600 rpm	
Source Status		NS	
Date Installed/Modified/Removed		2016	
Engine Manufactured/Reconstruction Date		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)		Yes	
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes	
Engine, Fuel and Combustion Data	Engine Type	RB4S	
	APCD Type	-	
	Fuel Type	RG	
	H2S (gr/100 scf)	0	
	Operating bhp/rpm	16.5 HP @ 2400 rpm	
	BSFC (Btu/bhp-hr)	9773	
	Fuel throughput (ft ³ /hr)	193	
	Fuel throughput (MMft ³ /yr)	1.6907	
	Operation (hrs/yr)	8760	
Reference	Potential Emissions	lbs/hr	tons/yr
MD	NO _x	0.3158	1.3831
MD	CO	5.6445	24.7228
AP	VOC	0.0071	0.0311
AP	SO ₂	0.0001	0.0006
AP	PM ₁₀	0.0023	0.0100
AP	Formaldehyde	0.0049	0.0215
MRR	Proposed Monitoring:	Monitor engine setting adjustments to ensure these are consistent with manufacturer's instructions.	
	Proposed Recordkeeping:	1) Maintain records of maintenance performed on engines. 2) Documentation from manufacturer that engine is certified to meet emission standards	
	Proposed Reporting:	N/A	

Attachment G: Tank Truck Loading

Emissions 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: L001, L002	2. Emission Point ID: EP-L001, EP-L002	3. Year Installed/Modified: 2016		
4. Emission Unit Description: CONDENSATE AND PRODUCED WATER				
5. Loading Area Data				
5A. Number of pumps: 2	5B. Number of liquids loaded: 2	5C. Maximum number of tank trucks loading at one time: 2		
6. Describe cleaning location, compounds and procedure for tank trucks: For hire tank trucks are used and are cleaned at the operator's dispatch terminal. These trucks are in dedicated service and cleaned only prior to repair or leak tests. Cleaning materials include water, steam, detergent, and solvents which are applied using hand held pressurized spray nozzles.				
7. Are tank trucks pressure tested for leaks at this or any other location? X Yes No If YES, describe: Tank trucks are pressure tested for leaks at the location of the leak testing company. Trucks are tested using EPA Method 27-internal vapor valve test and issued certification that DOT requirements are met.				
8. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	8	8	8	8
days/week	7	7	7	7
9. Bulk Liquid Data (<i>add pages as necessary</i>)				
Liquid Name	Condensate	Produced Water		
Max. daily throughput (1000 gal/day)	50.4	100.8		
Max. annual throughput (1000 gal/yr)	18,396.00	36,792.00		
Loading Method ¹	BF	BF		
Max. Fill Rate (gal/min)	168	168		
Average Fill Time (min/loading)	50	50		
Max. Bulk Liquid Temperature (°F)	72.1	72.1		
True Vapor Pressure ²	2.19	0.45		
Cargo Vessel Condition ³	U	U		
Control Equipment or Method ⁴	None	None		
Minimum collection efficiency (%)	0	0		
Minimum control efficiency (%)	0	0		
Maximum	Loading (lb/hr)	13.69	1.17	
Emission Rate	Annual (ton/yr)	12.49	2.13	
Estimation Method ⁵	Promax	Promax		
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 <i>Air Pollution Control Device Sheets as Attachment "H"</i>): 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				
10. Proposed Monitoring, Recordkeeping, Reporting, and Testing				
MONITORING		RECORDKEEPING		
1) Visual inspection to ensure that loading connections from storage tanks to trucks are leak-free.		1) Maintain records of condensate transferred from storage tanks. 2) Maintain records of produced water transferred from storage tanks.		
REPORTING N/A		TESTING N/A		
11. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty: N/A				

Attachment H

Air Pollution Control Device Data Sheet

Attachment H: 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#: EC001, EC002, EC003, EC004,		2. Installation Date: 2016		
3. Maximum Rated Total Flow Capacity: 131,000 scfd	4. Maximum Design Heat Input: 12 MMBtu/hr	5. Design Heat Content: 2300BTU/scf		
Control Device Information				
6. Select the type of vapor combustion control device being used: Enclosed Combustor				
7. Manufacturer: Model No. Cimarron, Model No. 48" HV ECD		8. Hours of operation per year: 8760		
9. List the emission units whose emissions are controlled by this vapor combustion control device: (Emission Point ID#)				
10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:	
TANKCOND001-010	Condensate Tank			
TANKPW001-002	PW Tanks			
If this vapor combustor controls emissions from more than six emission units, please attach additional pages.				
11. Assist Type		12. Flare Height (ft)	13. Tip Diameter (ft)	14. Was the design per §60.18?
Steam - Air - Pressure - <input checked="" type="checkbox"/> Non -		25ft	3.33	Yes
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)	
73.59	2,218.56	900	1.41E-01	
19. Provide an attachment with the characteristics of the waste gas stream to be burned.				
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?
Natural Gas	1	12.6	12800	Yes
25. If automatic re-ignition will be used, describe the method: Based on a monitoring system				
26. Describe the method of controlling flame: Flame Rectification, a thermocouple equivalent				
27. Is pilot flame equipped with a monitor to detect the presence of the flame? Yes		28. If yes, what type? Thermocouple		
29. Pollutant(s) Controlled		30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)	
F/W/B Emissions from TANKCOND		100	98	
F/W/B Emissions from TANKPW		100	98	

Attachment H: 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.

32. Has the control device been tested by the manufacturer and certified? Yes, see spec sheet.

33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty: See spec sheet for operating ranges.

MONITORING

- 1) Report any period when visible emissions exceeded 5 minutes during any two-hour period.
- 2) Monitor the presence of pilot flame at all times with the Flame rectification system, a thermocouple equivalent.
- 3) Monitor visible emissions from the vapor combustor.
- 4) Monitor throughput to the vapor combustor.

RECORDKEEPING

- 1) Record the times and duration of periods when the pilot flame was not present.
- 2) Records of throughput to the vapor combustor.
- 3) Records of vapor combustor malfunction or shutdown which resulted in excess emissions.
- 4) Records of vapor combustor inspection and maintenance activities conducted.

REPORTING

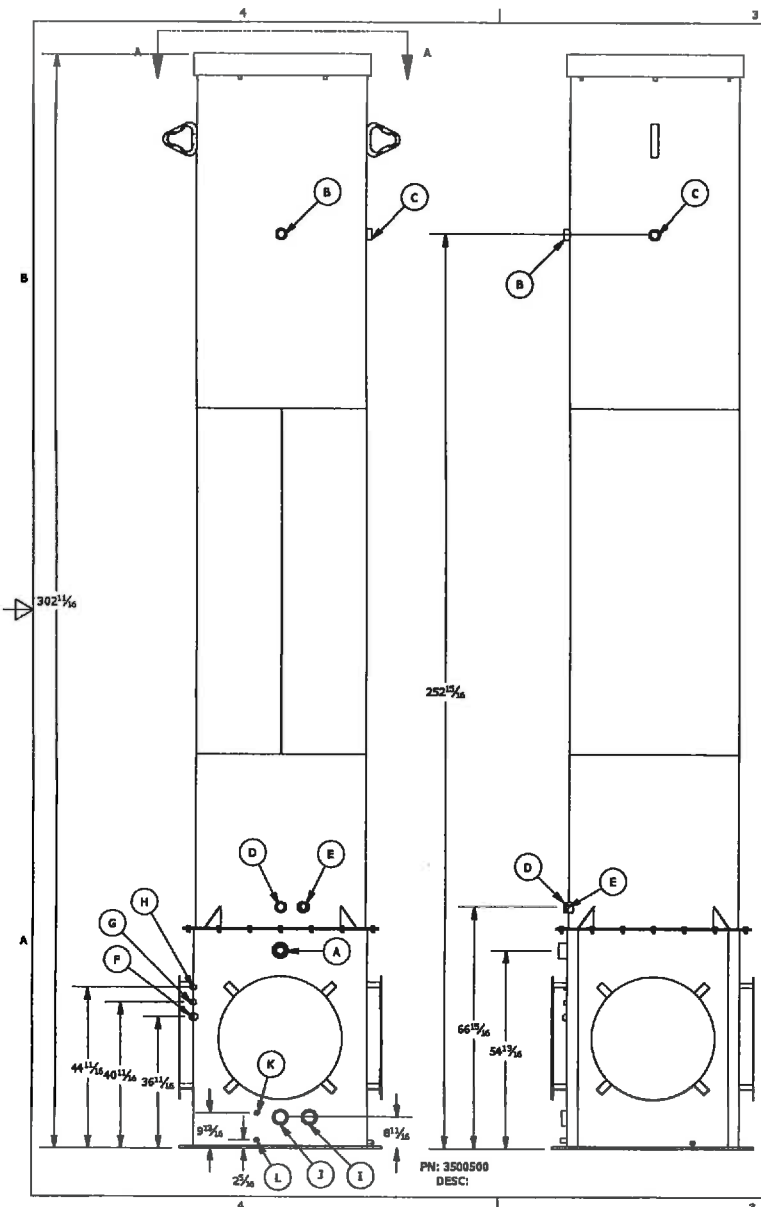
- 1) Report any period when visible emissions exceeded 5 minutes during any two-hour period.

34. Additional Information Attached? **YES**

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

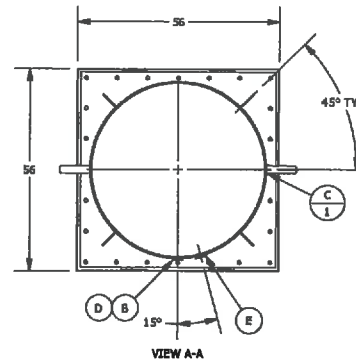
Please attach a copy of the manufacturer's performance testing.

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



**48" DIA x 302 5/8" HEIGHT, 88 ORIFICES
EMISSION CONTROL DEVICE**

- * >98% TVOC DRE, CERTIFIED USEPA 40 CFR 60, APPENDIX A, SOURCE EMISSIONS TEST METHODS REFERENCED. MEETS ALL EPA & CDPHE REGULATIONS.
- * DESTROYS OIL/CONDENSATE PRODUCTION TANK VAPORS W/ NO VISIBLE FLAME.
- * EXCELLENT OPACITY AND SMOKELESS OPERATION.
- * RELIABLE AND CUSTOMIZABLE IGNITION.
- * VERY LOW CAPITAL AND OPERATING COST.
- * EASY TO OPERATE AND MAINTAIN.
- * FIELD TESTED TO DESTROY UP TO 119.5 MDSCFD (131 MCFD) @ 10 oz/in²; 2300 BTU/CF WASTE GAS (SG 1.45)
- * STRUCTURE CERTIFIED FOR 90 MPH 3-SEC WIND GUST PER ASCE 7-05 & IBC 2006 STANDARDS. HIGHER WIND LOAD RATED STRUCTURES AVAILABLE.



PN: 3500500
DESC:

SCHEDULE OF NOZZLES			
MARK	QTY	DESCRIPTION	SERVICE
A	1	3" HALF COUPLING	2000# BURNER WASTE GAS IN
B	1	2" FULL COUPLING	3000# FLOW TEST/AUTOMATION
C	1	2" FULL COUPLING	3000# FLOW TEST/AUTOMATION
D	1	2" FULL COUPLING	3000# SIGHT GLASS
E	1	2" FULL COUPLING	3000# MANUAL LIGHTING
F	1	1" FULL COUPLING	3000# PILOT GAS IN
G	1	1/2" FULL COUPLING	3000# IGNITOR CABLE
H	1	1/2" FULL COUPLING	3000# AUTOMATION
I	1	3" HALF COUPLING	3000# DRIP TANK WASTE GAS IN
J	1	3" HALF COUPLING	3000# DRIP TANK WASTE GAS OUT
K	1	1/2" FULL COUPLING	3000# AUTOMATION
L	1	1/2" FULL COUPLING	3000# LIQUID DRAIN

- UNLESS OTHERWISE SPECIFIED
1. REMOVE ALL BURRS AND SHARP CORNERS.
 2. COR. RAD .03
 3. DO NOT SCALE DRAWING.
 4. ALL DIMENSIONS ARE IN INCHES.
 5. MACHINE FIN.
 6. FABRICATION
.X = ± 0.25
.XX = ± 0.125
.XXX = ± 0.06
ANGLES ± 3°
 7. MACHINE
.X = ± 0.030
.XX = ± 0.015
.XXX = ± 0.005
ANGLES ± 1/2°
CONTRICTY WITHIN 0.010 TIR

APPROVED FOR A.S.M.E CODE, SECTION VIII DIV 1
ED, ADDENDA BY, DATE

CIMARRON
Energy Inc.

TITLE:
48" HIGH VOLUME ECD

DATE: WO No.: SHEET: 1 OF 1

DRAWN BY: TDS | REV. | DRAW NO.: 3500500

Attachment I

Emission Calculations

Table 1

**Facility Information
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

Oil and Gas Site General Information

Administrative Information	
Company Name	Antero Resources Corporation
Facility/Well Name	Lockhart Heirs West
Nearest City/Town	Pullman
API Number/SIC Code	1311
Latitude/Longitude	39.189861, -80.927987
County	Ritchie

Technical Information	
Max Condensate Site Throughput (bbl/day):	1,200
Max Produced Water Site Throughput (bbl/day):	2,400
Are there any sour gas streams at this site?	No
Is this site currently operational/producing?	No

Equipment/Processes at Site	
Equipment/Process Types	How many for this site?
Fugitives	8
IC Engines	1
Gas Production Unit Heaters	8
Line Heaters	8
Condensate Tanks	10
Produced Water Tanks	2
Loading Jobs	2
Enclosed Combustors	4

Table 2

Uncontrolled/Controlled Emissions Summary
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation

Emission Source	VOC		NO _x		CO _{2e}		CO		SO ₂		PM _{2.5}		PM ₁₀		Lead		Total HAPs		Benzene		Xylenes		Formaldehyde	
	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)
UNCONTROLLED (Fugitives, Storage Tanks, Gas Production Unit Heaters, Line Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling) ¹	3.1338	13.7262			71.806	314.51							1.2125	1.9349			0.3035	1.3293	0.0052	0.0229	3.93E-02	1.72E-01		
Flashing, Working and Breathing (F/W/B) Losses ²	372.68	1,632.3			550.7	2,412.2											14.321	62.728	0.5568	2.4386	0.3120	1.3666		
Engine Emissions ³	0.0071	0.0311	0.3158	1.3831	27.78	121.66	5.6445	24.7228	0.0001	0.0006	0.0024	0.0104	0.0023	0.0100			0.0055	0.0241	0.0004	0.0017	4.68E-05	2.05E-04	0.0049	0.0215
Gas Production Unit Heater Emissions ⁴	0.0529	0.2318	0.9623	4.2147	1,154.72	5,057.66	0.8083	3.5404	0.0058	0.0253	0.0731	0.3203	0.0731	0.3203	4.81E-06	2.11E-05	1.81E-02	7.93E-02	2.02E-05	8.85E-05			0.0007	0.0032
Line Heater Emissions ⁴	0.0706	0.3091	1.2830	5.6196	1,539.62	6,743.54	1.0777	4.7205	0.0077	0.0337	0.0975	0.4271	0.0975	0.4271	6.42E-06	2.81E-05	2.42E-02	1.06E-01	2.69E-05	1.18E-04			0.0010	0.0042
TOTALS:	375.9435	1646.6325	2.5611	11.2174	3344.6475	14649.5560	7.5305	32.9836	0.0136	0.0596	0.1730	0.7578	1.3854	2.6923	0.0000	0.0000	14.6728	64.2667	0.5624	2.4633	0.3514	1.5391	0.0066	0.0289
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions ⁵	10.137	9.252			3.395	3.956											0.0289	0.0264	8.13E-04	7.45E-04	0.0022	0.0020		
CONTROLLED EMISSIONS																								
Enclosed Combustor Emissions (from F/W/B losses) ⁶	7.4539	32.6479	0.4466	1.9561	1495.6109	6550.7758	0.3751	1.6431	3.02E-05	1.32E-04	0.0255	0.1115	0.0339	0.1487	2.23E-06	9.78E-06	0.2865	1.2550	1.11E-02	4.88E-02	0.0062	0.0273	3.78E-06	1.66E-05
Controlled Fugitive Emissions from Hauling													0.6062	0.9674										
TOTALS:	7.4539	32.6479	0.4466	1.9561	1495.6109	6550.7758	0.3751	1.6431	3.02E-05	1.32E-04	0.0255	0.1115	0.6402	1.1161	2.23E-06	9.78E-06	0.2865	1.2550	0.0111	0.0488	0.0062	0.0273	3.78E-06	1.66E-05
POTENTIAL TO EMIT ⁷																								
	10.7183	56.1979	3.0077	13.1735	4289.5304	18792.0986	7.9057	34.6268	0.0136	0.0598	0.1985	0.8693	0.8131	1.8735	1.35E-05	5.90E-05	0.6378	2.8199	0.0168	0.0742	0.0456	0.2019	0.0066	0.0289

Enter any notes here:

1 - See Tables 4 and 5 for fugitive emission calculations; Table 12 for PM emissions from hauling.
2 - See Tables 6 and 7 for tanks emission calculations
3 - See Table 13 for engine emissions
4 - See Table 9 for gas production unit heater and line heaters emission calculations
5 - The maximum emission was calculated based on tank truck capacity of 200 barrels and actual fill rate of 50 minutes per tank truck. At a production rate of 1200 barrels per day, VOC emissions would be 10.1372 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 2.1123 pound per hour.
6 - See Table 10 and 11 for enclosed combustion emission calculations.
7 - The hourly potential to emit is the sum of emissions from gas production unit heaters, line heaters, engine, storage tanks, fugitives and enclosed combustors. Does not include emissions from loading (see footnote 5). The total TPY PTE is the sum of all emissions.
PM 10 TPY is the sum of uncontrolled hauling and other PM10 sources.

Table 3

**Permits Summary
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

Pollutant		Emissions		Threshold	Threshold Exceeded?	
		Uncontrolled	Controlled		Uncontrolled	Controlled
VOC	lbs/hr	375.9435	10.7183	6	Yes	Yes
	tons/yr	1655.8844	56.1979	10	Yes	Yes
NO _x	lbs/hr	2.5611	3.0077	6		
	tons/yr	11.2174	13.1735	10	Yes	Yes
CO	lbs/hr	7.5305	7.9057	6	Yes	Yes
	tons/yr	32.9836	34.6268	10	Yes	Yes
SO ₂	lbs/hr	0.0136	0.0136	6		
	tons/yr	0.0596	0.0598	10		
PM _{2.5}	lbs/hr	0.1730	0.1985	6		
	tons/yr	0.7578	0.8693	10		
PM ₁₀	lbs/hr	1.3854	0.8131	6		
	tons/yr	2.6923	1.8735	10		
Lead	lbs/hr	1.12E-05	1.35E-05	6		
	tons/yr	4.92E-05	5.90E-05	10		
Total HAPs	lbs/hr	14.6728	0.6378	2	Yes	
	tons/yr	64.2931	2.8199	5	Yes	
Total TAPs	lbs/hr	0.5690	0.0234	1.14		
n-Hexane	lbs/hr	13.1166	0.5274			
	tons/yr	57.4721	2.3316			
Toluene	lbs/hr	0.4956	0.0260			
	tons/yr	2.1723	0.1152			
Ethylbenzene	lbs/hr	0.1401	0.0153			
	tons/yr	0.6143	0.0678			
Xylenes	lbs/hr	0.3514	0.0456			
	tons/yr	1.5411	0.2019			
Benzene	lbs/hr	0.5624	0.0168			
	tons/yr	2.4641	0.0742			
Enter any notes here:		1. Emissions are based on 98% Enclosed Combustor DRE operating 100% of the time. 2. Please see Attachment C/O- Fugitive Emissions Data Summary Sheet and Attachment O – Emission Points Data Summary Sheet for sitewide sources and breakdown of emission quantities.				

Table 4

**Fugitive Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

VOC Type:	Condensate VOC
Emission Type:	Steady State (continuous)

Gas Weight Fraction From Analysis:	VOC frac	0.191
	n-Hexane	0.023
	Methane	0.603

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
400	Valves	Gas VOC	0.004500	0.34	6,624.61
		Non VOC	0.004500	1.46	28,064.99
472	Connectors	VOC	0.000200	0.02	347.42
		Non-VOC	0.000200	0.08	1,471.85
104	Flanges	VOC	0.000390	0.01	149.27
		Non-VOC	0.000390	0.03	632.40
Total VOCs:				0.37	7,121.30
Total THC:				1.93	37,290.55

Light Liquid Weight Fraction From Analysis:	VOC frac	0.974
	Benzene frac	0.002
	Toluene	0.007
	Ethylbenzene	0.006
	Xylenes	0.017
	n-hexane	0.053
	Methane	0.008

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
416	Valves	Light Liquid VOC	0.002500	1.01	19,528.73
		Light Liquid Non-VOC		0.03	514.15
Total VOC:				1.01	19,528.73
Total THC:				1.04	20,042.88

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	26,650.04	3.04	13.33
Ethylbenzene		0.01	0.06
Toluene		0.02	0.07
Xylenes		0.04	0.17
n-Hexane		0.22	0.96
TAPs (Benzene)		0.01	0.02
HAPs		0.29	1.28
CO _{2e}	565,717.91	64.58	282.86

Enter Notes Here:	Fugitive emissions based on an estimated component count
	Global Warming Potentials from EPA site
	Reference to Emission factors used: 1. Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. 2. Percent of speciated VOCs used in fugitive calculations are based on the total hydrocarbons, not of the total sample.

Table 5

**Pneumatic Control Valve Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

Number of PCVs	32
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	211.2

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions		
					(lbs/day)	(lbs/hr)	(tons/year)
Nitrogen	0.4946	14.0100	1.0445952	0.0028	0.0386	0.0016	0.0070
Carbon Dioxide	0.1467	44.0100	0.3098304	0.0008	0.0359	0.0015	0.0066
Methane	77.6927	16.0400	164.0869824	0.4324	6.9357	0.2890	1.2658
Ethane	14.1987	30.0700	29.9876544	0.0790	2.3762	0.0990	0.4337
Propane	4.4938	44.1000	9.4909056	0.0250	1.1030	0.0460	0.2013
Isobutane	0.5666	58.1200	1.1966592	0.0032	0.1833	0.0076	0.0334
n-Butane	1.1838	58.1200	2.5001856	0.0066	0.3829	0.0160	0.0699
Isopentane	0.3749	72.1500	0.7917888	0.0021	0.1505	0.0063	0.0275
n-Pentane	0.2914	72.1500	0.6154368	0.0016	0.1170	0.0049	0.0214
n-Hexane	0.5451	86.1800	1.1512512	0.0030	0.2614	0.0109	0.0477

	lb/hr	tpy
VOC Emissions	0.0916	0.4012
n-Hexane Emissions	0.0109	0.0477
HAPs Emissions	0.0109	0.0477
CO _{2e} emissions	7.2262	31.6506

Enter any notes here:	<p>1. PCV bleed rate obtained from the user manual for PCV http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual</p> <p>2. Emissions per hour= Mol % x no. of PCV x bleed rate x MW / 379.48 / 24</p>
------------------------------	--

Table 6

Uncontrolled Flashing Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation

# Hours Operational	8760
---------------------	------

	Condensate Tank Flashing Losses			Produced Water Tank Flashing Losses		
	Vapor Mass Fraction wt%	Flashing Losses		Vapor Mass Fraction wt%	Flashing Losses	
		lbs/hr	tpy		lbs/hr	tpy
Water	0.0961	0.4444	1.9464	2.5806	3.23E-01	1.4137
Nitrogen	0.0077	0.0354	0.1550	0.5238	0.0655	0.2870
Carbon Dioxide	0.1386	0.6407	2.8063	2.2803	0.2852	1.2492
Methane	3.2447	14.9980	65.6914	54.6503	6.8355	29.9394
Ethane	19.8024	91.5345	400.9209	22.8756	2.8612	12.5321
Propane	30.4756	140.8701	617.0111	11.5004	1.4384	6.3003
Isobutane	7.7116	35.6459	156.1291	0.6554	0.0820	0.3591
n-Butane	17.0519	78.8205	345.2339	2.7208	0.3403	1.4905
Isopentane	6.0838	28.1216	123.1726	0.5810	0.0727	0.3183
n-Pentane	6.2662	28.9647	126.8655	0.5670	0.0709	0.3106
2-Methylpentane	1.5984	7.3887	32.3623	0.0653	0.0082	0.0358
3-Methylpentane	0.9387	4.3390	19.0050	0.1012	0.0127	0.0555
n-Hexane	2.7686	12.7977	56.0540	0.0894	0.0112	0.0490
Methylcyclopentane	0.4056	1.8749	8.2122	0.1237	0.0155	0.0678
Benzene	0.1151	0.5319	2.3297	0.1886	0.0236	0.1033
2-Methylhexane	0.5439	2.5140	11.0111	0.0195	0.0024	0.0107
3-Methylhexane	0.4091	1.8908	8.2817	0.0153	0.0019	0.0084
Heptane	0.8279	3.8268	16.7614	0.0325	0.0041	0.0178
Methylcyclohexane	0.5916	2.7348	11.9785	0.1196	0.0150	0.0655
Toluene	0.0990	0.4578	2.0051	0.1528	0.0191	0.0837
Octane	0.6013	2.7792	12.1730	0.0140	0.0017	0.0077
Ethylbenzene	0.0262	0.1211	0.5306	0.0400	0.0050	0.0219
m & p-Xylene	0.0335	0.1547	0.6774	0.0506	0.0063	0.0277
o-Xylene	0.0306	0.1416	0.6203	0.0476	0.0059	0.0261
Nonane	0.1298	0.5999	2.6274	0.0046	0.0006	0.0025
C10+	0.0021	0.0098	0.0427	0.0000	1.26E-06	5.50E-06
Total VOCs	76.711	354.59	1,553.1	17.089	2.1375	9.3622
Total CO _{2e}		375.59	1,645.1		171.17	749.7
Total TAPs (Benzene)		0.5319	2.3297		0.0236	0.1033
Toluene		0.4578	2.0051		0.0191	0.0837
Ethylbenzene		0.1211	0.5306		0.0050	0.0219
Xylenes		0.2963	1.2978		0.0123	0.0538
n-Hexane		12.798	56.054		0.0112	0.0490
Total HAPs		14.205	62.217		0.0712	0.3117
Total	100.00	462.24	2,024.6	100.00	12.508	54.78

Enter any notes here:	Vapor mass fractions and Flashing losses from Promax output
-----------------------	---

Table 7

Uncontrolled Working and Breathing Losses

Lockhart Heirs West

Ritchie, West Virginia

Antero Resources Corporation

Condensate Tank Information	
Number of Tanks	10
Maximum Working Losses (lbs/hr)	10.9598
Maximum Breathing Losses (lbs/hr)	10.5848

	Condensate Tank W/B Losses						
	Vapor Mass Fraction wt%	Working Losses		Breathing Losses		Max W/B Losses	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Water	4.89E-05	5.36E-06	2.35E-05	5.17E-06	2.27E-05	1.05E-05	4.61E-05
Nitrogen	0.0003	3.28E-05	0.0001	3.17E-05	0.0001	0.0001	0.0003
Carbon Dioxide	0.1635	0.0179	0.0785	0.0173	0.0758	0.0352	0.1543
Methane	0.7110	0.0779	0.3413	0.0753	0.3296	0.1532	0.6709
Ethane	25.0657	2.7472	12.0326	2.6532	11.6208	5.4003	23.6534
Propane	32.6004	3.5730	15.6495	3.4507	15.1140	7.0236	30.7635
Isobutane	7.8193	0.8570	3.7536	0.8277	3.6251	1.6846	7.3787
n-Butane	16.9823	1.8612	8.1522	1.7975	7.8732	3.6588	16.0255
Isopentane	5.7901	0.6346	2.7795	0.6129	2.6844	1.2475	5.4638
n-Pentane	5.8651	0.6428	2.8155	0.6208	2.7191	1.2636	5.5346
2-Methylpentane	1.4766	0.1618	0.7088	0.1563	0.6846	0.3181	1.3934
3-Methylpentane	0.8626	0.0945	0.4141	0.0913	0.3999	0.1858	0.8140
n-Hexane	0.1730	0.0190	0.0831	0.0183	0.0802	0.0373	0.1633
Methylcyclopentane	0.3412	0.0374	0.1638	0.0361	0.1582	0.0735	0.3220
Benzene	0.0059	0.0006	0.0028	0.0006	0.0027	0.0013	0.0056
2-Methylhexane	0.0322	0.0035	0.0154	0.0034	0.0149	0.0069	0.0304
3-Methylhexane	0.3636	0.0399	0.1746	0.0385	0.1686	0.0783	0.3431
Heptane	0.6785	0.0744	0.3257	0.0718	0.3146	0.1462	0.6403
Methylcyclohexane	0.4808	0.0527	0.2308	0.0509	0.2229	0.1036	0.4537
Toluene	0.0110	0.0012	0.0053	0.0012	0.0051	0.0024	0.0103
Octane	0.4643	0.0509	0.2229	0.0492	0.2153	0.1000	0.4382
Ethylbenzene	0.0054	0.0006	0.0026	0.0006	0.0025	0.0012	0.0051
m & p-Xylene	0.0089	0.0010	0.0043	0.0009	0.0041	0.0019	0.0084
o-Xylene	0.0070	0.0008	0.0034	0.0007	0.0033	0.0015	0.0066
Nonane	0.0903	0.0099	0.0433	0.0096	0.0419	0.0195	0.0852
C10+	0.0010	0.0001	0.0005	0.0001	0.0005	0.0002	0.0010
Total VOCs	74.060	8.1168	35.552	7.8391	34.3351	15.9559	69.887
Total CO _{2e}		1.9661	8.6113	1.8988	8.3166	3.8648	16.928
Total TAPs (Benzene)		0.0006	0.0028	0.0006	0.0027	0.0013	0.0056
Toluene		0.0012	0.0053	0.0012	0.0051	0.0024	0.0103
Ethylbenzene		0.0006	0.0026	0.0006	0.0025	0.0012	0.0051
Xylenes		0.0017	0.0076	0.0017	0.0074	0.0034	0.0150
n-Hexane		0.0190	0.0831	0.0183	0.0802	0.0373	0.1633
Total HAPs		0.0232	0.1014	0.0224	0.0979	0.0455	0.1993
Total	100.00	10.9598	48.0041	10.5848	46.3615	21.5447	94.366

Table 7

Uncontrolled Working and Breathing Losses

Lockhart Heirs West

Ritchie, West Virginia

Antero Resources Corporation

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.1145
Maximum Breathing Losses (lbs/hr)	0.0082

	Produced Water Tank W/B Losses						
	Vapor Mass Fraction	Working Losses		Breathing Losses		Max W/B Losses	
	wt%	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Water	92.3992	0.1058	0.4636	0.0076	0.0334	0.1135	0.4969
Nitrogen	0.0107	0.0000	0.0001	8.82E-07	3.86E-06	1.31E-05	0.0001
Carbon Dioxide	3.1366	0.0036	0.0157	0.0003	0.0011	0.0039	0.0169
Methane	3.1006	0.0036	0.0156	0.0003	0.0011	0.0038	0.0167
Ethane	1.1974	0.0014	0.0060	0.0001	0.0004	0.0015	0.0064
Propane	0.1467	0.0002	0.0007	0.0000	0.0001	0.0002	0.0008
Isobutane	0.0010	1.20E-06	5.25E-06	8.63E-08	3.78E-07	1.29E-06	5.63E-06
n-Butane	0.0065	7.49E-06	3.28E-05	5.39E-07	2.36E-06	8.03E-06	3.52E-05
Isopentane	0.0003	4.01E-07	1.76E-06	2.89E-08	1.26E-07	4.30E-07	1.88E-06
n-Pentane	0.0002	2.85E-07	1.25E-06	2.05E-08	9.00E-08	3.06E-07	1.34E-06
2-Methylpentane	5.48E-06	6.28E-09	2.75E-08	4.52E-10	1.98E-09	6.73E-09	2.95E-08
3-Methylpentane	2.06E-05	2.36E-08	1.03E-07	1.70E-09	7.43E-09	2.53E-08	1.11E-07
n-Hexane	2.90E-07	3.33E-10	1.46E-09	2.39E-11	1.05E-10	3.56E-10	1.56E-09
Methylcyclopentane	0.0001	6.19E-08	2.71E-07	4.46E-09	1.95E-08	6.64E-08	2.91E-07
Benzene	0.0003	2.90E-07	1.27E-06	2.09E-08	9.15E-08	3.11E-07	1.36E-06
2-Methylhexane	2.68E-08	3.07E-11	1.34E-10	2.21E-12	9.67E-12	3.29E-11	1.44E-10
3-Methylhexane	3.15E-07	3.61E-10	1.58E-09	2.60E-11	1.14E-10	3.87E-10	1.69E-09
Heptane	4.90E-07	5.62E-10	2.46E-09	4.04E-11	1.77E-10	6.02E-10	2.64E-09
Methylcyclohexane	1.12E-05	1.28E-08	5.60E-08	9.20E-10	4.03E-09	1.37E-08	6.00E-08
Toluene	0.0001	1.13E-07	4.96E-07	8.14E-09	3.57E-08	1.21E-07	5.31E-07
Octane	4.11E-08	4.71E-11	2.06E-10	3.39E-12	1.49E-11	5.05E-11	2.21E-10
Ethylbenzene	1.46E-05	1.67E-08	7.30E-08	1.20E-09	5.26E-09	1.79E-08	7.83E-08
m & p-Xylene	2.05E-05	2.35E-08	1.03E-07	1.69E-09	7.41E-09	2.52E-08	1.10E-07
o-Xylene	2.02E-05	2.31E-08	1.01E-07	1.66E-09	7.29E-09	2.48E-08	1.08E-07
Nonane	6.44E-09	7.38E-12	3.23E-11	5.31E-13	2.33E-12	7.91E-12	3.46E-11
C10+	3.10E-15	3.56E-18	1.56E-17	2.56E-19	1.12E-18	3.81E-18	1.67E-17
Total VOCs	0.1554	0.0002	0.0008	0.0000	0.0001	0.0002	0.0008
Total CO _{2e}		0.0924	0.4046	0.0067	0.0291	0.0990	0.4337
Total TAPs (Benzene)		2.90E-07	1.27E-06	2.09E-08	9.15E-08	3.11E-07	1.36E-06
Toluene		1.13E-07	4.96E-07	8.14E-09	3.57E-08	1.21E-07	5.31E-07
Ethylbenzene		1.67E-08	7.30E-08	1.20E-09	5.26E-09	1.79E-08	7.83E-08
Xylenes		4.66E-08	2.04E-07	3.36E-09	1.47E-08	5.00E-08	2.19E-07
n-Hexane		3.33E-10	1.46E-09	2.39E-11	1.05E-10	3.56E-10	1.56E-09
Total HAPs		4.67E-07	2.05E-06	3.36E-08	1.47E-07	5.01E-07	2.19E-06
Total	100.00	0.1145	0.5017	0.0082	0.0361	0.1228	0.5378

Enter any notes here:	Vapor mass fractions, working losses and breathing losses from Promax output
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Table 8

Loading Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	3.41	1.0241
Annual Average Temp (F)	72.1	72.1
S (saturation factor)	0.6	0.6
P (true vapor pressure)	2.19	0.45
M (MW of vapor)	44.18	18.39
Collection Efficiency (%)	0	0
Loading Loss (lb/10 ³ gal)*	1.36	0.12
Maximum Throughput (gallons/hr)	10,080	10,080
Average Throughput (gallons/yr)	18,396,000	36,792,000
Loading Emissions (lbs/hr)	13.69	1.17
Loading Emissions (tpy)	12.49	2.13

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction wt%	Loading Losses		Vapor Mass Fraction wt%	Loading Losses	
		lbs/hr	tpy		lbs/hr	tpy
Water	0.0000	6.69E-06	6.10E-06	92.3992	1.08E+00	1.97E+00
Nitrogen	0.0003	4.09E-05	3.74E-05	0.0107	0.0001	0.0002
Carbon Dioxide	0.1635	0.0224	0.0204	3.1366	0.0366	0.0667
Methane	0.7110	0.0973	0.0888	3.1006	0.0361	0.0660
Ethane	25.0657	3.4303	3.1302	1.1974	0.0140	0.0255
Propane	32.6004	4.4615	4.0711	0.1467	0.0017	0.0031
Isobutane	7.8193	1.0701	0.9765	0.0010	1.22E-05	2.23E-05
n-Butane	16.9823	2.3241	2.1207	0.0065	7.62E-05	0.0001
Isopentane	5.7901	0.7924	0.7231	0.0003	4.08E-06	7.44E-06
n-Pentane	5.8651	0.8027	0.7324	0.0002	2.90E-06	5.30E-06
2-Methylpentane	1.4766	0.2021	0.1844	5.48E-06	6.39E-08	1.17E-07
3-Methylpentane	0.8626	0.1180	0.1077	2.06E-05	2.40E-07	4.38E-07
n-Hexane	0.1730	0.0237	0.0216	2.90E-07	3.38E-09	6.18E-09
Methylcyclopentane	0.3412	0.0467	0.0426	0.0001	6.30E-07	1.15E-06
Benzene	0.0059	8.10E-04	7.39E-04	0.0003	2.95E-06	5.39E-06
2-Methylhexane	0.0322	4.40E-03	4.02E-03	2.68E-08	3.12E-10	5.70E-10
3-Methylhexane	0.3636	0.0498	0.0454	3.15E-07	3.67E-09	6.70E-09
Heptane	0.6785	0.0929	0.0847	4.90E-07	5.72E-09	1.04E-08
Methylcyclohexane	0.4808	0.0658	0.0600	1.12E-05	1.30E-07	2.37E-07
Toluene	0.0110	1.50E-03	0.0014	0.0001	1.15E-06	2.10E-06
Octane	0.4643	0.0635	0.0580	4.11E-08	4.80E-10	8.75E-10
Ethylbenzene	0.0054	7.41E-04	0.0007	1.46E-05	1.70E-07	3.10E-07
m & p-Xylene	0.0089	1.22E-03	0.0011	2.05E-05	2.39E-07	4.36E-07
o-Xylene	0.0070	9.61E-04	0.0009	2.02E-05	2.35E-07	4.29E-07
Nonane	0.0903	0.0124	0.0113	6.44E-09	7.51E-11	1.37E-10
C10+	0.0010	1.38E-04	0.0001	3.10E-15	3.62E-17	6.60E-17
Total VOCs	74.0595	10.1354	9.2485	0.1554	0.0018	0.0033
Total CO _{2e}		2.4550	2.2402		0.9400	1.7155
Total TAPs (Benzene)		0.0008	0.0007		2.95E-06	5.39E-06
Toluene		0.0015	0.0014		1.15E-06	2.10E-06
Ethylbenzene		0.0007	0.0007		1.70E-07	3.10E-07
Xylenes		0.0022	0.0020		4.74E-07	8.66E-07
n-Hexane		0.0237	0.0216		3.38E-09	6.18E-09
Total HAPs		0.0289	0.0264		4.75E-06	8.67E-06
Total	100.0000	13.6854	12.4880	100.0000	1.1655	2.1270

Enter any notes here

Vapor mass fractions and loading losses from Promax output
 *Using equation $L_L = 12.46 \cdot \text{SPM}/T$ from AP-42, Chapter 5, Section 5.2-4
 MW was obtained by Promax; RVP was taken from laboratory reports
 Annual Average Temp (F) obtained from Charleston, WV (preset in Promax)
 S (saturation factor) is based on submerged loading, dedicated service as it was most representative
 True vapor pressure (TVP) equation from AP-42, Chapter 7, Figure 7.1-13b
 Loading emissions are vented to the atmosphere.

Table 9

Gas Production Unit Heater Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation

Gas Production Unit Heater Emissions

Number of Units	8
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,247

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	0.962	4.215
CO	84	0.808	3.540
CO ₂	120,000	1154.716	5057.656
Lead	0.0005	4.81E-06	2.11E-05
N ₂ O	2.2	0.021	0.093
PM (Total)	7.6	0.073	0.320
SO ₂	0.6	0.006	0.025
TOC	11	0.106	0.464
Methane	2.3	0.022	0.097
VOC	5.5	0.053	0.232
HAPS			
2-Methylnaphthalene	2.40E-05	2.31E-07	1.01E-06
Benzene	2.10E-03	2.02E-05	8.85E-05
Dichlorobenzene	1.20E-03	1.15E-05	5.06E-05
Fluoranthene	3.00E-06	2.89E-08	1.26E-07
Fluorene	2.80E-06	2.69E-08	1.18E-07
Formaldehyde	7.50E-02	7.22E-04	3.16E-03
Hexane	1.80E+00	1.73E-02	7.59E-02
Naphthalene	6.10E-04	5.87E-06	2.57E-05
Phenanthrene	1.70E-05	1.64E-07	7.17E-07
Toluene	3.40E-03	3.27E-05	1.43E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.1235	0.5409
TOTAL Uncontrolled HAPs	0.0423	0.1851
TOTAL Uncontrolled TAPs (Benzene)	4.72E-05	2.07E-04
TOTAL Uncontrolled TAPs (Formaldehyde)	0.0017	0.0074
TOTAL CO _{2e} Emissions	2,710.35	11,871.33

Enter any notes here:

All Emission Factors based off AP-42 Sec 1.4 Natural Gas Combustion

Line Heater Emissions

Number of Units	8
Line Heater Rating (MMBtu/hr)	2.00
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,247

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.283	5.620
CO	84	1.078	4.720
CO ₂	120,000	1539.621	6743.541
Lead	0.0005	6.42E-06	2.81E-05
N ₂ O	2.2	0.028	0.124
PM (Total)	7.6	0.098	0.427
SO ₂	0.6	0.008	0.034
TOC	11	0.141	0.618
Methane	2.3	0.030	0.129
VOC	5.5	0.071	0.309
HAPS			
2-Methylnaphthalene	2.40E-05	3.08E-07	1.35E-06
Benzene	2.10E-03	2.69E-05	1.18E-04
Dichlorobenzene	1.20E-03	1.54E-05	6.74E-05
Fluoranthene	3.00E-06	3.85E-08	1.69E-07
Fluorene	2.80E-06	3.59E-08	1.57E-07
Formaldehyde	7.50E-02	9.62E-04	4.21E-03
Hexane	1.80E+00	2.31E-02	1.01E-01
Naphthalene	6.10E-04	7.83E-06	3.43E-05
Phenanthrene	1.70E-05	2.18E-07	9.55E-07
Toluene	3.40E-03	4.36E-05	1.91E-04

Table 10

**Enclosed Combustor Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

General Information	
Unit Name:	EC001, EC002, EC003, EC004,

Pollutant	Emission Factor (lb/MMscf)
NOx	100
CO	84
PM10	7.6
PM2.5	5.7
SO ₂	0.6
CO ₂	120,000
VOC	5.5
benzene	2.10E-03
Hexane	1.80E+00
Toluene	3.40E-03
Formaldehyde	7.50E-02
N ₂ O	2.20
Lead	5.00E-04

Constants	
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H ₂ S molecular weight	34.08
SO ₂ molecular weight	64.06
seconds/hour	3,600
inches/ft	12

Destruction Efficiency	
VOC percent destruction efficiency (%)	98
H ₂ S percent destruction efficiency (%)	98

Enclosed Combustor operating hours	8760
No. of Enclosed Combustors	4

Stream Information							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed/Vapor Combustor (Enter Name of Each Stream Here)	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
Maximum Expected Hourly Volumetric Flow Rate of Stream (scf/hr)	50.4	--	3,969.93	258.07	185.04	2.53	4,465.97
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	441,504.00	--	34,776,620.16	2,260,706.35	1,620,916.77	22,193.00	39,121,940.29
Heating Content (Btu/ft ³)	1,247		2,315.39	1,103.87	2,315.39	1,103.87	2,218.56

Mass Flow Rates of the Vapors Sent to this Control Device, Hourly Basis (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
H ₂ S	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total VOC	-	-	354.5855	2.1375	15.9559	0.0002	372.6791
Benzene	-	-	0.5319	0.0236	0.0013	0.0000	0.5568
Toluene	-	-	0.4578	0.0191	0.0024	0.0000	0.4793
Ethylbenzene	-	-	0.1211	0.0050	0.0012	0.0000	0.1273
Xylenes	-	-	0.2963	0.0123	0.0034	0.0000	0.3120
n-Hexane	-	-	12.7977	0.0112	0.0373	0.0000	12.8462
HAPs	-	-	14.2048	0.0712	0.0455	0.0000	14.3215
Total Mass Flow	-	-	462.239	12.508	21.545	0.123	496.414
Mass Flow Rates of the Vapors Sent to this Control Device, Annual Basis (tpy)							
H ₂ S	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total VOC	-	-	1553.085	9.362	69.887	0.001	1632.334
Benzene	-	-	2.3297	0.1033	0.0056	0.0000	2.4386
Toluene	-	-	2.0051	0.0837	0.0103	0.0000	2.0991
Ethylbenzene	-	-	0.5306	0.0219	0.0051	0.0000	0.5576
Xylenes	-	-	1.2978	0.0538	0.0150	0.0000	1.3666
n-Hexane	-	-	56.0540	0.0490	0.1633	0.0000	56.2662
HAP	-	-	62.2171	0.3117	0.1993	0.0000	62.7281
Total Mass Flow	-	-	2024.605	54.784	94.366	0.538	2174.292

Table 10

Enclosed Combustor Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation

Controlled Emissions							
Hourly (lb/hr)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.005	-	0.397	0.026	0.019	0.000	0.45
CO	0.004	-	0.333	0.022	0.016	0.000	0.38
PM2.5	0.000	-	0.023	0.001	0.001	0.000	0.03
PM10	0.000	-	0.030	0.002	0.001	0.000	0.03
H ₂ S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO ₂	0.000	-	0.000	0.000	0.000	0.000	0.00
CO ₂	6.048	-	-	-	-	-	6.05
Total VOC	0.000	-	7.092	0.043	0.319	0.000	7.45
Benzene	0.000	-	0.011	0.000	0.000	0.000	0.01
Toluene	0.000	-	0.009	0.000	0.000	0.000	0.01
Ethylbenzene	0.000	-	0.002	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.006	0.000	0.000	0.000	0.01
n-Hexane	0.000	-	0.256	0.000	0.001	0.000	0.26
HAP	0.000	-	0.284	0.001	0.001	0.000	0.29
N ₂ O	0.000	-	0.009	0.001	0.000	0.000	0.01
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00
Annual (tpy)							
	1	2	3	4	5	6	Total
Stream Sent to Enclosed Combustor/Vapor Combustor	pilot(s)	added fuel stream(s)	Oil Tank Flash Emissions	Water Tank Flash Emissions	Oil Tank W/B Emissions	Water Tank W/B Emissions	-
NOx	0.022	-	1.739	0.113	0.081	0.001	1.96
CO	0.019	-	1.461	0.095	0.068	0.001	1.64
PM2.5	0.001	-	0.099	0.006	0.005	0.000	0.11
PM10	0.002	-	0.132	0.009	0.006	0.000	0.15
H ₂ S	0.000	-	0.000	0.000	0.000	0.000	0.00
SO ₂	0.000	-	0.000	0.000	0.000	0.000	0.00
CO ₂	26.490	-	-	-	-	-	26.49
Total VOC	0.001	-	31.062	0.187	1.398	0.000	32.65
Benzene	0.000	-	0.047	0.002	0.000	0.000	0.05
Toluene	0.000	-	0.040	0.002	0.000	0.000	0.04
Ethylbenzene	0.000	-	0.011	0.000	0.000	0.000	0.01
Xylenes	0.000	-	0.026	0.001	0.000	0.000	0.03
n-Hexane	0.000	-	1.121	0.001	0.003	0.000	1.13
HAP	0.000	-	1.244	0.006	0.004	0.000	1.25
N ₂ O	0.000	-	0.038	0.002	0.002	0.000	0.04
Lead	0.000	-	0.000	0.000	0.000	0.000	0.00
Formaldehyde	0.000	-	-	-	-	-	0.00

Enclosed Combustor/Vapor Combustor Total Emissions		
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
Total VOC	7.4539	32.6479
NOx	0.4466	1.9561
CO	0.3751	1.6431
PM2.5	0.0255	0.1115
PM10	0.0339	0.1487
H ₂ S	1.61E-05	7.05E-05
SO ₂	3.02E-05	0.0001
Benzene (TAPs)	0.0111	0.0488
Formaldehyde (TAPs)	3.78E-06	1.66E-05
HAPs	0.2865	1.2550
CO ₂ e	1495.61	6550.78
N ₂ O	0.0098	0.0430
Lead	2.23E-06	9.78E-06

Enter any notes here as needed

1. Emission Factors from AP-42 Tables 1.4-1, 1.4-2, and 1.4.3

Table 11

Enclosed Combustor GHG Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation

Enclosed Combustor CO₂ and CH₄ Emissions

Components	Mole fraction of oil flash gas constituents ^a	Volume of oil flash gas sent to Enclosed Combustor <i>scf/year</i>	Mole fraction of water flash gas constituents ^a	Volume of water flash gas sent to Enclosed Combustor <i>scf/year</i>	Mole fraction of oil tank vapors constituents ^a	Volume of oil tank vapor sent to Enclosed Combustor <i>scf/year</i>	Mole fraction of water tank vapors constituents ^a	Volume of water tank vapors sent to Enclosed Combustor <i>scf/year</i>	Component volume of gas sent to Enclosed Combustor <i>scf/year</i>	Number of carbon atoms	Combustion Efficiency	Combusted CO ₂ Volume ^b <i>scf/year</i>	Uncombusted CO ₂ and CH ₄ Volume ^b <i>scf/year</i>	Volume GHGs Emitted <i>scf/year</i>
CO ₂	0.001	34,776,620	0.0109	2,260,706	0.0016	1,620,917	0.013	22,193	76,134	1	0	--	76,134	110,379,789
Methane	0.090	34,776,620	0.7178	2,260,706	0.0196	1,620,917	0.036	22,193	4,770,617	1	0.98	4,675,205	95,412	95,412
Ethane	0.292	34,776,620	0.1603	2,260,706	0.3683	1,620,917	0.007	22,193	11,101,899	2	0.98	21,759,723	--	
Propane	0.306	34,776,620	0.0549	2,260,706	0.3267	1,620,917	0.001	22,193	11,296,872	3	0.98	33,212,803	--	
i-Butane	0.059	34,776,620	0.0024	2,260,706	0.0594	1,620,917	0.000	22,193	2,145,223	4	0.98	8,409,274	--	
n-Butane	0.130	34,776,620	0.0099	2,260,706	0.1291	1,620,917	0.000	22,193	4,750,161	4	0.98	18,620,631	--	
Pentane	0.076	34,776,620	0.0034	2,260,706	0.0714	1,620,917	0.000	22,193	2,759,524	5	0.98	13,521,669	--	
Hexane	0.027	34,776,620	0.0006	2,260,706	0.0129	1,620,917	0.000	22,193	970,493	6	0.98	5,706,498	--	
Benzene	0.001	34,776,620	0.0005	2,260,706	0.0000	1,620,917	0.000	22,193	23,893	6	0.98	140,491	--	
Heptanes	0.010	34,776,620	0.0005	2,260,706	0.0065	1,620,917	0.000	22,193	359,536	7	0.98	2,466,418	--	
Toluene	0.000	34,776,620	0.0003	2,260,706	0.0001	1,620,917	0.000	22,193	17,429	7	0.98	119,562	--	
Octane	0.005	34,776,620	0.0003	2,260,706	0.0040	1,620,917	0.000	22,193	180,927	8	0.98	1,418,465	--	
Ethyl benzene	0.000	34,776,620	0.0001	2,260,706	0.0000	1,620,917	0.000	22,193	4,018	8	0.98	31,497	--	
Xylenes	0.000	34,776,620	0.0002	2,260,706	0.0001	1,620,917	0.000	22,193	9,847	8	0.98	77,200	--	
Nonane	0.000	34,776,620	0.0000	2,260,706	0.0003	1,620,917	0.000	22,193	16,112	9	0.98	142,108	--	
Decane plus	0.000	34,776,620	0.0000	2,260,706	0.0000	1,620,917	0.000	22,193	216	10	0.98	2,112	--	
Subtotal												110,303,655	--	

Pollutant	Volume Emitted <i>scf/year</i>	Density of GHG ^c <i>lb/scf</i>	Conversion Factor <i>lb/ton</i>	GWF	Emissions ^c	
					<i>lbs/hr</i>	<i>(tons/yr)</i>
CO ₂	110,379,789	0.12	2000	1	1461.18	6,399.99
CH ₄	95,412	0.09	2000	25	1.01	4.44
CO₂e Emissions					1,486.5	6510.94

GHG Emissions Summary

Notes

a Flashing/Working/Breathing Losses from ProMax output reports

b 40 CFR 98.233 (n)(4): Eqns: W-19, W-20 and W-21

c 40 CFR 98.233(v) Eqn W-36 - density at 60F and 14.7 psia

Table 12

**Haul Road Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

	PM	PM10
Particle Size Multiplier (k)	0.8	0.36
Silt Content of Road Surface Material (s) (%)	5.1	5.1
Days per Year with Precipitation > 0.01 in (p)	150	150
Control Efficiency for Watering ¹ (%)	50	50

Tanker Truck Trip Calculation	
Condensate Production (bbl/day)	1,200
PW Production (bbl/day)	2,400
Truck Capacity (bbl)	200

Pick Up Truck Trip Calculation	
No of Trips Per day	2
Trips Per Year	730

	# of Wheels	Mean Vehicle Weight (W) (tons)	Mean Vehicle Speed (S) (mph)	Miles Per Trip (miles)	Maximum Trips per Hour	Maximum Trips per Year	Vehicle Miles Travelled		PM	PM10
							(miles/hr)	(miles/year)	(lbs/VMT)	(lbs/VMT)
Tanker Trucks Condensate	10	40	10	0.3400	1	2190	0.3400	744.6000	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.3400	1	4380	0.3400	1489.2000	3.8175	1.7179
Pick Up Truck	4	3	10	0.2840	1	730	0.2840	207.3200	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks Condensate	1.2980	2842.5324	1.4213	0.5841	1279.1396	0.6396	0.6490	1421.2662	0.7106	0.2920	639.5698	0.3198
Tanker Trucks PW	1.2980	5685.0648	2.8425	0.5841	2558.2791	1.2791	0.6490	2842.5324	1.4213	0.2920	1279.1396	0.6396
Pick Up Truck	0.0985	71.8736	0.0359	0.0443	32.3431	0.0162	0.0492	35.9368	0.0180	0.0222	16.1716	0.0081
Total Emissions	2.6944	8,599.4708	4.2997	1.2125	3,869.7619	1.9349	1.3472	4,299.7354	2.1499	0.6062	1,934.8809	0.9674

Enter any notes here:	1 EPA, AP-42, Volume I, Section 13.2.2 Unpaved Roads (11/06); assume 2:1 moisture ratio Section 13.2.2 Unpaved Roads (11/06) Source: Attachment L, Fugitive Emissions from Unpaved Haul Roads, Rev 03/2007, West Virginia Department of Environmental Protection
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Table 13

**Engine Emissions
Lockhart Heirs West
Ritchie, West Virginia
Antero Resources Corporation**

Kubota DG972-E2

Power (hp)	24
Fuel consumption (lbs/BHP-hr) ¹	0.449
Heat Content of Fuel (Btu/scf)	1247.06
Density of NG (lb/scf)	0.056
Operating Hours/year	8760

Pollutant	Emission Factors		lb/hr	tpy
	(g/hp-hr)	(lb/MMBtu)		
NO _x ¹	5.97		0.3158	1.3831
CO ²	106.7		5.6445	24.7228
CO ₂		110.000	26.3967	115.62
PM _{2.5}		9.910E-03	0.0024	0.0104
PM ₁₀		9.500E-03	0.0023	0.0100
PM (Total)		9.910E-03	0.0024	0.0104
SO ₂		5.880E-04	0.0001	0.0006
TOC		0.358	0.0859	0.3763
Methane		0.230	0.0552	0.2417
VOC ³		0.0296	0.0071	0.0311
HAPS				
Benzene		1.58E-03	3.79E-04	1.66E-03
Ethylbenzene		2.48E-05	5.95E-06	2.61E-05
Formaldehyde		2.05E-02	4.92E-03	2.15E-02
Naphthalene		9.71E-05	2.33E-05	1.02E-04
Toluene		5.58E-04	1.34E-04	5.86E-04
Xylene		1.95E-04	4.68E-05	2.05E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.007	0.031
TOTAL Uncontrolled NO _x	0.316	1.383
TOTAL Uncontrolled HAPs	0.006	0.024
TOTAL Uncontrolled TAPs (Benzene)	0.000	0.002
TOTAL Uncontrolled TAPs (Formaldehyde)	0.005	0.022
TOTAL CO _{2e} Emissions	27.78	121.7

Enter Any Notes Here:

1. Emission factor used for the 24 HP engine's NO_x is the 40 CFR 1054 standard indicated on the EPA's Certificate of Conformity. See Appendix P.
2. Emission factor for CO was the Certification CO level taken from EPA's Non-Road Small SI 2013 Certification issued by Office of Transportation and Air Quality, March 2014.
3. Emission factors for all other contaminants including VOCs were obtained from AP-42, Section 3.2 "Natural Gas-fired Reciprocating Engines", Table 3.2-3.



Bryan Research & Engineering, Inc.

ProMax[®] 3.2

with
TSWEET[®] & PROSIM[®]

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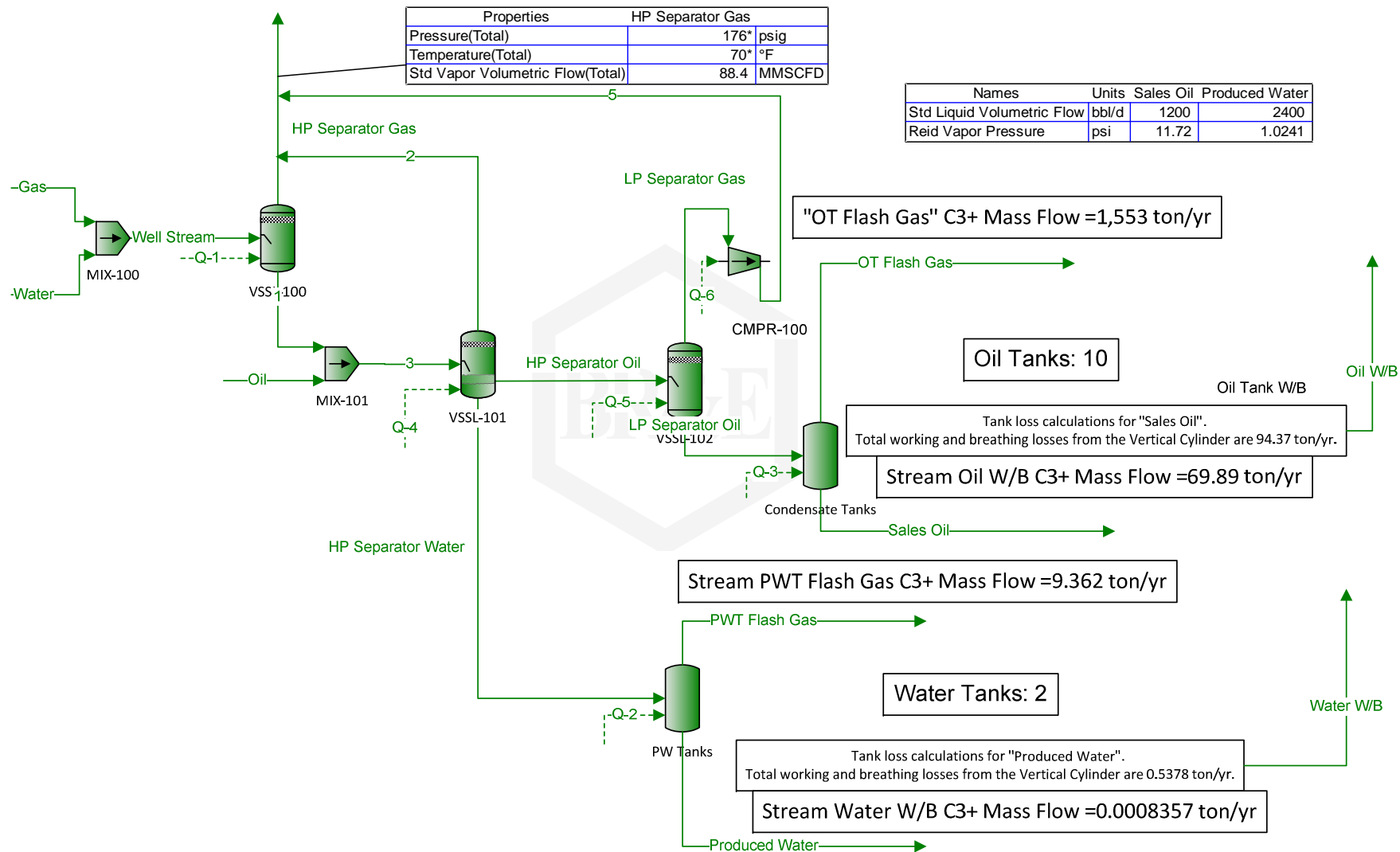
Simulation Report

Client Name:	Antero Resources
Location:	Ritchie County, WV
Job:	Lockhart Heirs West Well Pad
Project Name:	PROMAX SCENARIO 3
File Name:	ProMax@P:\AirQuality\ANTERO RESOURCES\ProMax\Antero WV_Updated 2Ph Separator\PROMAX SCENARIO 3.PMX
ProMax Version:	3.2.13330.0
Report Created:	10/2/2015 11:59

Stream HP Separator Gas C3+ Mass Flow =1.676E+05 ton/yr

Properties	HP Separator Gas
Pressure(Total)	176* psig
Temperature(Total)	70* °F
Std Vapor Volumetric Flow(Total)	88.4 MMSCFD

Names	Units	Sales Oil	Produced Water
Std Liquid Volumetric Flow	bb/d	1200	2400
Reid Vapor Pressure	psi	11.72	1.0241



Process Streams	Well Stream	HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	1	3	LP Separator Oil
Phase: Total	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	16.8496	0.200665	99.9673	0.0518361	0.236359	0.00492407	0	100	0	99.9967	3.02980	0.000119877	94.3312	99.9676	93.9310	0.0260420
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.411310	0.493682	0.000124935	0.0166853	0.0121015	1.92958E-05	0.494658	0	0.0179998	4.63437E-06	0.395514	0.800471886	0.00702305	0.78456E-05	0.00116066	0.00112177
Carbon Dioxide	0.121996	0.146248	0.000864585	0.0318014	0.139497	0.00259339	0.146717	0	0.0309997	0.000531395	1.09595	0.164112	1.31082	0.000922164	0.00273842	0.0150585
Methane	64.6094	77.5460	0.0236507	4.72021	8.95798	0.8431426	77.7018	0	4.76595	0.00173455	72.0548	1.95829	3.55469	0.0243017	0.310630	0.856602
Ethane	11.8077	14.1718	0.00534566	5.70838	29.1683	0.866442	14.2004	0	5.72594	0.000451332	16.0914	36.8327	0.732428	0.00486665	0.350338	3.44893
Propane	3.73705	4.48527	0.00184878	6.54024	30.6105	3.39323	4.49433	0	6.54493	0.000170921	5.51642	32.6664	0.0611890	0.00166416	0.396785	5.87674
Isobutane	0.471186	0.565552	7.51180E-05	2.26702	1.70544	1.70544	0.566666	0	2.06698	2.57096E-06	0.238513	5.94429	0.000331233	6.81067E-05	0.124880	2.08603
n-Butane	0.984450	1.18158	0.000324659	5.90949	12.9940	5.41367	1.18394	0	5.90894	2.35023E-05	0.990128	12.9101	0.00206933	0.000360606	0.357104	6.10536
Isopentane	0.311767	0.374203	5.45816E-05	3.77100	3.73472	4.05972	0.374944	0	3.76996	2.77079E-06	0.170340	3.54592	8.92114E-05	0.227712	4.03006	4.03006
n-Pentane	0.242329	0.290859	5.32390E-05	5.04715	3.84669	5.58153	0.291434	0	5.04595	2.67714E-06	0.166234	3.59187	6.34911E-05	4.81848E-05	0.304749	5.42323
2-Methylpentane	0	0	5.00135E-06	2.52561	0.821540	2.93275	0	2.52497	1.22971E-07	0.0160386	0.757084	1.16937E-06	0	0.152473	2.74011	0
3-Methylpentane	0	0	8.07521E-06	1.64532	0.482455	1.91718	0	1.64498	5.16923E-07	0.0248497	0.442275	4.39262E-06	0	0.0993336	1.78626	0
n-Hexane	0.453306	0.544099	6.80832E-06	6.01806	1.42297	7.05521	0.545164	0	6.01594	1.33782E-07	0.0219438	0.0887123	6.19609E-08	3.20532E-05	0.363307	6.54128
Methylcyclopentane	0	0	1.13963E-05	0.924079	0.213466	1.08396	0	0.923991	1.94139E-06	0.0310865	0.179134	1.18173E-05	0	0.0557959	1.00453	0
Benzene	0	0	0.000174542	0.280362	0.0652464	0.328804	0	0.282997	0.000159056	0.0510729	0.00334897	5.96714E-05	0	0.0170890	0.304755	0
2-Methylhexane	0	0	1.27918E-06	2.38566	0.240396	8.23715	0	2.38498	2.66991E-08	0.00411776	0.0141865	4.91676E-09	0	0.144019	2.60020	0
3-Methylhexane	0	0	1.00408E-06	1.87952	0.180807	2.23629	0	1.87898	2.18848E-08	0.00329216	0.160340	5.77887E-08	0	0.113464	2.04873	0
Heptane	0	0	2.13055E-06	4.79334	0.365937	5.71499	0	4.79195	4.66902E-08	0.00685107	0.299190	9.00196E-08	0	0.289366	5.22690	0
Methylcyclohexane	0	0	8.89844E-06	3.40284	0.266885	4.05626	0	3.40197	1.06431E-06	0.0257571	0.216380	2.09093E-06	0	0.205430	3.71049	0
Toluene	0	0	0.000100946	0.742642	0.0476056	0.886567	0	0.743993	9.03018E-05	0.0350845	0.00525632	1.97170E-05	0	0.049266	0.810014	0
Octane	0	0	7.98761E-07	9.69179	0.233129	11.6182	0	9.68890	1.16360E-08	0.00258782	0.179614	6.62464E-09	0	0.585072	10.5794	0
Ethylbenzene	0	0	2.09911E-05	0.509821	0.0109325	0.611324	0	0.509995	1.85704E-05	0.0077709	0.00225370	2.52118E-06	0	0.0307964	0.556540	0
m-Xylene	0	0	2.73365E-05	0.776800	0.0139589	0.931792	0	0.776992	2.42796E-05	0.0100743	0.00370430	3.55454E-06	0	0.0469193	0.848042	0
o-Xylene	0	0	3.37394E-05	0.792705	0.0127829	0.951052	0	0.792992	3.08672E-05	0.00947377	0.00292402	3.49485E-06	0	0.0478854	0.865437	0
Nonane	0	0	2.38550E-07	5.65864	0.0448159	6.79474	0	5.65594	5.47833E-09	0.000766267	0.0311023	9.23465E-10	0	0.341599	6.17882	0
C10+	0	0	3.16807E-10	24.1090	0.000457134	28.9730	0	24.1018	0.00095E-12	0.13825E-06	0.000218301	2.79118E-16	0	1.45540	26.3293	0
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	1963.03	19.4768	1943.49	0.0647475	0.0246675	0.00511800	0	1963.03	0	1943.47	0.0179164	5.84521E-07	0.00629761	1943.55	1943.55	0.0297855
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	47.9190	47.9175	0.00242890	0.0208413	0.00126297	2.00575E-05	47.9190	0	0.0024900	9.00076E-05	0.00023882	2.30093E-06	4.68863E-07	0.00152551	0.0240155	0.00128303
Carbon Dioxide	14.2129	14.1950	0.0168086	0.0397226	0.0145585	0.00269553	14.2129	0	0.0387328	0.0103278	0.0048077	0.000800215	8.75115E-05	0.0179285	0.0566614	0.0172540
Methane	7527.21	7526.73	0.459799	5.89593	0.934897	0.0448418	7527.21	0	5.95486	0.00377116	0.426807	0.00954868	0.000237313	0.472468	6.42733	0.979738
Ethane	1375.64	1375.54	0.103926	7.13024	3.04414	0.900568	1375.63	0	7.15433	0.00877178	0.0951546	0.179597	4.88974E-05	0.0946164	7.24894	3.94471
Propane	435.379	435.347	0.0359426	8.16930	3.19465	3.52687	435.379	0	8.17762	0.00332190	0.0326207	0.159282	4.08502E-06	0.0325544	8.20998	6.72152
Isobutane	54.8947	54.8933	0.00146039	2.58188	0.613293	1.77261	54.8947	0	2.58261	4.99675E-05	0.00141042	0.0289845	2.21133E-08	0.00132412	2.58393	2.38590
n-Butane	114.692	114.686	0.00631178	7.38144	1.35612	5.62689	114.692	0	7.38298	0.000456776	0.00555000	0.0629498	1.38150E-07	0.00596097	7.38894	6.98301
Isopentane	36.3219	36.3207	0.00106113	4.71029	0.389772	4.21961	36.3219	0	4.71041	5.38512E-05	0.00107028	0.0172900	5.95581E-09	0.00124027	4.71165	4.60938
n-Pentane	28.2321	28.2312	0.00103503	6.30430	0.401458	5.80136	28.2321	0	6.30470	5.20310E-05	0.000983002	0.0175140	4.23871E-09	0.000936799	6.30564	6.20282
2-Methylpentane	0	0	9.72325E-05	3.15469	0.0857397	3.04826	0	3.15485	2.38998E-06	9.8425E-05	0.00369156	7.80681E-11	0	0.315485	3.13400	0
3-Methylpentane	0	0	0.000156992	2.05514	0.0503513	1.99269	0	2.05534	1.00466E-05	0.000146946	0.00215654	2.93254E-10	0	2.05534	2.04304	0
n-Hexane	52.8117	52.8110	0.000132362	7.51705	1.418508	7.33308	52.8117	0	7.51667	2.60011E-06	0.000129762	0.000432563	4.13655E-12	0.000623172	7.51729	7.48159
Methylcyclopentane	0	0	0.000221558	1.15425	0.0222783	1.12666	0	1.15449	3.77316E-05	0.000183826	0.000873459	7.88930E-10	0	1.15449	1.14894	0
Benzene	0	0	0.00339331	0.350195	0.00680941	0.341754	0	0.353593	0.00309130	0.000302013	1.63296E-05	3.98370E-09	0	0.353593	0.348563	0
2-Methylhexane	0	0	2.48688E-05	2.97989	0.0250889	2.94889	0	2.97993	5.18905E-07	2.44399E-05	6.91737E-05	3.28246E-13	0	2.97993	2.97398	0
3-Methylhexane	0	0	1.95206E-05	2.34768	0.0188698	2.24366	0	2.34771	4.25338E-07	1.90952E-05	0.000781819	3.85802E-12	0	2.34771	2.34323	0
Heptane	0	0	4.14204E-05	5.98727	0.0381909	5.94008	0	5.98735	9.01439E-07	4.05130E-05	0.00145886	6.00977E-12	0	5.98735	5.97827	0
Methylcyclohexane	0	0	0.000172997	4.25042	0.0278534	4.21602	0	4.25062	2.06852E-05	0.000152311	0.00105507	1.39592E-10	0	4.25062	4.24387	0
Toluene	0	0	0.00196251	0.927622	0.00496834	0.921485	0	0.929588	0.000175505	0.000207468	2.56299E-05	1.31632E-09	0	0.929588	0.926453	0
Octane	0	0	1.55289E-05	12.1058	0.0243305	12.0758	0	12.1059	2.26149E-07	1.53028E-05	0.000875802	4.42265E-13	0	12.1059	12.1002	0
Ethylbenzene	0	0	0.000408094	0.636809	0.00114097	0.635401	0	0.637217	0.000360922	4.71716E-05	1.09891E-05	1.68316E-10	0	0.637217	0.636542	0
m-Xylene	0	0	0.000531455	0.970287	0.00145682	0.968491	0	0.970820	0.000471881	5.95734E-05	1.80622E-05	2.37304E-10	0	0.970820	0.969948	0
o-Xylene	0	0	0.000655936	0.990154	0.00133408	0.988509	0	0.990811	0.000599914	5.62002E-05	1.42576E-05	2.33319E-10	0	0.990811	0.989843	0
Nonane	0	0	4.63770E-06	7.06811	0.00467720	7.06235	0	7.06812	1.06473E-07	4.53123E-06	0.000151656	6.16511E-14	0	7.06812	7.06703	0
C10+	0	0	6.15912E-09	30.1141	4.77087E-05	30.1141	0	30.1141	1.95510E-11	6.13957E-09	1.06444E-06	1.86341E-20	0	30.1141	30.1141	0
Mass Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	14.8769	0.173114	99.9595	0.00855872	0.0961392	0.000716599	0	100	0	99.9943	2.58056	4.88767E-05	92.3992	99.9620	71.9595	0.00402580
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.564699	0.662265	0.000194257	0.00428386	0.00765409	4.36656E-06	0.663391	0	0.00462217	7.20617E-06	0.532826	0.000299178	0.0106970	0.000122005	0.00138264	0.000269555
Carbon Dioxide	0.263132	0.308215	0.00211193	0.0128271	0.0129811	0.00021987	0.309119	0	0.0210509	0.00129811	2.28032	0.163461	0.313663	0.00225263	0.00512489	0.00569697
Methane	50.7982	59.5730	0.0210591	6.94014	3.24465	0.00559099	59.6762	0	0.700862							

Toluene	0	0	0.000516244	0.627128	0.0990344	0.659878	0	0	0.628378	0.000461834	0.152832	0.0109610	9.87765E-05	0	0.176028	0.640428
Octane	0	0	5.06427E-06	10.1465	0.601255	10.7208	0	0	10.1452	7.37778E-08	0.0139755	0.464345	4.11442E-08	0	2.84199	10.3698
Ethylbenzene	0	0	0.000123692	0.496061	0.0262052	0.524281	0	0	0.496317	0.000109434	0.0004391	0.00541507	1.45532E-05	0	0.139034	0.507008
m-Xylene	0	0	0.000161083	0.755834	0.0334595	0.799119	0	0	0.756153	0.000143077	0.00505658	0.00890048	2.05181E-05	0	0.21822	0.727567
o-Xylene	0	0	0.000198813	0.771309	0.0306405	0.815637	0	0	0.771724	0.000181898	0.0475514	0.00702566	2.01735E-05	0	0.216184	0.788414
Nonane	0	0	1.69816E-06	6.65154	0.129776	7.03977	0	0	6.65071	3.90005E-08	0.00464637	0.0092804	6.43972E-09	0	1.86307	6.80014
C10+	0	0	3.59633E-09	45.1938	0.00211103	47.8705	0	0	45.1881	1.14206E-11	0.00398E-05	0.00101052	3.10402E-15	0	12.6586	46.2104
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Water	35364.5	350.880	35012.5	1.16644	0.444392	0.0922023	0	35364.5	0	35012.1	0.322769	1.05303E-05	0.113453	35013.6	35013.6	0.536595
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	1342.37	1342.33	0.0680416	0.583836	0.0353801	0.000561829	1342.37	0	0.630022	0.00252318	0.0655184	6.44568E-05	0.131345E-05	0.0427348	0.672757	0.0359420
Carbon Dioxide	625.504	624.715	0.739739	1.74817	0.640713	0.118629	625.504	0	1.70461	0.454523	0.285215	0.0352171	0.00385134	0.789026	2.49364	0.759342
Methane	120755	120747	7.37631	94.5852	14.9980	0.719373	120755	0	95.5306	0.540817	6.83549	0.153184	0.00380709	7.57955	103.110	15.7174
Ethane	41363.9	41361.1	3.12497	214.399	91.5345	27.0792	41363.9	0	215.124	0.263759	2.86121	5.40031	0.00147030	2.84503	217.969	118.614
Propane	19198.3	19196.9	1.58491	360.230	140.870	155.520	19198.3	0	360.597	0.146481	1.43843	7.02364	0.000180131	1.42669	362.024	296.390
Isobutane	3190.60	3190.52	0.0848809	150.064	35.6459	103.028	3190.60	0	150.107	0.00290422	0.0819767	1.68464	1.28528E-06	0.0769606	150.184	138.674
n-Butane	6666.13	6665.79	0.366855	429.025	78.8205	327.047	6666.13	0	429.115	0.00265488	0.34306	3.65878	8.02957E-06	0.346465	429.461	405.868
Isopentane	2620.58	2620.49	0.0765596	339.841	28.1216	304.440	2620.58	0	339.850	0.00388530	0.0726743	1.24745	4.29704E-07	0.0894837	339.940	332.561
n-Pentane	2036.91	2036.84	0.0746764	454.848	28.9647	418.561	2036.91	0	454.877	0.00375397	0.0709224	1.26362	3.05817E-07	0.0675889	454.944	447.526
2-Methylpentane	0	0	0.00837905	271.857	7.38865	262.485	0	271.870	0.000205958	0.00817309	0.318121	6.72755E-09	0	271.870	270.074	
3-Methylpentane	0	0	0.0135289	177.103	4.33904	171.721	0	177.120	0.000865766	0.0102631	0.185841	2.52713E-08	0	177.120	176.060	
n-Hexane	4551.06	4551.01	0.0114064	647.784	12.7977	631.931	4551.06	0	647.752	0.000224065	0.011823	0.0372763	3.56496E-10	0.0537021	647.805	644.729
Methylcyclopentane	0	0	0.0186462	97.1411	1.87493	94.8189	0	97.1611	0.00317547	0.0154707	0.0735099	6.63960E-08	0	97.1611	96.6398	
Benzene	0	0	0.265058	27.3544	0.531896	26.6950	0	27.6198	0.241467	0.00239908	0.00127554	3.11174E-07	0	27.6198	27.2269	
2-Methylhexane	0	0	0.00249190	298.590	2.51395	296.485	0	298.595	5.19953E-05	0.00243991	0.00693134	3.28909E-11	0	298.595	297.999	
3-Methylhexane	0	0	0.00195600	235.242	1.89079	232.906	0	235.245	4.26197E-05	0.00191338	0.0783398	3.86581E-10	0	235.245	234.797	
Heptane	0	0	0.00415041	599.937	3.82680	595.207	0	599.944	9.09272E-05	0.00405948	0.146180	6.02190E-10	0	599.944	599.034	
Methylcyclohexane	0	0	0.0169859	417.332	2.73481	413.954	0	417.351	0.00203100	0.0149549	0.103594	1.37060E-08	0	417.351	416.689	
Toluene	0	0	0.180823	85.4696	0.457775	84.9042	0	85.6508	0.161707	0.0191158	0.00236150	1.21284E-07	0	85.6508	85.3620	
Octane	0	0	0.00177384	1382.83	2.77923	1379.40	0	1382.84	2.58327E-05	0.00174801	0.100042	5.05193E-11	0	1382.84	1382.18	
Ethylbenzene	0	0	0.0433253	67.6068	0.121131	67.4574	0	67.6502	0.0383173	0.00500797	0.00116666	1.78893E-08	0	67.6502	67.5785	
m-Xylene	0	0	0.0564219	103.011	0.154663	102.820	0	103.067	0.00509973	0.00632461	0.00191758	2.51934E-08	0	103.067	102.975	
o-Xylene	0	0	0.0696375	105.120	0.141632	104.945	0	105.189	0.0638699	0.00594758	0.00151365	2.47703E-08	0	105.189	105.087	
Nonane	0	0	0.000594809	906.521	0.599874	905.783	0	906.522	1.36557E-05	0.000581153	0.0194506	7.90707E-12	0	906.522	906.382	
C10+	0	0	1.25974E-06	6159.34	0.00975799	6159.32	0	6159.34	3.99882E-09	1.25574E-06	0.000217713	3.81129E-18	0	6159.34	6159.33	

Process Streams		Well Stream	HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	1	3	LP Separator Oil
Phase: Total	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units																
Temperature	°F	164.5	70.0	70.0	70.0	75.9	75.9	200.0	200.0	200.0	75.9	75.94	75.9425	75.9425	70	92.9360	70
Pressure	psig	200	176	176	176	0	0	300	200	300	0	8.85622	-14.2259	176	176	40	0
Mole Fraction Vapor	%	85.3323	100	0	0	100	0	100	0	1.05157	0	100	100	0	0.0716227	0	0
Mole Fraction Light Liquid	%	14.6677	0	100	100	0	100	0	100	98.9484	100	0	0	100	5.97689	100	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	93.9515	0	0
Molecular Weight	lb/lbmol	20.4	20.9	18.0	109.1	44.3	123.8	20.9	18.0	109.1	18.0	21.1515	44.1849	18.3920	18.0163	23.5159	116.537
Mass Density	lb/ft³	0.8	0.7	62.3	45.0	0.1	45.8	1.0	60.2	37.9	62.2	0.0542842	0.186044	0.00150479	62.2619	53.1811	45.4728
Molar Flow	lbmol/h	11650.3	9706.1	1944.1	124.9	10.4	103.9	9687.3	1963.0	124.9	1943.5	0.591338	0.487602	0.00667607	1944.18	2069.13	114.375
Mass Flow	lb/h	237714.8	202687.9	35026.7	13628.7	462.2	12866.2	202350.3	35364.5	13630.4	35014.2	12.5077	21.5447	0.122786	35027.0	48657.4	13328.9
Vapor Volumetric Flow	MCFH	301.0	274.9	0.6	0.3	4.0	0.3	210.0	0.6	0.4	0.6	0.230411	0.115804	0.0815968	0.562575	0.914938	0.293118
Liquid Volumetric Flow	Mbbbl/d	1286.5	1175.2	2.4	1.3	17.2	1.2	9.9	2.5	1.5	2.4	0.984911	0.495015	0.348792	2.40477	3.91098	1.25296
Sld Vapor Volumetric Flow	MMSCFD	106.1	88.4	17.7	1.1	0.1	0.9	88.2	17.9	1.1	17.7	0.00538569	0.00440090	6.08031E-05	17.7069	18.8448	1.04168
Sld Liquid Volumetric Flow	Mbbbl/d	42.9	40.5	2.4	1.3	0.1	1.2	40.5	2.4	1.3	2.4	0.00243617	0.00304144	0.27880E-06	2.40244	3.71896	1.26418
Compressibility		0.828	0.950	0.010	0.081	0.983	0.007	0.964	0.009	0.128	0.001	0.996214	0.973139	0.999551	0.00970768	0.0142189	0.0246602
Specific Gravity		0.721	0.998	0.722	0.964	0.734	0.721	0.964	0.721	0.998	0.730304	1.52559	0.635024	0.998282	0.729093	0.729093	0.729093
API Gravity				10.0	63.3	59.4		10.0						10.0441		61.3120	
Enthalpy	MMBtu/h	-556.6	-334.8	-239.1	-11.9	-0.5	-10.8	-319.7	-236.9	-10.9	-238.9	-0.0221073	-0.0223247	-0.000679181	-239.099	-250.007	-11.4236
Mass Enthalpy	Btu/lb	-2341.6	-1651.7	-6826.0	-870.4	-1042.6	-841.9	-1579.9	-6699.9	-800.3	-6822.3	-1767.50	-1036.20	-5531.43	-4826.13	-5138.11	-857.058
Mass Cp	Btu/(lb*°F)	0.6	0.5	0.4	0.5	0.4	0.5	0.6	1.0	0.6	1.0	0.471762	0.407946	0.443277	0.983065	0.848019	0.486557
Ideal Gas Cp/Cv Ratio		1.236	1.249	1.326	1.051	1.125	1.044	1.215	1.320	1.042	1.326	1.24960	1.12552	1.32218	1.32581	1.24196	1.04740
Dynamic Viscosity	cP	0.0	1.0	0.5	0.0	0.7	0.0	0.3	0.0	0.9	0.0106606	0.00837446	0.0102449	0.995521	0.001982	0.601982	0.001982
Kinematic Viscosity	cSt	0.9	1.0	0.7	4.5	0.9	0.9	0.8	0.3	0.9	12.2599	2.81009	425.023	0.998177	0.826439	0.826439	0.826439
Thermal Conductivity	Btu/(h*ft*°F)	0.0	0.3	0.1	0.0	0.1	0.0	0.4	0.3	0.3	0.0169407	0.0105213	0.0122167	0.346580	0.0691488	0.0691488	0.0691488
Surface Tension	lb/ft		0.005	0.001	0.002		0.004				0.005			0.00504013		0.00155071	
Net I.G. Heating Value	Btu/ft³	949.5	1139.6	0.4	5484.0	2315.4	6203.8	1141.9	0.0	5483.6	0.0	1103.87	2313.79	45.6831	0.355148	331.465	5848.96
Net Liquid Heating Value	Btu/lb	17449.4	20646.6	-1051.4	18903.4	19681.2	18846.1	20684.2	-1059.8	18905.3	-1058.8	19713.7	19714.5	-41.0104	-1051.90	4538.74	18875.0
Gross I.G. Heating Value	Btu/ft³	1055.2	1256.4	50.7	5888.5	2516.3	6655.1	1258.8	50.3	5888.1	50.4	1218.02	2514.68	97.9506	50.6854	403.180	6277.45
Gross Liquid Heating Value	Btu/lb	19415.4	22769.2	8.7	20309.1	21402.3	20228.4	22808.7	0.0	20311.1	0.9	21761.8	21439.7	1037.4	8.2	5695.7	20269.1

Process Streams		Well Stream	HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	1	3	LP Separator Oil
Phase: Vapor	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		2.56077	0.200665	0.200643	0.200643	0.236359	0.236359	0		0	3.02980	3.02980	0.000119877	94.3312	0.200665	0.420354	0.331921
H2S		0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Nitrogen		0.482000	0.493682	0.785227	0.785227	0.0121015	0.0121015	0.494658		0.398604	0.395514	0.395514	0.000471886	0.00702305	0.493682	0.554917	0.185681
Carbon Dioxide		0.146286	0.146248	0.137091	0.137091	0.139497	0.139497	0.146717		0.164255	1.09595	1.09595	0.164112	1.31082	0.146248	0.160250	0.213311
Methane		75.7119	77.5460	75.4302	75.4302	8.95798	8.95798	77.7018		55.1883	72.0548	72.0548	1.95829	3.55469	77.5460	69.8897	46.6731
Ethane		13.8367	14.1718	15.5725	15.5725	29.1683	29.1683	14.2004		21.4399	16.0914	16.0914	36.8327	0.732428	14.1718	18.2062	30.2426
Propane		4.37930	4.98657	4.98865	4.98865	30.6105	30.6105	4.49433		10.6602	5.51642	5.51642	32.6664	0.0611890	4.8527	6.50053	13.7448

Isobutane	0.552172	0.565552	0.624907	0.624907	5.87644	5.87644	0.566666	1.81665	0.238513	0.238513	5.94429	0.000331233	0.565552	0.868561	1.86055
n-Butane	1.15364	1.18158	1.25350	1.25350	12.9940	12.9940	1.18394	4.12778	0.990128	0.990128	12.9101	0.00206933	1.18158	1.78819	3.78256
Isopentane	0.365352	0.374203	0.320851	0.320851	3.73472	3.73472	0.374944	1.42374	0.170340	0.170340	3.54592	8.92114E-05	0.374203	0.485351	0.957951
n-Pentane	0.283978	0.290859	0.322200	0.322200	3.84669	3.84669	0.291434	1.59588	0.166234	0.166234	3.59187	6.34911E-05	0.290859	0.498944	0.963474
2-Methylpentane	0	0	0.0670228	0.0670228	0.821540	0.821540	0	0.443592	0.0160386	0.0160386	0.757084	1.16937E-06	0	0.109910	0.196411
3-Methylpentane	0	0	0.0392458	0.0392458	0.482455	0.482455	0	0.267952	0.0248497	0.0248497	0.442275	4.39262E-06	0	0.0647567	0.114924
n-Hexane	0.531221	0.544099	0.116009	0.116009	1.42297	1.42297	0.545164	0.866633	0.0219438	0.0219438	0.0887123	6.19609E-08	0.544099	0.194998	0.336648
Methylcyclopentane	0	0	0.0171455	0.0171455	0.213466	0.213466	0	0.124201	0.0310865	0.0310865	0.179134	1.18173E-05	0	0.0286308	0.0504579
Benzene	0	0	0.00522899	0.00522899	0.0652464	0.0652464	0	0.0375233	0.0510729	0.0510729	0.00334897	5.96714E-05	0	0.00869288	0.0154933
2-Methylhexane	0	0	0.0200011	0.0200011	0.240396	0.240396	0	0.206909	0.00411776	0.00411776	0.0141865	4.91676E-09	0	0.0360157	0.0560402
3-Methylhexane	0	0	0.0150378	0.0150378	0.180807	0.180807	0	0.154693	0.00322916	0.00322916	0.160340	5.77887E-08	0	0.0270023	0.0421693
Heptane	0	0	0.0308544	0.0308544	0.365937	0.365937	0	0.334674	0.00685107	0.00685107	0.299190	9.00196E-08	0	0.0558033	0.0855199
Methylcyclohexane	0	0	0.0220131	0.0220131	0.266885	0.266885	0	0.225145	0.0257571	0.0257571	0.216380	2.09093E-06	0	0.0393712	0.0621812
Toluene	0	0	0.00390891	0.00390891	0.0476056	0.0476056	0	0.0422728	0.0350845	0.0350845	0.00525632	1.97170E-05	0	0.00705695	0.0110906
Octane	0	0	0.0203853	0.0203853	0.233129	0.233129	0	0.325219	0.00258782	0.00258782	0.179614	6.62464E-09	0	0.0379942	0.0540512
Ethylbenzene	0	0	0.000932348	0.000932348	0.0109325	0.0109325	0	0.0144790	0.00797709	0.00797709	0.00225370	2.52118E-06	0	0.00180814	0.00252771
m-Xylene	0	0	0.00119527	0.00119527	0.0139589	0.0139589	0	0.0200339	0.0100743	0.0100743	0.00370430	3.55454E-06	0	0.00235555	0.00321995
o-Xylene	0	0	0.00109389	0.00109389	0.0127829	0.0127829	0	0.0187036	0.00947377	0.00947377	0.00292402	3.49485E-06	0	0.00216315	0.00294682
Nonane	0	0	0.00403279	0.00403279	0.0448159	0.0448159	0	0.0936694	0.000766267	0.000766267	0.0311023	9.23465E-10	0	0.00847736	0.0102469
C10+	0	0	5.20475E-05	5.20475E-05	0.000457134	0.000457134	0	0.00902106	1.03825E-06	1.03825E-06	0.000218301	0	0	0.000162816	0.000103582
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	254.579	19.4768	0	0	0.0246675	0	0	0	0	0.01799164	5.84521E-07	0.00629761	0	0.00622950	0
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	47.9180	47.9175	0	0	0.00126297	0	47.9190	0.00523723	0	0.00233882	2.30093E-06	4.68863E-07	0	0.00822367	0
Carbon Dioxide	14.2050	14.1950	0	0	0.0145585	0	14.2129	0.00215813	0	0.00648077	0.000800215	8.75115E-05	0	0.00237485	0
Methane	7526.90	7526.73	0	0	0.934897	0	7527.21	0.725116	0	0.426087	0.00954868	0.000237313	0	1.03574	0
Ethane	1375.58	1375.54	0	0	3.04414	0	1375.63	0.281697	0	0.0951546	0.179597	4.88974E-03	0	0.269810	0
Propane	435.367	435.347	0	0	3.19465	0	435.379	0.140064	0	0.0326207	0.159282	4.08502E-06	0	0.0963356	0
Isobutane	54.8941	54.8933	0	0	0.613293	0	54.8947	0.0238689	0	0.00411042	0.0299845	2.21133E-08	0	0.0128718	0
n-Butane	114.689	114.686	0	0	1.35612	0	114.692	0.0542347	0	0.00585500	0.0629498	1.38150E-07	0	0.0265004	0
Isopentane	36.3215	36.3207	0	0	0.389772	0	36.3219	0.0187064	0	0.00100728	0.0172900	5.95581E-09	0	0.00719274	0
n-Pentane	28.2316	28.2312	0	0	0.401458	0	28.2321	0.0209682	0	0.000983002	0.0175140	4.23871E-09	0	0.00739418	0
2-Methylpentane	0	0	0	0	0.0857397	0	0	0.00582833	0	9.48425E-05	0.00369156	7.80681E-11	0	0.00162883	0
3-Methylpentane	0	0	0	0	0.0503513	0	0	0.00352060	0	0.000146946	0.00215654	2.93254E-10	0	0.000959672	0
n-Hexane	52.8113	52.8110	0	0	0.148508	0	52.8117	0.0113866	0	0.000129762	0.000432563	4.13655E-12	0	0.00289891	0
Methylcyclopentane	0	0	0	0	0.0222783	0	0	0.00163188	0	0.000183826	0.000873459	7.88930E-10	0	0.000424299	0
Benzene	0	0	0	0	0.00680941	0	0	0.000493017	0	0.000302013	1.63296E-05	3.98370E-09	0	0.000128825	0
2-Methylhexane	0	0	0	0	0.0250889	0	0	0.00271857	0	2.43499E-05	6.91737E-05	3.28246E-13	0	0.000533740	0
3-Methylhexane	0	0	0	0	0.0188698	0	0	0.00203251	0	1.90952E-05	0.000781819	3.85802E-12	0	0.000400165	0
Heptane	0	0	0	0	0.0381909	0	0	0.0439727	0	4.05130E-05	0.00145886	6.00977E-12	0	0.000826985	0
Methylcyclohexane	0	0	0	0	0.0278534	0	0	0.00295816	0	0.000152311	0.00105507	1.39592E-10	0	0.000583468	0
Toluene	0	0	0	0	0.00496834	0	0	0.000555420	0	0.000207468	2.56299E-05	1.31632E-09	0	0.000104582	0
Octane	0	0	0	0	0.0243305	0	0	0.00427303	0	1.53028E-05	0.000875802	4.42265E-13	0	0.000589736	0
Ethylbenzene	0	0	0	0	0.00114097	0	0	0.000190238	0	4.71716E-05	1.09891E-05	1.68316E-10	0	2.67960E-05	0
m-Xylene	0	0	0	0	0.00145682	0	0	0.000263224	0	5.95734E-05	1.80622E-05	2.37304E-10	0	3.49084E-05	0
o-Xylene	0	0	0	0	0.00133408	0	0	0.000245746	0	5.60220E-05	1.42576E-05	2.33319E-10	0	3.20571E-05	0
Nonane	0	0	0	0	0.00467720	0	0	0.00123072	0	4.53123E-06	0.000151656	6.16511E-14	0	0.000125631	0
C10+	0	0	0	0	4.77087E-05	0	0	0.000118527	0	6.13957E-09	1.06444E-06	0	0	2.41288E-06	0
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	2.21637	0.173114	0.170593	0.170593	0.0961392	0.0961392	0	0	2.58056	2.58056	4.88767E-05	92.3992	0.173114	0.333810	0.210058
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.648699	0.662265	1.03815	1.03815	0.00765409	0.00765409	0.663391	0.387223	0.523826	0.523826	0.000299178	0.0106970	0.662265	0.685230	0.182725
Carbon Dioxide	0.302110	0.308215	0.284742	0.284742	0.138611	0.138611	0.309119	0.2506479	2.28032	2.28032	0.163661	0.313663	0.308215	0.310877	0.329780
Methane	58.3534	59.5730	57.1102	57.1102	3.24465	3.24465	59.6762	30.7024	54.6503	54.6503	0.711009	3.10059	59.5730	49.4227	26.3028
Ethane	19.9887	20.4063	22.0992	22.0992	19.8024	19.8024	20.4417	22.3561	22.8756	22.8756	25.0657	1.19745	20.4063	24.1314	31.9450
Propane	9.27749	9.47115	10.3819	10.3819	30.4756	30.4756	9.48766	16.3010	11.5004	11.5004	32.6004	0.146704	9.47115	12.6353	21.2912
Isobutane	1.54187	1.57411	1.71417	1.71417	7.71158	7.71158	1.57677	3.66158	0.655411	0.655411	7.81930	0.00104676	1.57411	2.22528	3.79881
n-Butane	3.22138	3.28870	3.43847	3.43847	17.0519	17.0519	3.29435	8.31981	2.72077	2.72077	16.9823	0.00653949	3.28870	4.58141	7.72313
Isopentane	1.26640	1.29287	1.09252	1.09252	6.08379	6.08379	1.29507	3.56216	0.581037	0.581037	5.79007	0.000349962	1.29287	1.54357	2.42793
n-Pentane	0.984337	1.00492	1.09711	1.09711	6.26618	6.26618	1.00663	3.99286	0.567031	0.567031	5.86510	0.000249066	1.00492	1.58680	2.44193
2-Methylpentane	0	0	0.272586	0.272586	1.59845	1.59845	0	1.32563	0.0653446	0.0653446	1.47657	5.47909E-06	0	0.417507	0.594583
3-Methylpentane	0	0	0.159615	0.159615	0.938701	0.938701	0	0.800745	0.101242	0.101242	0.862584	2.05816E-05	0	0.245986	0.347903
n-Hexane	2.19932	2.24533	0.471817	0.471817	2.76864	2.76864	2.24910	2.58984	0.0894034	0.0894034	0.173019	2.90317E-07	2.24533	0.740724	1.01912
Methylcyclopentane	0	0	0.0681007	0.0681007	0.405619	0.405619	0	0.362480	0.123690	0.123690	0.341198	5.40746E-05	0	0.106213	0.149175

Benzene	0	0	0.0192767	0.0192767	0.115070	0.115070	0		0.101642	0.188611	0.188611	0.00592044	0.000253428	0	0.0299311	0.0425133
2-Methylhexane	0	0	0.0945859	0.0945859	0.543865	0.543865	0		0.718969	0.0195073	0.0195073	0.0321720	2.67872E-08	0	0.159078	0.197261
3-Methylhexane	0	0	0.0711143	0.0711143	0.409051	0.409051	0		0.537530	0.0152976	0.0152976	0.363616	3.14841E-07	0	0.119267	0.148435
Heptane	0	0	0.145912	0.145912	0.827885	0.827885	0		1.16293	0.0324559	0.0324559	0.678499	4.90439E-07	0	0.246478	0.301029
Methylcyclohexane	0	0	0.102007	0.102007	0.591645	0.591645	0		0.766595	0.119565	0.119565	0.480832	1.11625E-05	0	0.170401	0.214474
Toluene	0	0	0.0169978	0.0169978	0.0990344	0.0990344	0		0.135069	0.152832	0.152832	0.0109610	9.87765E-05	0	0.0286616	0.0358971
Octane	0	0	0.109898	0.109898	0.601255	0.601255	0		1.28826	0.0139755	0.0139755	0.464345	4.11442E-08	0	0.200372	0.216893
Ethylbenzene	0	0	0.00467150	0.00467150	0.0262052	0.0262052	0		0.0533057	0.0400391	0.0400391	0.00541507	1.45532E-05	0	0.00846168	0.00942700
m-Xylene	0	0	0.00598885	0.00598885	0.0334595	0.0334595	0		0.0737567	0.0505658	0.0505658	0.00890048	2.05181E-05	0	0.0110234	0.0120087
o-Xylene	0	0	0.00548092	0.00548092	0.0306405	0.0306405	0		0.0688590	0.0475514	0.0475514	0.00702566	2.01735E-05	0	0.0101230	0.0109901
Nonane	0	0	0.0244106	0.0244106	0.129776	0.129776	0		0.416607	0.00464637	0.00464637	0.0902804	6.43972E-09	0	0.0479267	0.0461669
C10+	0	0	0.000502413	0.000502413	0.00211103	0.00211103	0		0.0639846	1.00398E-05	1.00398E-05	0.00101052	0	0	0.00146792	0.000744239
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Water	4586.31	350.880	0	0	0.444392	0	0	0	0	0	0.322769	1.05303E-05	0.113453	0	0.112226	0
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	1342.34	1342.33	0	0	0.0353801	0	1342.37	0.146713	0	0.0655184	6.44568E-05	1.31345E-05	0	0.230373	0	0
Carbon Dioxide	625.153	624.715	0	0	0.640713	0	625.504	0.0949784	0	0.285215	0.0352171	0.00385134	0	0.104516	0	0
Methane	120750	120747	0	0	14.9980	0	120755	11.6326	0	6.83549	0.153184	0.00380709	0	16.6158	0	0
Ethane	41362.3	41361.1	0	0	91.5345	0	41363.9	8.47036	0	2.86121	5.40031	0.00147030	0	8.11292	0	0
Propane	19197.8	19196.9	0	0	140.870	0	19198.3	6.17619	0	1.43843	7.02364	0.000180131	0	4.24798	0	0
Isobutane	3190.57	3190.52	0	0	35.6459	0	3190.60	1.38731	0	0.0819767	1.68464	1.28528E-06	0	0.748135	0	0
n-Butane	6665.96	6665.79	0	0	78.8205	0	6666.13	3.15224	0	0.340306	3.65878	8.02957E-06	0	1.54026	0	0
Isopentane	2620.55	2620.49	0	0	28.1216	0	2620.58	1.34965	0	0.0726743	1.24745	4.29704E-07	0	0.518947	0	0
n-Pentane	2036.88	2036.84	0	0	28.9647	0	2036.91	1.51283	0	0.0709224	1.26362	3.05817E-07	0	0.533481	0	0
2-Methylpentane	0	0	0	0	7.38865	0	0	0.502259	0	0.00817309	0.318121	6.72755E-09	0	0.140365	0	0
3-Methylpentane	0	0	0	0	4.33904	0	0	0.303389	0	0.0126631	0.185841	2.52713E-08	0	0.0827001	0	0
n-Hexane	4551.03	4551.01	0	0	12.7977	0	4551.06	0.981247	0	0.0111823	0.0372763	3.56469E-10	0	0.249300	0	0
Methylcyclopentane	0	0	0	0	1.87493	0	0	0.137338	0	0.0154707	0.0735099	6.63960E-08	0	0.0357088	0	0
Benzene	0	0	0	0	0.531896	0	0	0.0385105	0	0.0235908	0.00127554	3.11174E-07	0	0.0106028	0	0
2-Methylhexane	0	0	0	0	2.51395	0	0	0.272406	0	0.00243991	0.00693134	3.28909E-11	0	0.0534818	0	0
3-Methylhexane	0	0	0	0	1.89079	0	0	0.203661	0	0.00191338	0.0783398	3.86581E-10	0	0.0409773	0	0
Heptane	0	0	0	0	3.82680	0	0	0.440615	0	0.00405948	0.146180	6.02190E-10	0	0.0828655	0	0
Methylcyclohexane	0	0	0	0	2.73481	0	0	0.290450	0	0.0149549	0.103594	1.37060E-08	0	0.0572884	0	0
Toluene	0	0	0	0	0.457775	0	0	0.0511755	0	0.0191158	0.00236150	1.21284E-07	0	0.00963598	0	0
Octane	0	0	0	0	2.77923	0	0	0.488102	0	0.00174801	0.100042	5.05193E-11	0	0.0673647	0	0
Ethylbenzene	0	0	0	0	0.121131	0	0	0.0201967	0	0.00500797	0.00116666	1.78693E-08	0	0.00284480	0	0
m-Xylene	0	0	0	0	0.154663	0	0	0.0279452	0	0.00632461	0.00191758	2.51934E-08	0	0.00370605	0	0
o-Xylene	0	0	0	0	0.141632	0	0	0.0260896	0	0.00594758	0.00151365	2.47703E-08	0	0.00340334	0	0
Nonane	0	0	0	0	0.599874	0	0	0.157846	0	0.000581153	0.0194506	7.90707E-12	0	0.0161129	0	0
C10+	0	0	0	0	0.00975799	0	0	0.0242427	0	1.25574E-06	0.000217713	0	0	0.000493513	0	0
Process Streams	Well Stream	HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	1	3	LP Separator Oil
Phase: Vapor	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units															
Temperature	*F	164.5	70.0	70.0	70.0	75.9	75.9	200.0	200.0	75.9	75.94	75.9425	75.9425	70	92.9360	70
Pressure	psig	200	176	176	176	0	0	300	300	0	8.85622	-14.2259	176	176	40	40
Mole Fraction Vapor	%	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Mole Fraction Light Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molecular Weight	lb/lbmol	20.8	20.9	21.2	21.2	44.3	44.3	20.9	28.8	21.2	21.1515	44.1849	18.3920	20.8824	22.6860	28.4666
Mass Density	lb/ft^3	0.7	0.7	0.7	0.7	0.1	0.1	1.0	1.4	0.1	0.0542842	0.186044	0.00150479	0.737260	0.769122	0.281566
Molar Flow	lbmol/h	9941.5	9706.1	0.0	0.0	10.4	0.0	9687.3	1.3	0.0	0.591338	0.487602	0.00667607	0	1.48197	0
Mass Flow	lb/h	206928.8	202687.9	0.0	0.0	462.2	0.0	202350.3	37.9	0.0	12.5077	21.5447	0.122786	0	33.6198	0
Vapor Volumetric Flow	MCFH	300.4	274.9	0.0	0.0	4.0	0.0	210.0	0.0	0.0	0.230411	0.115804	0.0815968	0	0.0437119	0
Liquid Volumetric Flow	Mbb/d	1284.3	1175.2	0.0	0.0	17.2	0.0	897.7	0.1	0.0	0.984911	0.495015	0.348792	0	0.186850	0
Sld Vapor Volumetric Flow	MMSCFD	90.5	88.4	0.0	0.0	0.1	0.0	88.2	0.0	0.0	0.00538569	0.0044090	6.08031E-05	0	0.0134972	0
Sld Liquid Volumetric Flow	Mbb/d	40.8	40.5	0.0	0.0	0.1	0.0	40.5	0.0	0.0	0.00243617	0.00304144	9.27880E-06	0	0.0064033	0
Compressibility		0.969	0.950	0.949	0.949	0.983	0.983	0.964	0.923	0.996	0.996214	0.973139	0.999551	0.950238	0.948471	0.972839
Specific Gravity		0.719	0.721	0.732	0.732	1.529	1.529	0.721	0.996	0.730	0.730304	1.52559	0.635024	0.721013	0.783285	0.982874
API Gravity																
Enthalpy	MMBtu/h	-349.3	-334.8	0.0	0.0	-0.5	0.0	-319.7	0.0	0.0	-0.0221073	-0.0223247	-0.000679181	0	-0.0521481	0
Mass Enthalpy	Btu/lb	-1688.1	-1651.7	-1626.3	-1626.3	-1042.6	-1042.6	-1579.9	-1273.5	-1767.5	-1767.50	-1036.20	-5531.43	-1651.67	-1551.11	-1336.73
Mass Cp	Btu/(lb*°F)	0.5	0.5	0.5	0.5	0.4	0.4	0.6	0.5	0.5	0.471762	0.407946	0.443277	0.502368	0.498433	0.443293
Ideal Gas Cp/Cv Ratio		1.226	1.249	1.247	1.247	1.125	1.125	1.215	1.158	1.250	1.24960	1.12552	1.32218	1.24909	1.22661	1.19114

Dynamic Viscosity	cP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0106606	0.00837446	0.0102449	0.0107125	0.0109102	0.00967007
Kinematic Viscosity	cSt	1.1	0.9	0.9	0.9	4.5	4.5	0.8	0.5	12.3	12.2599	2.81009	425.023	0.907084	0.885554	2.14402	
Thermal Conductivity	Btu/(h*ft ² *F)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0169407	0.0105213	0.0122167	0.0176599	0.0178662	0.0143686	
Surface Tension	lb/ft																
Net I.G. Heating Value	Btu/ft ³	1112.7	1139.6	1150.8	1150.8	2315.4	2315.4	1141.9	1539.1	1103.9	1103.87	2313.79	45.6831	1139.61	1226.41	1521.42	
Net Liquid Heating Value	Btu/lb	20202.3	20646.6	20543.4	20543.4	19681.2	19681.2	20684.2	20142.1	19713.7	19713.7	19714.5	-41.0104	20646.6	20433.9	20164.5	
Gross I.G. Heating Value	Btu/ft ³	1227.9	1256.4	1268.2	1268.2	2516.3	2516.3	1258.8	1684.3	1218.0	1218.02	2514.68	97.9506	1256.41	1349.37	1665.50	
Gross Liquid Heating Value	Btu/lb	22303.2	22769.2	22647.0	22647.0	21402.3	21402.3	22808.7	22051.7	21761.8	21761.8	21439.7	1037.4	22769.2	22490.5	22085.1	

Process Streams	Well Stream	HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	1	3	LP Separator Oil
Phase: Light Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Mole Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water	99.9772	99.9676	99.9673	99.9673	0.0518361	0.00492407	0.00492407	100	0	99.9967	99.9967	3.59019E-06	100.0000	99.9676	0.0924374	0.0260420
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	6.07978E-05	7.84656E-05	0.000124935	0.0116853	1.92958E-05	1.92958E-05	0.0139550	4.63437E-06	4.63437E-06	1.22840E-06	2.63172E-09	7.84656E-05	0.0115533	0.00112177	0.0150855	0.00112177
Carbon Dioxide	0.000466268	0.000922164	0.000864585	0.0018014	0.00259339	0.00259339	0.00259339	0.00259339	0.00259339	0.00461036	2.04378E-05	0.00461036	0.00461036	0.0313853	0.0150855	0.0150855
Methane	0.0181637	0.0243017	0.0236507	4.72021	0.0431426	0.0431426	4.23009	0.00173455	0.00173455	0.0155892	2.74526E-06	0.0243017	4.05838	0.0243017	0.056602	0.056602
Ethane	0.00311529	0.00486665	0.00534566	5.70838	0.866442	0.866442	5.55894	0.000451332	0.000451332	1.78791	6.62923E-07	0.00486665	5.56180	0.00486665	3.44893	3.44893
Propane	0.000668641	0.00166416	0.00184878	6.50120	3.39323	3.39323	6.50120	0.000170921	0.000170921	5.84767	6.14767E-08	0.00166416	6.53362	0.00166416	5.87674	5.87674
Isobutane	3.43299E-05	6.81067E-05	7.51180E-05	2.06702	1.70544	1.70544	2.06964	2.57096E-06	2.57096E-06	2.73608	1.16267E-10	6.81067E-05	2.07773	6.81067E-05	2.07773	2.08603
n-Butane	0.000177570	0.000306606	0.000324659	5.90949	5.41367	5.41367	5.92787	2.35023E-05	2.35023E-05	8.55806	1.60065E-09	0.000306606	5.94755	0.000306606	6.10536	6.10536
Isopentane	2.87761E-05	6.37938E-05	5.45816E-05	3.77100	4.05972	4.05972	3.79490	2.77079E-06	2.77079E-06	6.08833	4.75254E-11	6.37938E-05	3.80311	4.75254E-11	4.03006	4.03006
n-Pentane	2.77296E-05	4.81848E-05	5.32390E-05	5.04715	5.58153	5.58153	5.08262	2.67714E-06	2.67714E-06	8.21789	3.34872E-11	4.81848E-05	5.09179	4.81848E-05	5.42233	5.42233
2-Methylpentane	0	0	5.00135E-06	2.52561	2.93275	2.93275	2.54709	1.22971E-07	1.22971E-07	4.25811	2.94679E-13	0	2.54962	2.94679E-13	2.74011	2.74011
3-Methylpentane	0	0	8.07521E-06	1.64532	1.91718	1.91718	1.65962	5.16923E-07	5.16923E-07	2.76678	3.00340E-12	0	1.66103	1.66103	1.78626	1.78626
n-Hexane	1.98715E-05	3.20532E-05	6.80832E-06	6.01806	7.05521	7.05521	6.07066	1.33782E-07	1.33782E-07	0.691949	1.24302E-14	3.20532E-05	6.07066	3.20532E-05	6.54128	6.54128
Methylcyclopentane	0	0	1.13963E-05	0.924079	1.08396	1.08396	0.932490	1.94139E-06	1.94139E-06	1.42345	2.42273E-11	0	0.932490	0.932490	1.00453	1.00453
Benzene	0	0	0.000174542	0.280362	0.328804	0.328804	0.285606	0.000159056	0.000159056	0.0259286	6.08934E-09	0	0.282865	0.282865	0.304755	0.304755
2-Methylhexane	0	0	1.27918E-06	2.38566	2.83715	2.83715	2.40812	2.66991E-08	2.66991E-08	0.257796	1.05314E-15	0	2.40914	2.40914	2.60020	2.60020
3-Methylhexane	0	0	1.00408E-06	1.87952	2.23629	2.23629	1.89731	2.18848E-08	2.18848E-08	3.05232	1.29353E-14	0	1.89803	1.89803	2.04873	2.04873
Heptane	0	0	2.13055E-06	4.79334	5.71499	5.71499	4.83932	4.66902E-08	4.66902E-08	7.16399	2.02875E-14	0	4.84071	4.84071	5.22690	5.22690
Methylcyclohexane	0	0	8.89644E-06	3.40284	4.05626	4.05626	3.43573	1.06431E-06	1.06431E-06	5.09135	2.84896E-12	0	3.43644	3.43644	3.71049	3.71049
Toluene	0	0	0.000100946	0.742642	0.886567	0.886567	0.751450	9.03018E-05	9.03018E-05	0.150643	1.67121E-09	0	0.749726	0.749726	0.810014	0.810014
Octane	0	0	7.98761E-07	9.69179	11.6182	11.6182	9.78842	1.16360E-08	1.16360E-08	13.6844	9.89707E-16	0	9.78841	9.78841	10.5794	10.5794
Ethylbenzene	0	0	2.09911E-05	0.509821	0.611324	0.611324	0.515261	1.85704E-05	1.85704E-05	0.193446	1.94308E-10	0	0.514867	0.514867	0.556540	0.556540
m-Xylene	0	0	2.73365E-05	0.776800	0.931792	0.931792	0.785037	2.42796E-05	2.42796E-05	0.379201	2.83797E-10	0	0.784476	0.784476	0.848042	0.848042
o-Xylene	0	0	3.37394E-05	0.792705	0.951052	0.951052	0.801221	3.08672E-05	3.08672E-05	0.333544	3.77152E-10	0	0.800510	0.800510	0.865437	0.865437
Nonane	0	0	2.38550E-07	5.65864	6.79474	6.79474	5.71607	5.47833E-09	5.47833E-09	7.26948	2.20559E-16	0	5.71522	5.71522	6.17882	6.17882
C10+	0	0	3.16807E-10	24.1090	28.9730	28.9730	24.3578	1.00595E-12	1.00595E-12	20.0015	0	0	24.3505	24.3505	26.3293	26.3293
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	1708.45	0	1943.49	0.0647475	0	0.00511800	1963.03	0	1943.47	0	0	0	1943.55	0.114317	0.0297855	0.0297855
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	0.00103894	0	0.00242890	0.0208413	0	2.00557E-05	0.0172528	9.00705E-05	0	0	0	0.00152551	0.0142879	0.00128303	0.00128303	0.00128303
Carbon Dioxide	0.00796777	0	0.0168086	0.0397226	0	0.00269553	0.0365747	0.01032278	0	0	0	0.0179285	0.0388140	0.0172540	0.0172540	0.0172540
Methane	0.310389	0	0.459799	5.89593	0	0.0448418	5.22974	0.0337116	0	0	0	0.472468	5.01898	0.472468	0.979738	0.979738
Ethane	0.0532354	0	0.103926	7.13024	0	0.900568	6.87263	0.00877178	0	0	0	0.0946164	6.87824	0.0946164	3.94471	3.94471
Propane	0.0114260	0	0.0359426	8.16930	0	3.52687	8.03756	0.00332190	0	0	0	0.0323544	8.08009	0.0323544	6.72152	6.72152
Isobutane	0.000586642	0	0.00146039	2.58188	0	1.77261	2.55874	4.99675E-05	0	0	0	0.00132412	2.56952	0.00132412	2.38590	2.38590
n-Butane	0.00303439	0	0.00631178	7.38144	0	5.62689	7.32874	0.000456776	0	0	0	0.00596097	7.35530	0.00596097	6.98301	6.98301
Isopentane	0.000491737	0	0.00106113	4.71029	0	4.21961	4.69171	5.38512E-05	0	0	0	0.00124027	4.70329	0.00124027	4.60938	4.60938
n-Pentane	0.000473854	0	0.00103503	6.30430	0	5.80136	6.28374	5.20310E-05	0	0	0	0.000936799	6.29699	0.000936799	6.20282	6.20282
2-Methylpentane	0	0	9.72325E-05	3.15469	0	3.04826	3.14902	2.38998E-06	0	0	0	0	3.15309	3.15309	3.13400	3.13400
3-Methylpentane	0	0	0.000156992	2.05514	0	1.99269	2.05182	1.00466E-05	0	0	0	0	2.05418	2.05418	2.04304	2.04304
n-Hexane	0.000339572	0	0.000132362	7.51705	0	7.33308	7.50528	2.60011E-06	0	0	0	0.000623172	7.51423	0.000623172	7.48159	7.48159
Methylcyclopentane	0	0	0.000221558	1.15425	0	1.12666	1.15286	3.77316E-05	0	0	0	0	1.15384	1.15384	1.14894	1.14894
Benzene	0.00339331	0	0.350195	0.341754	0	0.341754	0.353100	0.00309130	0	0	0	0	0.349817	0.349817	0.348563	0.348563
2-Methylhexane	0	0	2.48688E-05	2.97989	0	2.94889	2.97721	5.18905E-07	0	0	0	2.97937	2.97937	2.97937	2.97937	2.97937
3-Methylhexane	0	0	1.95206E-05	2.34768	0	2.32436	2.34568	4.25338E-07	0	0	0	2.34729	2.34729	2.34729	2.34323	2.34323
Heptane	0	0	4.14204E-05	5.98727	0	5.94008	5.98295	9.07439E-07	0	0	0	5.98648	5.98648	5.98648	5.98227	5.98227
Methylcyclohexane	0	0	0.000172997	4.25042	0	4.21602	4.24766	2.06852E-05	0	0	0	4.24982	4.24982	4.24982	4.24387	4.24387
Toluene	0	0	0.00196251	0.927622	0	0.921485	0.929032	0.00175505	0	0	0	0	0.927182	0.927182	0.926453	0.926453
Octane	0	0	1.55289E-05	12.1058	0	12.1058	12.1016	2.26149E-07	0	0	0	12.1053	12.1053	12.1053	12.1002	12.1002
Ethylbenzene	0	0	0.000408094	0.636809	0	0.635401	0.637027	0.000360922	0	0	0	0.636733	0.636733	0.636733	0.636542	0.636542
m-Xylene	0	0	0.000531455	0.970287	0	0.968491	0.970556	0.000471881	0	0	0	0.970156	0.970156	0.970156	0.969948	0.969948

o-Xylene	0	0	0.000655936	0.990154	0	0.988509	0	0.990565	0.000599914	0	0	0	0	0.989987	0.989843	
Nonane	0	0	4.63770E-06	7.06811	0	7.06235	0	7.06689	1.06473E-07	0	0	0	0	7.06798	7.06703	
C10+	0	0	6.15912E-09	30.1141	0	30.1141	0	30.1140	1.95510E-11	0	0	0	0	30.1141	30.1141	
Mass Fraction	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Water	99.9748	99.9620	99.9595	0.00855872	0.000716599	0.000716599	100	0	99.9943	99.9943	5.86200E-07	99.9999	99.9620	0.0151434	0.00402580	
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nitrogen	9.45371E-05	0.000122005	0.000194257	0.00428386	4.36656E-06	4.36656E-06	0	0.00355569	7.20617E-06	7.20617E-06	3.11885E-07	4.09227E-09	0.000122005	0.00294312	0.000269655	
Carbon Dioxide	0.00113902	0.00225263	0.00211193	0.0128271	0.000921987	0.000921987	0	0.0118420	0.00129811	0.00129811	0.00183895	4.99275E-05	0.00225263	0.0125605	0.00566997	
Methane	0.0161743	0.0216392	0.0210591	0.694014	0.00559099	0.00559099	0	0.617235	0.00154457	0.00154457	0.00226664	2.44463E-06	0.0216392	0.592051	0.117920	
Ethane	0.00519956	0.00812239	0.00892168	1.57314	0.210460	0.210460	0	1.52034	0.000753293	0.000753293	0.487251	1.10647E-06	0.00812239	1.52079	0.889899	
Propane	0.00163658	0.00407311	0.00452487	2.64317	1.20870	1.20870	0	2.60747	0.000418348	0.000418348	2.33704	1.50475E-07	0.00407311	2.61990	2.22367	
Isobutane	0.000110755	0.000219718	0.000242332	1.10109	0.800736	0.800736	0	1.09412	8.29442E-06	8.29442E-06	1.44132	3.75108E-10	0.000219718	1.09816	1.04040	
n-Butane	0.000572876	0.000989137	0.00104736	3.14795	2.54182	2.54182	0	3.13379	7.58231E-05	7.58231E-05	4.50822	5.16414E-09	0.000989137	3.14352	3.04503	
Isopentane	0.000115242	0.000255471	0.000218575	2.49357	2.36612	2.36612	0	2.49034	1.10964E-05	1.10964E-05	3.98121	1.90333E-10	0.000255471	2.49519	2.49504	
n-Pentane	0.000111050	0.000192963	0.000213199	3.33742	3.25307	3.25307	0	3.33538	1.07213E-05	1.07213E-05	5.37374	1.34112E-10	0.000192963	3.34068	3.35756	
2-Methylpentane	0	0	2.39219E-05	1.99473	2.04160	2.04160	0	1.99645	5.88213E-07	5.88213E-07	3.32573	1.40959E-12	0	1.99799	2.02623	
3-Methylpentane	0	0	3.86244E-05	1.29948	1.33462	1.33462	0	1.30083	2.47262E-06	2.47262E-06	2.16095	1.43667E-11	0	1.30165	1.32089	
n-Hexane	9.50521E-05	0.000153317	3.25648E-05	4.75308	4.91139	4.91139	0	4.75827	6.39927E-07	6.39927E-07	0.504037	5.94593E-14	0.000153317	4.76146	4.83708	
Methylcyclopentane	0	0	5.32343E-05	0.712767	0.736936	0.736936	0	0.713801	9.06912E-06	9.06912E-06	1.08576	1.13179E-10	0	0.714037	0.725446	
Benzene	0	0	0.000756732	0.200711	0.207474	0.207474	0	0.202915	0.000689627	0.000689627	0.0183562	2.64026E-08	0	0.200924	0.204270	
2-Methylhexane	0	0	7.11430E-06	2.19089	2.29652	2.29652	0	2.19475	1.48498E-07	1.48498E-07	0.234120	5.85763E-15	0	2.19520	2.23574	
3-Methylhexane	0	0	5.58431E-06	1.72607	1.81015	1.81015	0	1.72919	1.21721E-07	1.21721E-07	2.77200	7.19468E-14	0	1.72948	1.76156	
Heptane	0	0	1.18493E-05	4.40200	4.62597	4.62597	0	4.41052	2.59687E-07	2.59687E-07	6.50607	1.12840E-13	0	4.41083	4.49425	
Methylcyclohexane	0	0	4.84941E-05	3.06215	3.21727	3.21727	0	3.06830	5.80051E-06	5.80051E-06	4.53075	1.55273E-11	0	3.06827	3.12621	
Toluene	0	0	0.000516244	0.627128	0.659878	0.659878	0	0.629753	0.000461834	0.000461834	0.125799	8.54733E-09	0	0.628172	0.640428	
Octane	0	0	5.06427E-06	10.1465	10.1208	10.1208	0	10.1699	3.77778E-08	3.77778E-08	14.1673	6.27538E-15	0	10.1677	10.3698	
Ethylbenzene	0	0	0.000123692	0.496061	0.524281	0.524281	0	0.497552	0.000109434	0.000109434	0.186135	1.14506E-09	0	0.497064	0.507008	
m-Xylene	0	0	0.000161083	0.755834	0.799119	0.799119	0	0.758055	0.000143077	0.000143077	0.364870	1.67243E-09	0	0.757349	0.772567	
o-Xylene	0	0	0.000198813	0.771309	0.815637	0.815637	0	0.773683	0.000181898	0.000181898	0.320939	2.22258E-09	0	0.772829	0.788414	
Nonane	0	0	1.69816E-06	6.65154	7.03977	7.03977	0	6.66809	3.90005E-08	3.90005E-08	8.45018	1.57021E-15	0	6.66566	6.80014	
C10+	0	0	3.59653E-09	45.1938	47.8705	47.8705	0	45.3139	1.14206E-11	1.14206E-11	37.0777	0	0	45.2905	46.2104	
Mass Flow	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	
Water	30778.2	0	35012.5	1.16644	0	0.0922023	35364.5	0	35012.1	0	0	0	35013.6	2.05945	0.536595	
H2S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nitrogen	0.0291042	0	0.0680416	0.583836	0	0.000561829	0	0.483310	0.00252318	0	0	0.0427348	0.400253	0.0359420	0	
Carbon Dioxide	0.350658	0	0.739739	1.74817	0	0.118629	0	1.60963	0.454523	0	0	0.789026	1.70818	0.759342	0	
Methane	4.97940	0	7.37631	94.5852	0	0.719373	0	83.8980	0.540817	0	0	7.57955	80.5167	15.7174	0	
Ethane	1.60074	0	3.12497	214.399	0	27.0792	0	206.653	0.263759	0	0	2.84503	206.822	118.614	0	
Propane	0.503837	0	1.58491	360.230	0	155.520	0	354.421	0.146481	0	0	1.42669	356.297	296.390	0	
Isobutane	0.0340969	0	0.0848809	150.064	0	103.028	0	148.719	0.00290422	0	0	0.0769606	149.346	138.674	0	
n-Butane	0.176365	0	0.366855	429.025	0	327.047	0	425.963	0.0265488	0	0	0.346465	427.506	405.868	0	
Isopentane	0.0354782	0	0.0765596	339.841	0	304.440	0	338.501	0.00388530	0	0	0.0894837	339.336	332.561	0	
n-Pentane	0.0341880	0	0.0746764	454.848	0	418.561	0	453.364	0.00375397	0	0	0.0675889	454.320	447.526	0	
2-Methylpentane	0	0	0.00837905	271.857	0	262.685	0	271.368	0.000205958	0	0	271.719	270.074	270.074	0	
3-Methylpentane	0	0	0.0135289	177.103	0	171.721	0	176.816	0.000865766	0	0	0	177.020	176.060	0	
n-Hexane	0.0292627	0	0.0114064	647.784	0	631.931	0	646.770	0.000224065	0	0	0.0537021	647.541	644.729	0	
Methylcyclopentane	0	0	0.0186462	97.1411	0	94.8189	0	97.0238	0.00317547	0	0	97.1064	96.6938	96.6938	0	
Benzene	0	0	0.265058	27.3544	0	26.6950	0	27.5813	0.241467	0	0	0	27.3249	27.2269	0	
2-Methylhexane	0	0	0.00249190	298.590	0	295.485	0	298.322	5.19953E-05	0	0	298.538	297.999	297.999	0	
3-Methylhexane	0	0	0.00195600	235.242	0	232.906	0	235.041	4.26197E-05	0	0	235.203	234.797	234.797	0	
Heptane	0	0	0.00415041	599.937	0	595.207	0	599.503	9.09272E-05	0	0	599.857	599.034	599.034	0	
Methylcyclohexane	0	0	0.0169859	417.332	0	413.954	0	417.061	0.00203100	0	0	417.274	416.689	416.689	0	
Toluene	0	0	0.180823	85.4696	0	84.9042	0	85.5996	0.161707	0	0	85.4291	85.3620	85.3620	0	
Octane	0	0	0.00177384	1382.83	0	1379.40	0	1382.35	2.58327E-05	0	0	1382.77	1382.18	1382.18	0	
Ethylbenzene	0	0	0.0433253	67.6068	0	67.4574	0	67.6300	0.0383173	0	0	67.5988	67.5785	67.5785	0	
m-Xylene	0	0	0.0564219	103.011	0	102.820	0	103.039	0.0500973	0	0	102.997	102.975	102.975	0	
o-Xylene	0	0	0.0696375	105.120	0	104.945	0	105.163	0.0636899	0	0	105.102	105.087	105.087	0	
Nonane	0	0	0.000594809	906.521	0	905.783	0	906.364	1.36557E-05	0	0	906.505	906.382	906.382	0	
C10+	0	0	1.25974E-06	6159.34	0	6159.32	0	6159.31	3.99882E-09	0	0	6159.34	6159.33	6159.33	0	
Process Streams	Well Stream	HP Separator Gas	HP Separator Water	HP Separator Oil	OT Flash Gas	Sales Oil	Gas	Water	Oil	Produced Water	PWT Flash Gas	Oil W/B	Water W/B	1	3	LP Separator Oil
Phase: Light Liquid	Status	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Property	Units															
Temperature	°F	164.5	70.0	70.0	70.0	75.9	75.9	200.0	200.0	75.9	75.94	75.9425	75.9425	70	92.9360	70

[illegible]

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

For: Antero Resources Appalachian Corp.
 1625 17th Street
 Denver, Colorado 80202

Sample: Prunty No. 1H (Lockhart Heirs Pad)
 Separator Hydrocarbon Liquid
 Sampled @ 200 psig & 66 oF

Date Sampled: 09/05/13

Job Number: 35453.002

CHROMATOGRAPH EXTENDED ANALYSIS- GPA 2186-M

COMPONENT	MOL%	LIQ VOL%	WT%
Nitrogen	0.018	0.004	0.005
Carbon Dioxide	0.031	0.011	0.013
Methane	4.766	1.667	0.703
Ethane	5.726	3.161	1.584
Propane	6.545	3.722	2.654
Isobutane	2.067	1.396	1.105
n-Butane	5.909	3.845	3.159
2,2 Dimethylpropane	0.174	0.138	0.116
Isopentane	3.770	2.846	2.502
n-Pentane	4.872	3.645	3.233
2,2 Dimethylbutane	0.188	0.162	0.149
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.408	0.345	0.323
2 Methylpentane	2.525	2.163	2.001
3 Methylpentane	1.645	1.386	1.304
n-Hexane	4.430	3.760	3.511
Heptanes Plus	56.925	71.749	77.639
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity-----	0.7695	(Water=1)
oAPI Gravity -----	52.38	@ 60°F
Molecular Weight -----	148.3	
Vapor Volume -----	16.47	CF/Gal
Weight -----	6.41	Lbs/Gal

Characteristics of Total Sample:

Specific Gravity -----	0.7111	(Water=1)
oAPI Gravity -----	67.48	@ 60°F
Molecular Weight-----	108.7	
Vapor Volume -----	20.76	CF/Gal
Weight -----	5.93	Lbs/Gal

Base Conditions: 14.850 PSI & 60 oF

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
 Processor: JCdjv
 Cylinder ID: W-1106

 David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT

COMPONENT	Mol%	LiqVol%	Wt%
Carbon Dioxide	0.031	0.011	0.013
Nitrogen	0.018	0.004	0.005
Methane	4.766	1.667	0.703
Ethane	5.726	3.161	1.584
Propane	6.545	3.722	2.654
Isobutane	2.067	1.396	1.105
n-Butane	6.083	3.983	3.274
Isopentane	3.770	2.846	2.502
n-Pentane	4.872	3.645	3.233
Other C-6's	4.766	4.057	3.778
Heptanes	10.970	9.986	9.818
Octanes	13.091	12.723	13.001
Nonanes	5.657	6.431	6.603
Decanes Plus	24.100	40.280	45.352
Benzene	0.283	0.163	0.203
Toluene	0.744	0.514	0.630
E-Benzene	0.510	0.406	0.498
Xylenes	1.570	1.245	1.533
n-Hexane	4.430	3.760	3.511
2,2,4 Trimethylpentane	0.000	0.000	0.000
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity -----	0.7111 (Water-1)
API Gravity -----	67.48 @ 60°F
Molecular Weight-----	108.7
Vapor Volume -----	20.76 CF/Gal
Weight -----	5.93 Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity -----	0.8007 (Water-1)
Molecular Weight-----	204.6

Characteristics of Atmospheric Sample:

API Gravity -----	59.13 @ 60°F
Reid Vapor Pressure (ASTM D-5191)-----	3.41 psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	-----	W-1106*	W-1020
Pressure, PSIG	200	176	173
Temperature, °F	66	70	70

* Sample used for analysis

TOTAL EXTENDED REPORT

COMPONENT	Mol%	LiqVol%	Wt%
Nitrogen	0.018	0.004	0.005
Carbon Dioxide	0.031	0.011	0.013
Methane	4.766	1.667	0.703
Ethane	5.726	3.161	1.584
Propane	6.545	3.722	2.654
Isobutane	2.067	1.396	1.105
n-Butane	5.909	3.845	3.159
2,2 Dimethylpropane	0.174	0.138	0.116
Isopentane	3.770	2.846	2.502
n-Pentane	4.872	3.645	3.233
2,2 Dimethylbutane	0.188	0.162	0.149
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.408	0.345	0.323
2 Methylpentane	2.525	2.163	2.001
3 Methylpentane	1.645	1.386	1.304
n-Hexane	4.430	3.760	3.511
Methylcyclopentane	0.924	0.675	0.715
Benzene	0.283	0.163	0.203
Cyclohexane	0.990	0.695	0.766
2-Methylhexane	2.385	2.288	2.198
3-Methylhexane	1.879	1.780	1.732
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	0.950	0.888	0.867
n-Heptane	3.842	3.658	3.540
Methylcyclohexane	3.402	2.823	3.072
Toluene	0.744	0.514	0.630
Other C-8's	6.777	6.822	6.870
n-Octane	2.912	3.079	3.059
E-Benzene	0.510	0.406	0.498
M & P Xylenes	0.777	0.622	0.758
O-Xylene	0.793	0.623	0.775
Other C-9's	3.760	4.227	4.366
n-Nonane	1.897	2.203	2.238
Other C-10's	3.702	4.574	4.810
n-decane	1.350	1.710	1.766
Undecanes(11)	3.614	4.581	4.885
Dodecanes(12)	2.655	3.636	3.932
Tridecanes(13)	2.209	3.243	3.555
Tetradecanes(14)	1.728	2.718	3.020
Pentadecanes(15)	1.331	2.242	2.521
Hexadecanes(16)	1.068	1.923	2.181
Heptadecanes(17)	0.926	1.763	2.018
Octadecanes(18)	0.821	1.647	1.896
Nonadecanes(19)	0.691	1.442	1.670
Eicosanes(20)	0.601	1.304	1.519
Heneicosanes(21)	0.459	1.048	1.228
Docosanes(22)	0.372	0.884	1.042
Tricosanes(23)	0.349	0.862	1.021
Tetracosanes(24)	0.313	0.800	0.952
Pentacosanes(25)	0.261	0.693	0.829
Hexacosanes(26)	0.243	0.668	0.803
Heptacosanes(27)	0.193	0.550	0.664
Octacosanes(28)	0.192	0.565	0.684
Nonacosanes(29)	0.157	0.479	0.582
Triacotanes(30)	0.150	0.470	0.574
Hentriacotanes Plus(31+)	0.717	2.481	3.199
Total	100.000	100.000	100.000



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

For: Antero Resources Appalachian Corp.
1625 17th Street
Denver, Colorado 80202

Date Sampled: 09/05/13

Date Analyzed: 09/13/13

Job Number: J35434

Sample: Prunty No. 1H (Lockhart Heirs Pad)

FLASH LIBERATION OF SEPARATOR WATER		
	Separator	Stock Tank
Pressure, psig	200	0
Temperature, °F	66	70
Gas Water Ratio (1)	-----	1.55
Gas Specific Gravity (2)	-----	0.922

(1) - Scf of water saturated vapor per barrel of stock tank water

(2)- Air= 1.000

(3) - Separator volume / Stock tank volume

Analyst: O. A.

Piston No. : WF-133*

Base Conditions: 14.85 PSI & 60 °F

Certified: FESCO, Ltd.

Alice, Texas

David Dannhaus 361-661-7015

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

For: Antero Resources Appalachian Corp.
1625 17th Street
Denver, Colorado 80202

Sample: Prunty No. 1H (Lockhart Heirs Pad)
Gas Liberated from Separator Water
From 200 psig & 66 oF to 0 psig & 70 oF

Date Sampled: 09/05/13

Job Number: 35453.001

CHROMATOGRAPH EXTENDED ANALYSIS SUMMARY REPORT

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.000	
Carbon Dioxide	1.891	
Methane	63.614	
Ethane	17.120	4.615
Propane	7.633	2.119
Isobutane	1.356	0.447
n-Butane	3.304	1.050
2-2 Dimethylpropane	0.064	0.025
Isopentane	1.192	0.439
n-Pentane	1.225	0.448
Hexanes	1.136	0.472
Heptanes Plus	1.465	0.652
Totals	100.000	10.266

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity ----- 3.602 (Air=1)
Molecular Weight----- 103.68
Gross Heating Value ----- 5501 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity ----- 0.922 (Air=1)
Compressibility (Z) ----- 0.9937
Molecular Weight----- 26.54
Gross Heating Value
Dry Basis ----- 1548 BTU/CF
Saturated Basis----- 1522 BTU/CF

*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)

Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol%

Base Conditions: 14.850 PSI & 60 Deg F

Certified: FESCO, Ltd. Alice, Texas

Analyst: MR
Processor: ANB
Cylinder ID: WF# 13 S

David Dannhaus 361-661-7015

**CHROMATOGRAPH EXTENDED ANALYSIS
TOTAL REPORT**

COMPONENT	MOL%	GPM	WT%
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.000		0.000
Carbon Dioxide	1.891		3.135
Methane	63.614		38.445
Ethane	17.120	4.615	19.393
Propane	7.633	2.119	12.680
Isobutane	1.356	0.447	2.969
n-Butane	3.304	1.050	7.234
2,2 Dimethylpropane	0.064	0.025	0.174
Isopentane	1.192	0.439	3.240
n-Pentane	1.225	0.448	3.330
2,2 Dimethylbutane	0.035	0.015	0.114
Cyclopentane	0.019	0.008	0.050
2,3 Dimethylbutane	0.060	0.025	0.195
2 Methylpentane	0.334	0.140	1.084
3 Methylpentane	0.207	0.085	0.672
n-Hexane	0.481	0.199	1.562
Methylcyclopentane	0.071	0.025	0.225
Benzene	0.042	0.012	0.124
Cyclohexane	0.089	0.031	0.282
2-Methylhexane	0.113	0.053	0.427
3-Methylhexane	0.108	0.050	0.408
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.121	0.053	0.452
n-Heptane	0.183	0.085	0.691
Methylcyclohexane	0.161	0.065	0.596
Toluene	0.057	0.019	0.198
Other C8's	0.217	0.102	0.901
n-Octane	0.070	0.036	0.301
Ethylbenzene	0.003	0.001	0.012
M & P Xylenes	0.031	0.012	0.124
O-Xylene	0.005	0.002	0.020
Other C9's	0.099	0.051	0.471
n-Nonane	0.033	0.019	0.159
Other C10's	0.044	0.026	0.234
n-Decane	0.010	0.006	0.054
Undecanes (11)	0.008	0.005	0.044
Totals	100.000	10.266	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity-----	0.922	(Air-1)
Compressibility (Z) -----	0.9937	
Molecular Weight-----	26.54	
Gross Heating Value		
Dry Basis -----	1548	BTU/CF
Saturated Basis -----	1522	BTU/CF

Antero Resources
Prunty Unit 1H - Lockhart Heirs Pad

Tag Name	Value	Units	Timestamp
Accumulated Gas Flow	560999.8	MCF	10/16/2013 16:11:13
Casing Pressure	450.96	PSIA	10/16/2013 17:05:05
Current Day Gas Flow	2287.78	MCF	10/16/2013 16:11:13
Differential Pressure	57.03	inH2O	10/16/2013 16:11:13
Flow Rate	7454.35	MCF Per Day	10/16/2013 16:11:13
Pressure	108.81	PSIA	10/16/2013 16:11:13
Previous Day Energy	9462.83	MBTU	10/16/2013 16:11:15
Previous Day Gas Flow	7588.11	MCF	10/16/2013 16:11:15
Temperature	60.11	F	10/16/2013 16:11:13
Tubing Pressure	748.58	PSIA	10/16/2013 17:05:05
Daily AP	63.93	PSIA	10/16/2013 09:00:00
Daily DP	111.06	inH2O	10/16/2013 09:00:00
Daily Energy	9462.83	MBTU	10/16/2013 09:00:00
Daily Flow	7588.11	MCF	10/16/2013 09:00:00
Daily Tf	59.56	F	10/16/2013 09:00:00
Hourly AP	110.1	PSIA	10/16/2013 10:00:00
Hourly DP	61.64	Inches	10/16/2013 10:00:00
Hourly Energy	399.7	MBTU	10/16/2013 10:00:00
Hourly Flow Time	3600	Seconds	10/16/2013 10:00:00
Hourly Tf	61.1	F	10/16/2013 10:00:00
Hourly Volume	320.5	MCF	10/16/2013 10:00:00
Argon	0	%	10/16/2013 16:11:25
BTU	1247.06	BTU	10/16/2013 16:11:13
CO2	0.1467	%	10/16/2013 16:11:25
Carbon Monoxide	0	%	10/16/2013 16:11:25
Decane	0	%	10/16/2013 16:11:25
Ethane	14.1987	%	10/16/2013 16:11:25
Helium	0	%	10/16/2013 16:11:25
Heptane	0	%	10/16/2013 16:11:25
Hexane	0.5451	%	10/16/2013 16:11:25
Hydrogen	0	%	10/16/2013 16:11:25
Hydrogen Sulfide	0	%	10/16/2013 16:11:25
Iso-Butane	0.5666	%	10/16/2013 16:11:25
Iso-Pentane	0.3749	%	10/16/2013 16:11:25
Methane	77.6927	%	10/16/2013 16:11:25
N2	0.4946	%	10/16/2013 16:11:25
N-Butane	1.1838	%	10/16/2013 16:11:25
Nonane	0	%	10/16/2013 16:11:25
N-Pentane	0.2914	%	10/16/2013 16:11:25
Octane	0	%	10/16/2013 16:11:25
Oxygen	0.0117	%	10/16/2013 16:11:25
Plate Size	3.75	Inches	10/16/2013 16:11:20
Propane	4.4938	%	10/16/2013 16:11:25
SPG	0.7248		10/16/2013 16:11:13
Water	0	%	10/16/2013 16:11:25

Attachment J

Class I Legal Advertisement

Attachment J

**Air Quality Permit Notice
Notice of Application
Lockhart Heirs West
Antero Resources Corporation
Ritchie, West Virginia**

Notice is given that Antero Resources Corporation has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-A General Permit Registration Application for an Oil and Natural Gas facility located at 1132 Oxford Rd. Pullman, WV 26421 in Ritchie, West Virginia.

The latitude and longitude coordinates are: 39.189861 degrees N and -80.927987 degrees W

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

Pollutants	TOTALS (tpy):
VOC	56.1980
NO _x	13.1735
CO _{2e}	18792.1000
CO	34.6268
SO ₂	0.0598
PM _{2.5}	0.8693
PM ₁₀	1.8735
Lead	5.90E-05
Total HAPs	2.8199
Benzene	0.0742
Formaldehyde	0.0289
Xylenes	0.2019

Startup of operation is planned to begin on June 2016. 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 this the __ day of _____, 2015

By: Antero Resources Corporation
Barry Schatz
Senior Environmental & Regulatory Manager
1615 Wynkoop Street
Denver, CO 80202

Attachment K

Electronic Submittal

Attachment K

**Electronic Submittal
Lockhart Heirs West Well Pad
Antero Resources Corporation
Ritchie County, West Virginia**

No electronic submission was made.

Attachment L

General Permit Modification Application Fee

GHD SERVICES INC.

▼ PLEASE DETACH AND RETAIN FOR YOUR RECORDS ▼

INVOICE NUMBER	DATE	VOUCHER NO	AMOUNT
Account Number: CR100215	10/2/2015	40WVDEPAQ 400973271	428600 1,500.00

TOTAL: 1,500.00

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GHD SERVICES INC.

2055 NIAGARA FALLS BLVD, SUITE 3
NIAGARA FALLS, NY 14304

M&T BANK

MANUFACTURERS AND TRADERS TRUST COMPANY
Commercial Banking
Main Office, Ithaca, NY 14850
50-7093-2213

10/2/2015

NO. 428600

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CENTS

\$*****1,500.00

TO THE
ORDER
OF

WV Dept. of Environmental Protectio
Division Air Quality
601 57th Street SE
Charleston, WV 25304 US

GHD SERVICES INC.

AUTHORIZED SIGNATURES

WARNING: THIS DOCUMENT IS VOID IF ACCOUNT NUMBER DOES NOT APPEAR ON THE REVERSE SIDE IN RED

⑈ 4 28600 ⑈ ⑆ 2 2 1 3 706 3 2 ⑆ 6 1000000 1 189 10 ⑈

Attachment M

Siting Criteria Waiver

Attachment M

Siting Waiver

**Lockhart Heirs West Well Pad
Antero Resources Corporation
Ritchie County, West Virginia**

A Siting Waiver form is not required because there are no occupied dwelling structures within 300 feet of Lockhart Heirs West Well Pad.

Attachment N

Material Safety Data Sheets

Attachment N

Description of Material Safety Data Sheets (MSDS)

Lockhart Heirs West Well Pad

Antero Resources Corporation

Ritchie County, West Virginia

Three generic Material Safety Data Sheets (MSDS), and analysis of the condensate and produced water of a similar well with the same formation are provided. Antero Resources Corporation has developed its own MSDS for these materials.

1. Natural Gas: The MSDS for natural gas reflects pipeline quality odorized gas. This is essentially the same as the material delivered to the metering and downstream gathering lines from the Antero well pad.
2. Condensate: Condensate is the hydrocarbon liquid that has been separated from raw natural gas through the well pad gas production unit. The liquid is often characterized as having a gasoline-like odor and consistency.
3. Produced Water: Produced water is primarily groundwater with residual trace hydrocarbons that has been withdrawn from the ground during the gas extraction process and then separated from the natural gas and condensate in the gas production units.



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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

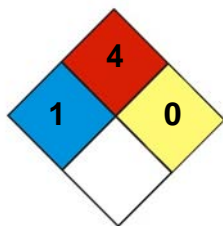
First Aid: Ingestion

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

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

***** 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)

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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)

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

Evaporation Rate:	ND	VOC:	ND
Octanol / H₂O Coeff.:	ND	Flash Point:	Flammable Gas
Flash Point Method:	N/A		
Lower Flammability Limit:	3.8 – 6.5	Upper Flammability Limit:	13-17
(LFL):		(UFL):	
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

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

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 1 minute

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.

SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

*** 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.

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

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:



SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

*** 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

X

Sudden Release of Pressure

X

Reactive

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

SAFETY DATA SHEET

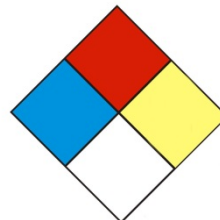
Material Name: Dry Field Natural Gas

US GHS

*** 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

EMERGENCY PHONE: (800) 878-1373

PRODUCT CODES: 64741-47-5

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

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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.

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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.

SAFETY DATA SHEET

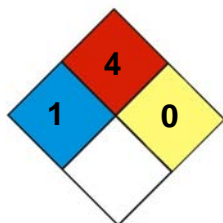
Material Name: Natural Gas Condensate

US GHS

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 (CO₂), 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

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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."

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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)

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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).

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

*** 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.

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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)

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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.

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

*** 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

<u>Acute Health</u>	<u>Chronic Health</u>	<u>Fire</u>	<u>Sudden Release of Pressure</u>	<u>Reactive</u>
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:

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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.

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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

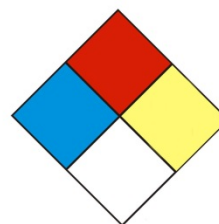
Ingredient Disclosure List:

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

SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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

EMERGENCY PHONE: (800) 878-1373

PRODUCT CODES: Mixture

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.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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.

SAFETY DATA SHEET

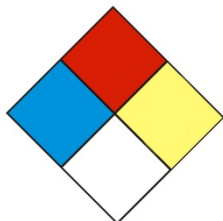
Material Name: Produced Water

US GHS

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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

* * * 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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** * * 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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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	Upper Flammability Limit:	ND
Lower Flammability Limit:	ND	(UFL):	
(LFL):		Burning Rate:	ND
Auto Ignition:	ND		

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

***** 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.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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.

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

*** 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

SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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 Sheet

Attachment O: G70-A Emissions Summary Sheet
Emission Points Data Summary Sheet

Table 1: Emissions Data												
Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type1	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CAS3 (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions 4		Maximum Potential Controlled Emissions 5		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used 6
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
EP-H001, EP-H002, EP-H003, EP-H004, EP-H005, EP-H006, EP-H007, EP-H008	Vertical Stack	H001, H002, H003, H004, H005, H006, H007, H008	Gas Production Unit Heaters	N/A		CO (630080)	0.8083	3.5404	0.8083	3.5404	Gas/Vapor /Solid (for PM)	MB AP-42
						NOx (10102439)	0.9623	4.2147	0.9623	4.2147		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	1154.7159	5057.6556	1154.7159	5057.6556		
						SO2 (7446095)	0.0058	0.0253	0.0058	0.0253		
						PM, PM10, PM2.5	0.0731	0.3203	0.0731	0.3203		
						Hexane (110543)	0.0173	0.0759	0.0173	0.0759		
						Total VOCs	0.0529	0.2318	0.0529	0.2318		
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008	Vertical Stack	LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008	Line Heaters	N/A		CO (630080)	1.0777	4.7205	1.0777	4.7205		
						NOx (10102439)	1.2830	5.6196	1.2830	5.6196		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	1539.6212	6743.5408	1539.6212	6743.5408		
						SO2 (7446095)	0.0077	0.0337	0.0077	0.0337		
						PM, PM10, PM2.5	0.0975	0.4271	0.0975	0.4271		
						Hexane (110543)	0.0231	0.1012	0.0231	0.1012		
						Total VOCs	0.0706	0.3091	0.0706	0.3091		
F001	N/A	F001	Fugitives	N/A		Benzene (71432)	0.0052	0.0229	0.0052	0.0229	Gas/Vapor	MB
						Toluene (108883)	0.0162	0.0709	0.0162	0.0709		
						Ethyl benzene (100414)	0.0128	0.0560	0.0128	0.0560		
						Hexane (110543)	0.2191	0.9596	0.2191	0.9596		
						o,m,p-xylenes (95476,108383,106423)	0.0393	0.1723	0.0393	0.1723		
						CO2 Equivalent CO2 (124389)), CH4	64.5797	282.8590	64.5797	282.8590		
						VOCs	3.0422	13.3250	3.0422	13.3250		
						TAPs (benzene)	0.0052	0.0229	0.0052	0.0229		
EP-L001, EP-L002	N/A	L001, L002	Loading (Condensate), Loading (Water)	N/A		VOCs	10.1372	9.2518	10.1372	9.2518	Gas/Vapor	MB
						hexane (110543)	0.0237	0.0216	0.0237	0.0216		
						CO2 Equivalent CO2 (124389), CH4	3.3950	3.9557	3.3950	3.9557		

Attachment O: G70-A Emissions Summary Sheet
Emission Points Data Summary Sheet

Table 1: Emissions Data												
Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type1	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		All Regulated Pollutants - Chemical Name/CAS3 (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions 4		Maximum Potential Controlled Emissions 5		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used 6
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
EP-HR001	N/A	HR001	Haul Truck	N/A		PM, PM10, PM2.5	2.6944	4.2997	1.3472	2.1499	Solid	MB
EP-EC001, EP-EC002, EP-EC003, EP-EC004,	N/A	TANKCOND00 1-010, TANKPW001- 002, EC001, EC002, EC003, EC004,	Condensate Tank F/W/B, PW Tank F/W/B, Enclosed Combustor	EC001, EC002, EC003, EC004,	Enclosed Combustor	CO (630080)	0.00E+00	0.00E+00	0.3751	1.6431	Gas/Vapor/ Solid (for PM)	MB
						NOx (10102439)	0.00E+00	0.00E+00	0.4466	1.9561		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4	550.7280	2412.1888	1495.6109	6550.7758		
						PM, PM10, PM2.5	0.00E+00	0.00E+00	0.0339	0.1487		
						Benzene (71432)	0.5568	2.4386	0.0111	0.0488		
						Toluene (108883)	0.4793	2.0991	0.0096	0.0420		
						ethyl benzene	0.1273	0.5576	0.0025	0.0112		
						hexane (110543)	12.8462	56.2662	0.2569	1.1253		
						o,m,p-xylenes (95476,108383,106423)	0.3120	1.3666	0.0062	0.0273		
						VOCs	372.6791	1632.3343	7.4539	32.6479		
EP-PCV	valve	PCV	Pneumatic CV	N/A		hexane (110543)	0.0109	0.0477	0.0109	0.0477	Gas/Vapor	MB
						CO2 Equivalent CO2 (124389)), CH4	7.2262	31.6506	7.2262	31.6506		
						VOCs	0.0916	0.4012	0.0916	0.4012		
EP-ENG001	Vertical Stack	ENG001	Compressor Engine	N/A		CO (630080)	5.6445	24.7228	5.6445	24.7228	Gas/Vapor/ Solid (for PM)	MB
						NOx (10102439)	0.3158	1.3831	0.3158	1.3831		
						CO2 Equivalent N2O (10024972), CO2 (124389), CH4 (74828)	27.7765	121.6612	27.7765	121.6612		
						PM, PM10, PM2.5	0.0023	0.0100	0.0023	0.0100		
						TAPs Formaldehyde (50000)	0.0049	0.0215	0.0049	0.0215		
						Total VOCs	0.0071	0.0311	0.0071	0.0311		

Attachment C/O: G70-A Emissions Summary Sheet
Fugitive Emissions Data 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	n/a					
Unpaved Haul Roads	PM, PM10, PM2.5	2.6944	4.2997	1.3472	2.1499	MB
Loading/Unloading Operations	VOCs	10.1372	9.2518	10.1372	9.2518	MB
	hexane (110543)	0.0237	0.0216	0.0237	0.0216	
	CO2 Equivalent CO2 (124389), CH4	3.3950	3.9557	3.3950	3.9557	
Equipment Leaks (Components)	Benzene (71432)	Does not apply	0.0229	Does not apply	0.0229	MB
	Toluene (108883)		0.0709		0.0709	
	Ethyl benzene (100414)		0.0560		0.0560	
	Hexane (110543)		0.9596		0.9596	
	o,m,p-xylenes (95476,108383,106423)		0.1723		0.1723	
	CO2 Equivalent CO2 (124389)), CH4		282.8590		282.8590	
	VOCs		13.3250		13.3250	
	TAPs (benzene)		0.0229		0.0229	
Equipment Leaks (PCVs)	hexane (110543)	0.0109	0.0477	0.0109	0.0477	MB
	CO2 Equivalent CO2 (124389)), CH4	7.2262	31.6506	7.2262	31.6506	
	VOCs	0.0916	0.4012	0.0916	0.4012	

1 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS2, VOCs, H2S, Inorganics, Lead, Organics, O3, NO, NO2, SO2, SO3, all applicable Greenhouse Gases (including CO2 and methane), etc. DO NOT LIST H2, H2O, N2, O2, 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; O = other (specify).

Attachment P

Other Supporting Documentation

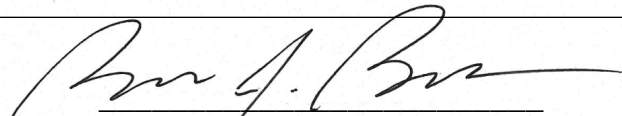


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2013 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT OF 1990

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 + NO_x (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.

TECHNICAL INFORMATION

DG972-SAEH-S1

NATURAL GAS FUEL ENGINE

July, 2006

KUBOTA Corporation

CONTENTS

1. GENERAL SPECIFICATIONS

2. PERFORMANCE CURVES

3. DIMENSIONS

4. TECHNICAL DATA

4-1) BRAKE HORSE POWER

4-2) FUEL CONSUMPTION

4-3) NOISE LEVEL

4-4) AIR REQUIREMENTS

1. Combustion air requirements
2. Cooling air requirements
3. Combustion and cooling air requirements

4-5) EXHAUST GAS VOLUME

4-6) HEAT REJECTION TO COOLING WATER (H_o)

4-7) COOLING FAN DATA

4-8) CENTER OF GRAVITY

4-9) UNBALANCED FORCES OF ENGINES

4-10) MASS ELASTIC SYSTEM

5. FUEL SYSTEM AND FUEL DIAGRAM

Specifications and dimensions are subject to change without prior notice.

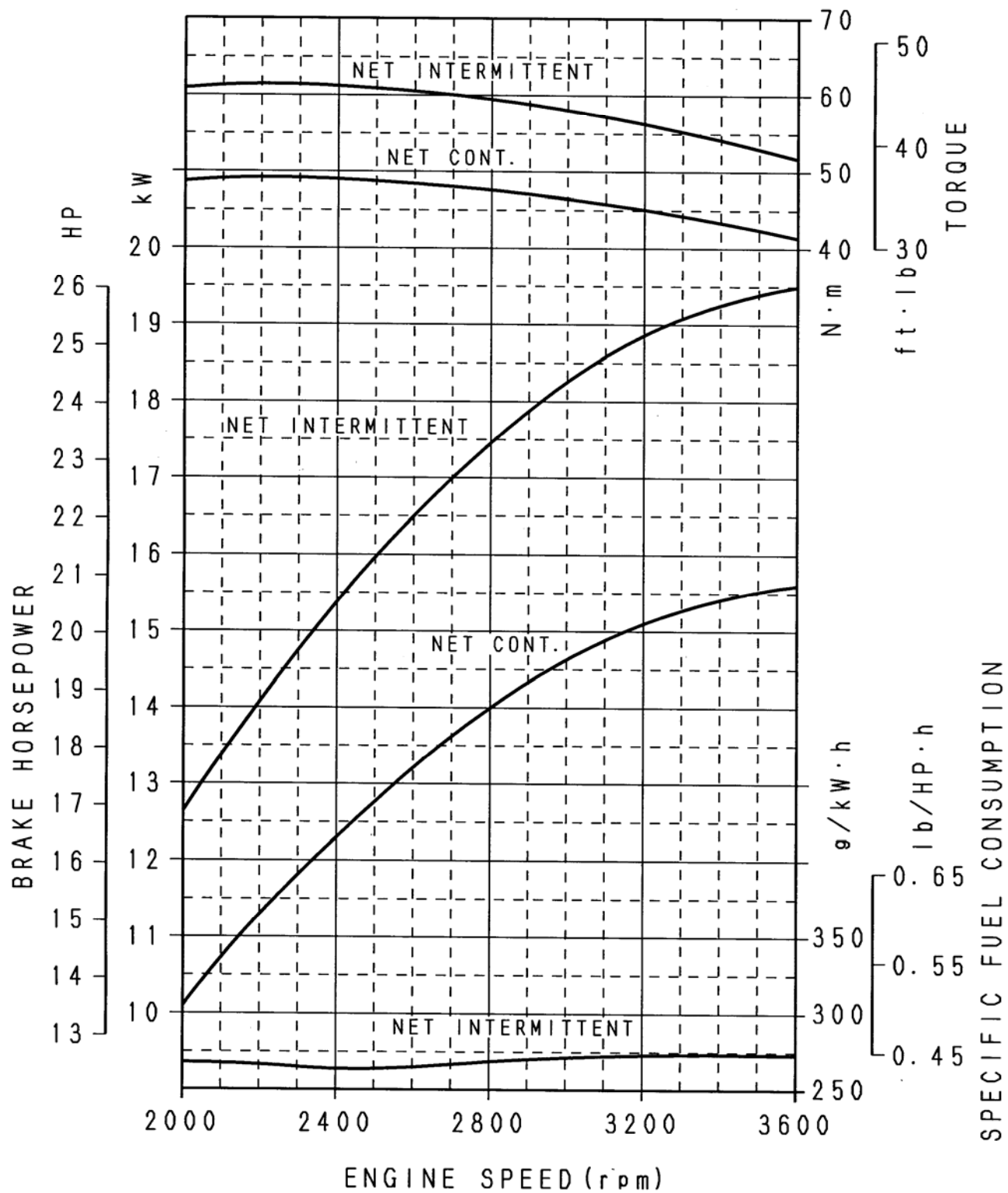
1. GENERAL SPECIFICATIONS

ITEM	UNIT	SPECIFICATIONS
Engine model		DG972-SAEH-S1
Type		Vertical, In line, 4cycle Natural Gas engine
Cooling system		Water cooling with water pump
Number of cylinders		3
Cylinder bore	mm(in)	74.5 (2.93)
Stroke	mm(in)	73.6 (2.90)
Total displacement	L(cu. in)	0.962 (58.7)
High idle	rpm	3850
Low idle	rpm	1500
Horsepower	kW(HP)	19.5(26.1)
Max. torque (SAE J1349)	Nm(ft-lb) /rpm	61.2 (45.2)/2400
Compression ratio		9.2
Firing order		1-2-3
Ignition timing		B.T.D.C.15° /1000rpm B.T.D.C.28° /3600rpm
Ignition system		Distributor-less Solid State type
Fuel		Natural Gas only
Direction of rotation		Counter-clockwise from flywheel side
Starting system		Electric starting with cell starter
Starter output	V-kW	12-1.0
Alternator output	V-W	12-480 (Standard)
Lubricating system		Forced lubricating by trochoid pump
Lubricating oil		Quality better than SH class
Lube. oil capacity	L(US gal)	3.4 (0.90)
Coolant capacity	L(US gal)	1.22 (0.32)
Governor type		Centrifugal flyweight mechanical type governor
Dimensions (LxBxH)	mm(in)	526x415x503 (20.7x16.3x19.8)
Dry weight	kg(lb)	Approx. 95.4(210)
Application		Stationary only

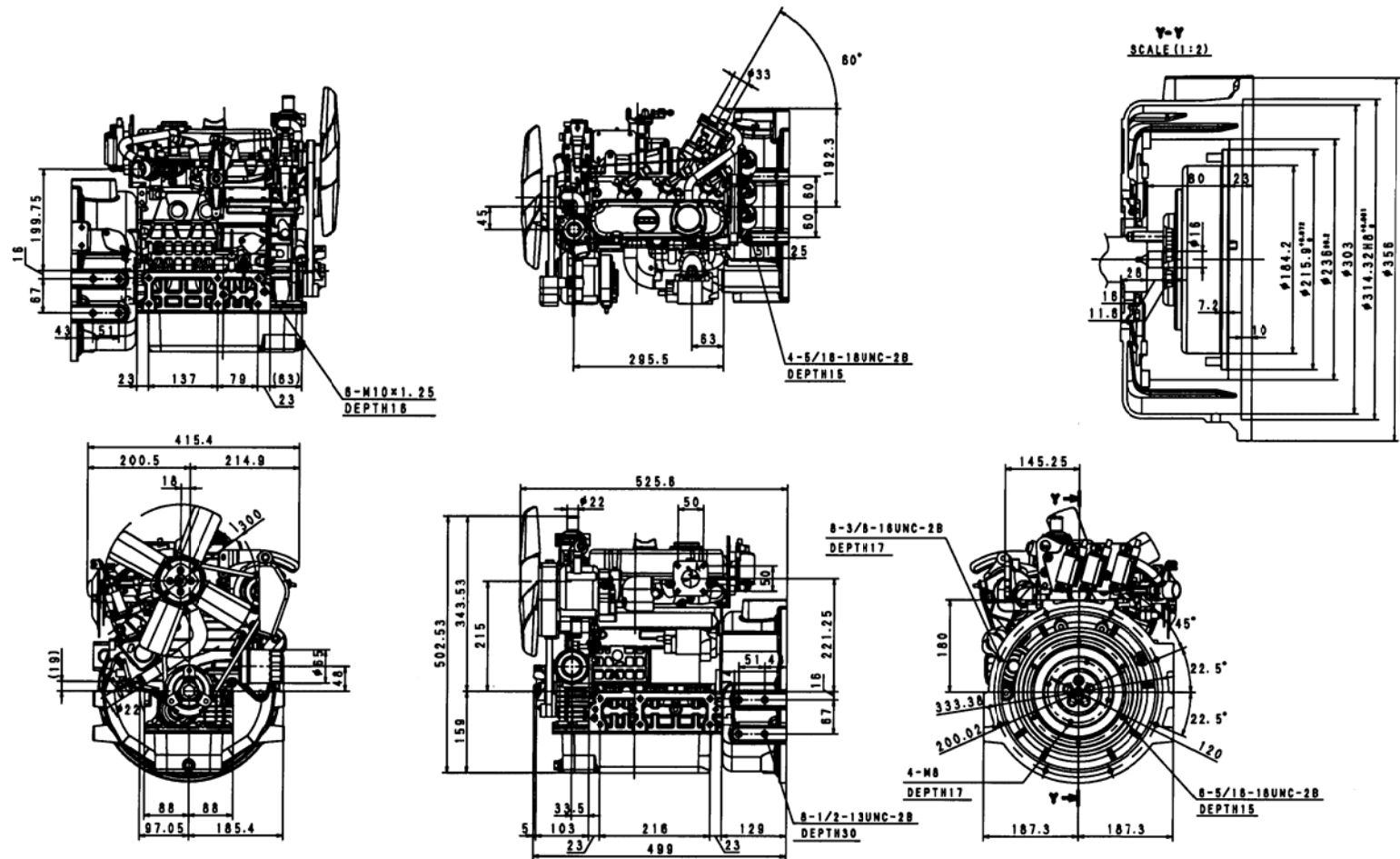
2. PERFORMANCE CURVES

DG972 PERFORMANCE CURVES

Higher calorific value : 11000kcal/m^3 (1236BTU/ft^3)



3. DIMENSIONS



4. TECHNICAL DATA

ITEM		SPECIFICATIONS		
Engine model		DG972-SAEH-S1		
Brake horse power		See attached sheet	4-1)	
Top Clearance		1.35 to 1.65mm (0.05315 to 0.06496in)		
Compression pressure		1.32MPa (192psi)		
Fuel consumption		See attached sheet	4-2)	
Lube. oil consumption		Max.0.67g/kWh (0.5g/HPh) at rated load		
Lube. oil pressure		at idling speed: more than 69kPa (more than 9.95psi)		
		at rated speed: 196 to 441kPa (28.44 to 63.99psi)		
Noise level		See attached sheet	4-3)	
Combustion air requirements		See attached sheet (Refer to 25deg.C and 1000hPa)		4-4)
Cooling air requirements				
Combustion and cooling air requirements				
Exhaust gas volume		See attached sheet (Refer to 25deg.C and 1000hPa)	4-5)	
Cold starting limits		-15deg.C (5deg.F)		
Heat rejection		See attached sheet	4-6)	
Angles of tilt	Front or Rear down	30° (Less than 10min. continuous operation)		
		20° (Continuous operation)		
	Left or Right side down	30° (Less than 10min. continuous operation)		
		20° (Continuous operation)		
Valve timing		[Inlet valve] Open: TDC –20° Close: BDT +45°		
		[Exhaust valve] Open: BDC –50° Close: TDC +15°		
Cooling fan data		See attached sheet	4-7)	
Center of gravity		See attached sheet	4-8)	
Unbalanced forces of engines		See attached sheet	4-9)	
Mass elastic system		See attached sheet	4-10)	
Thermostat specifications		Opening temperature: 71±1.5deg.C (159.8±2.7deg.F)		
		Fully opened temperature: 85deg.C (185deg.F) [at Thermostat lift:8mm (0.31in)]		

4-1) BRAKE HORSE POWER

SAE J1349

Engine speed	rpm	2000	2400	2800	3200	3600
Net intermittent	kW	12.6	15.4	17.4	18.9	19.5
	HP	16.9	20.6	23.3	25.3	26.1
	PS	17.1	20.9	23.7	25.7	26.5
Net continuous	kW	10.1	12.3	13.9	15.1	15.6
	HP	13.5	16.5	18.7	20.3	20.9
	PS	13.7	16.8	18.9	20.6	21.2

Note

1. Conversion rates 1kW=1.35962PS=1.34048HP
 1PS=0.7355kW=0.985925HP
 1HP=0.7457kW=1.01428PS
2. Fuel detail Japanese standard gas
 higher calorific value : 11000kcal/m³ (1236BTU/ft³)
 supply pressure : 0.98 – 2.45kPa (7.35 – 18.38mmHg)

4-2) FUEL CONSUMPTION

Specific at net intermittent (SAE J1349)

Engine speed	rpm	2000	2400	2800	3200	3600
Brake horse power	kW	12.6	15.4	17.4	18.9	19.5
	HP	16.9	20.6	23.3	25.3	26.1
	PS	17.1	20.9	23.7	25.7	26.5
Fuel consumption	g/kWh	269	264	269	273	273
	g/HPh	200	197	200	204	204
	g/PSh	198	194	198	201	201
	lb/HPh	0.442	0.434	0.442	0.449	0.449

Note

1. Conversion rates 1kW=1.35962PS=1.34048HP 1kg=2.20462lb (1g=0.00220462lb)
 1PS=0.7355kW=0.985925HP 1lb=0.45359kg
 1HP=0.7457kW=1.01428PS
2. Fuel detail Japanese standard gas
 higher calorific value : 11000kcal/m³ (1236BTU/ft³)
 supply pressure : 0.98 – 2.45kPa (7.35 – 18.38mmHg)

4-3) NOISE LEVEL

Load × rpm	Unit	Sound pressure at 1m(3.3ft)
0/4 × 3850	dB(A)	90.0
4/4 × 3850 15.6kW (20.9HP)	dB(A)	92.0
0/4 × 1500	dB(A)	72.0

These data show the average noise level at four points.

Note

1. Measurement conditions : With radiator, cooling fan, air cleaner and muffler.

4-4) AIR REQUIREMENTS

1. Combustion air requirements (Refer to 25deg.C and 1000hPa)

rpm	2000	2400	2800	3200	3600
L/sec	12.35	14.81	17.28	19.75	22.22
m ³ /h	44.44	53.33	62.22	71.11	80.00
in ³ /sec	753	904	1055	1205	1356
ft ³ /min	26.13	31.35	36.58	41.80	47.03

Combustion air requirements calculating formula

$$Q_1 = V_h \cdot N \cdot C \cdot \eta \cdot 10^{-3}$$

Q₁: Amount of intake air (m³/min)

η: Intake efficiency

V_h: Total displacement (L)

Natural Gas: 0.77

N: Engine speed (rpm)

C: Coefficient=0.5

2. Cooling air requirements (Refer to 25deg.C and 1000hPa)

rpm	2000	2400	2800	3200	3600
L/sec	571.2	737.2	824.7	833.9	764.7
m ³ /h	2056	2654	2969	3002	2753
in ³ /sec	34859	44984	50327	50888	46667
ft ³ /min	1210.2	1561.8	1747.3	1766.7	1620.2

Above data is decided by following conditions.

1. Using the standard radiator.
2. Engine is run as open unit.

3. Combustion and cooling air requirements (Refer to 25deg.C and 1000hPa)

rpm	2000	2400	2800	3200	3600
L/sec	583.5	752.0	842.0	853.7	786.9
m ³ /h	2100.4	2707.3	3031.2	3073.1	2833.0
in ³ /sec	35612	45888	51382	52093	48023
ft ³ /min	1236.3	1593.2	1783.9	1808.5	1667.2

Note

1. Cooling fan and fan pulley specifications(Cooling fan Part No. 15881-74112)

Item	
Fan diameter	300mm (11.81in)
No. of blade and type of shape	4, S type
Diameter of fan driving pulley	100mm (3.94in)
Diameter of fan pulley	84mm (3.31in)

2. Conversion rates

$$1L = 61.0237 \text{ in}^3 = 0.035315 \text{ ft}^3$$

$$1 \text{ ft}^3 = 28.3168 \text{ L}$$

$$1L/\text{sec} = 3.6 \text{ m}^3/\text{h} = 2.1189 \text{ ft}^3/\text{min}$$

4-5) EXHAUST GAS VOLUME

Refer to 25deg.C and 1000hPa

rpm	2000	2400	2800	3200	3600
L/sec	35.46	42.55	49.65	56.74	63.83
m ³ /h	127.67	153.19	178.73	204.26	229.80
in ³ /sec	2164	2597	3030	3462	3895
ft ³ /min	75.05	90.06	105.07	120.08	135.09

Note

- Conversion rates
 - 1L=61.0237in³=0.035315ft³
 - 1ft³=28.3168L
 - 1L/sec=3.6m³/h=127.133ft³/hr

4-6) HEAT REJECTION TO COOLING WATER

1. Specific at net intermittent (SAE J1349)

Engine speed	rpm	2000	2400	2800	3200	3600
Brake horse power	kW	12.6	15.4	17.4	18.9	19.5
	HP	16.9	20.6	23.3	25.3	26.1
	PS	17.1	20.9	23.7	25.7	26.5
Fuel consumption	g/kWh	269	264	269	273	273
	g/HPh	200	197	200	204	204
	g/PSh	198	194	198	201	201
	lb/HPh	0.442	0.434	0.442	0.449	0.449
Heat rejection to cooling water	MJ/h	29.05	31.52	38.79	45.13	51.82
	kcal/h	6940	7529	9267	10781	12379
	BTU/h	12491	13551	16679	19404	22281

Note

Heat rejection to cooling water calculating formula

$$Ho = Hu \cdot Ne \cdot be \cdot i$$

Ho: Heat rejection to cooling water

Hu: Fuel low calorific value

Japanese standard gas; 49.4MJ/kg, 11800kcal/h, 212391BTU/lb

Ne: Brake horse power

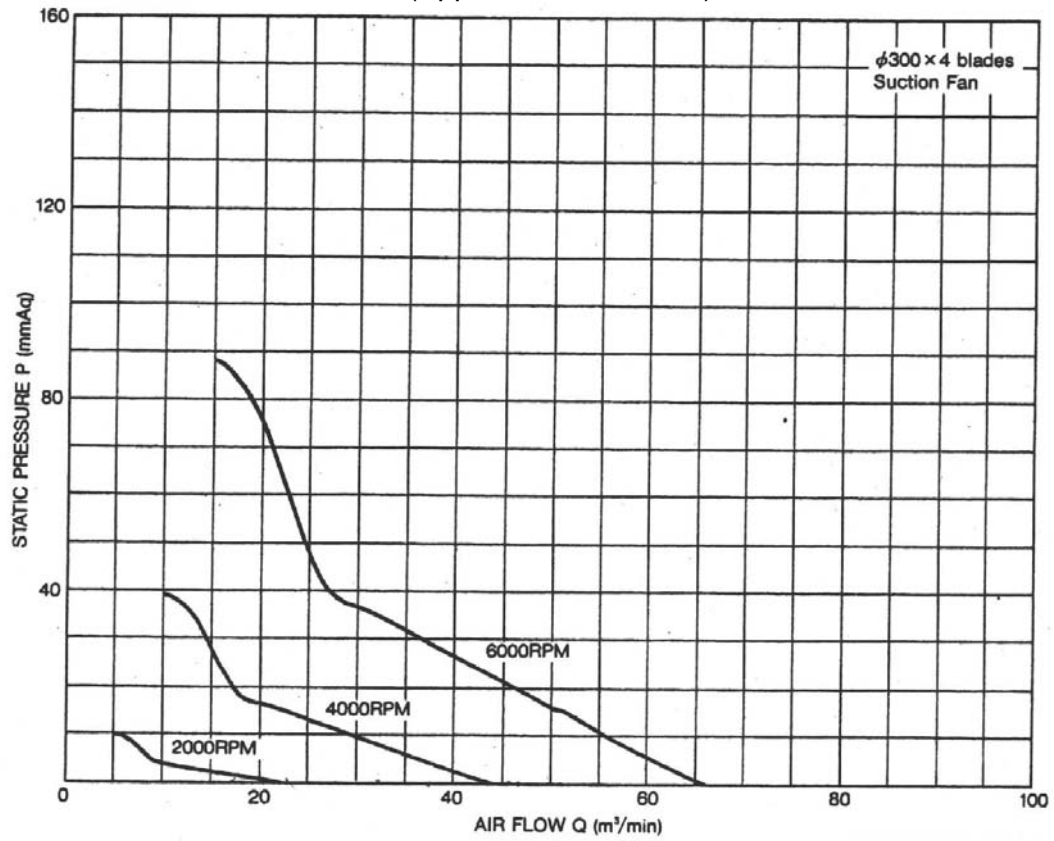
Be: Specific fuel consumption

i: Dispersion ratio to cooling water

4-7) COOLING FAN DATA

1. Performance curves <P-Q>

- Part No. 15881-74110 (Applicable for DG972)



4-8) CENTER OF GRAVITY

1. With standard flywheel and rear-end plate

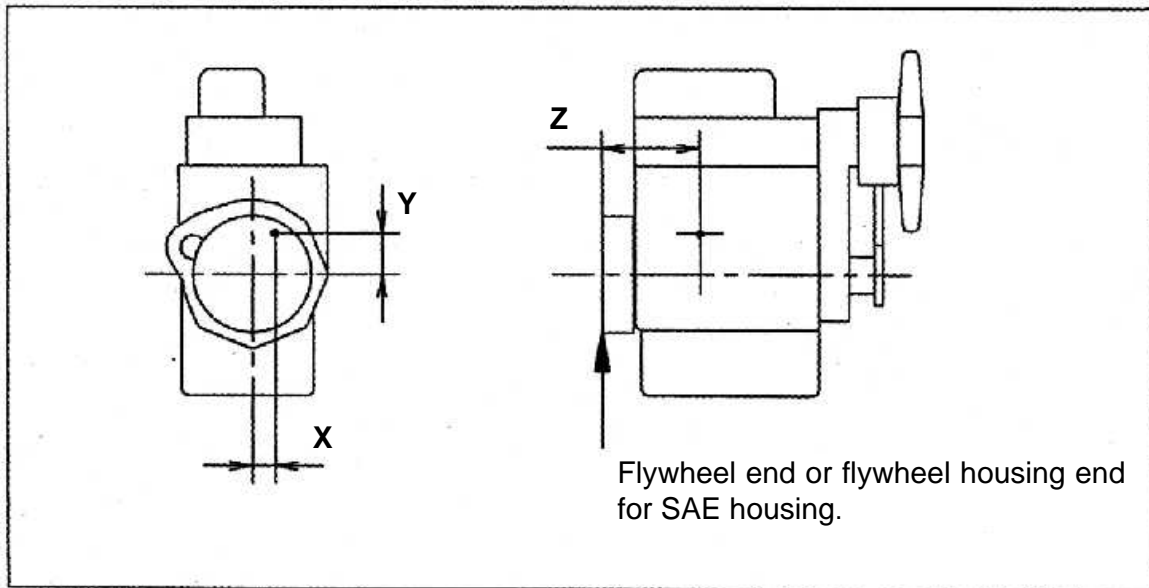
Model	Dry weight kg (lb)	Center of gravity		
		X mm (in)	Y mm (in)	Z mm (in)
WG/DF972	72.0 (159)	-25.5 (-1.00)	73.3 (2.89)	179.5 (7.07)

2. With SAE flywheel and flywheel housing

Model	Dry weight kg (lb)	Center of gravity		
		X mm (in)	Y mm (in)	Z mm (in)
DG972 -SAEH-S1	95.4 (210)	-10.0 (0.39)	28.0 (1.10)	207.0 (8.15)

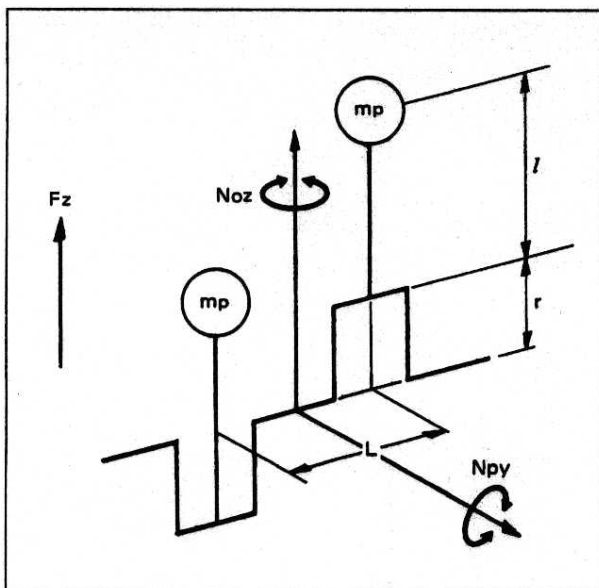
Note

Cooling water and lubricating oil weight is not included in above engine weight.



4-9) UNBALANCED FORCES OF ENGINES

1. Base data



F_z : Unbalanced inertia force
 N_{py} , N_{oz} : Unbalanced inertia couple
 m_p : Reciprocating mass
 r : Crank radius
 l : Center distance of connecting rod
 L : Cylinder distance
 ω : Angular velocity

$$\omega = 2\pi n / 60 \quad n: \text{Engine speed (rpm)}$$

$l=0.098\text{m}$	Cylinder bore (mm)	m_p (kg)
$r=0.0368\text{m}$	74.5	0.37/9.80665
$L=0.080\text{m}$		

2. Unbalanced inertia force and couple

$(\times \omega^2)$

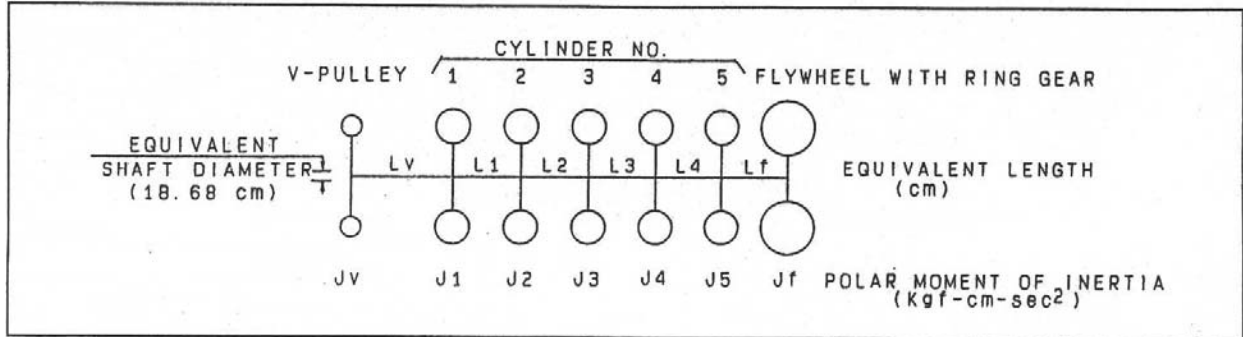
Model	No. of Cylinder	Cylinder Bore	Order	F_z	N_{py}	N_{oz}
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼An example of calculation

Calculation condition	ω^2	F_z, N_{py}, N_{oz}		
		Order	Calculation	
Engine model DG972 Engine speed 3600(rpm)	$[2 \times \pi \times 3600/60]^2$ $=142122$	F_z	1	0
			2	0
		N_{py}	1	$0.000096 \times 142122 = 13.6\text{kg}$
			2	$0.000072 \times 142122 = 10.2\text{kg}$
		N_{oz}	1	$0.000096 \times 142122 = 13.6\text{kg}$
			2	0

4-10) MASS ELASTIC SYSTEM

Equivalent torsional vibration data



MODEL	EQUIVALENT LENGTH (cm)				POLAR MOMENT OF INERTIA (kgfcm-sec ²)				
	LV	L1	L2	Lf	JV	J1	J2	J3	Jf
DG972 -SAEH-S1	35082	4528	4528	2824	0.013	0.026	0.026	0.026	1.281

Note: Flywheel E8052-25110, V-Pulley 16861-74280

5. FUEL SYSTEM AND FUEL DIAGRAM

- All fuel connections added to this engine must be installed by qualified personnel utilizing recognized procedures and standards.
- These non-KUBOTA installed parts, such as hoses, shutoff solenoid valve should be approved for Natural gas use.
- An approved, listed fuel filter and shutoff solenoid valve must be installed between the gas tank and Kubota regulator.
- Two fuel cut solenoids must be installed in series before the regulator on the fuel supply line for safety (backup) purpose.

1. Tightening torque and leak check

- 1) The joint must be installed to the gas entrance of the regulator by screw with O-ring. Screw is tightened to the specified torque using a driver, and leak check must be performed as shown in the below table.
- 2) The connector on the gas mixer may be mounted on any position since it is not sealed. The lock nut may be loosened using a wrench. The connector may be changed to any specified angle. The lock nut should be tightened to the specified torque using a wrench as shown in the below table.

[TIGHTENING TORQUE AND LEAK CHECK]

	Qty.	Size	Tightening torque			Leak check pressure
			Nm	kgfm	ft-lb	
SCREW	2	M4	1.9 to 2.9	0.2 to 0.3	1.5 to 2.2	Soap solution or its equivalent
LOCK NUT	1	M16 × 1	19.6 to 39.2	2.0 to 4.0	14.5 to 28.9	

2. Setting of the regulator

- 1) Install the regulator in **UPRIGHT** position, it must be installed within 4G vibration level. If not, it may not supply necessary fuel to the engine.
- 2) **DO NOT** connect any extension hose to the air vent pipe of the regulator. This may cause an improper supply of fuel to the engine.

3. Caution for FUEL SYSTEM

The standard engine is equipped with $\phi 6.6$ jet for the fuel calorific gas value of 11000kcal/m³ (1236BTU/ft³).

When the engine is operated with the different calorific gas, it is necessary to select the correct jet of the mixer.

In that case, refer to the manual [**Adjustment for Natural Gas Engine DG972**].

Japanese standard gas higher calorific value : 11000kcal/m³ (1236BTU/ft³)
supply pressure : 0.98 – 2.45kPa (7.35 – 18.38mmHg)

Equipments Vacuum Meter : Not KUBOTA supplied
Adjustable Jet : Service Tool

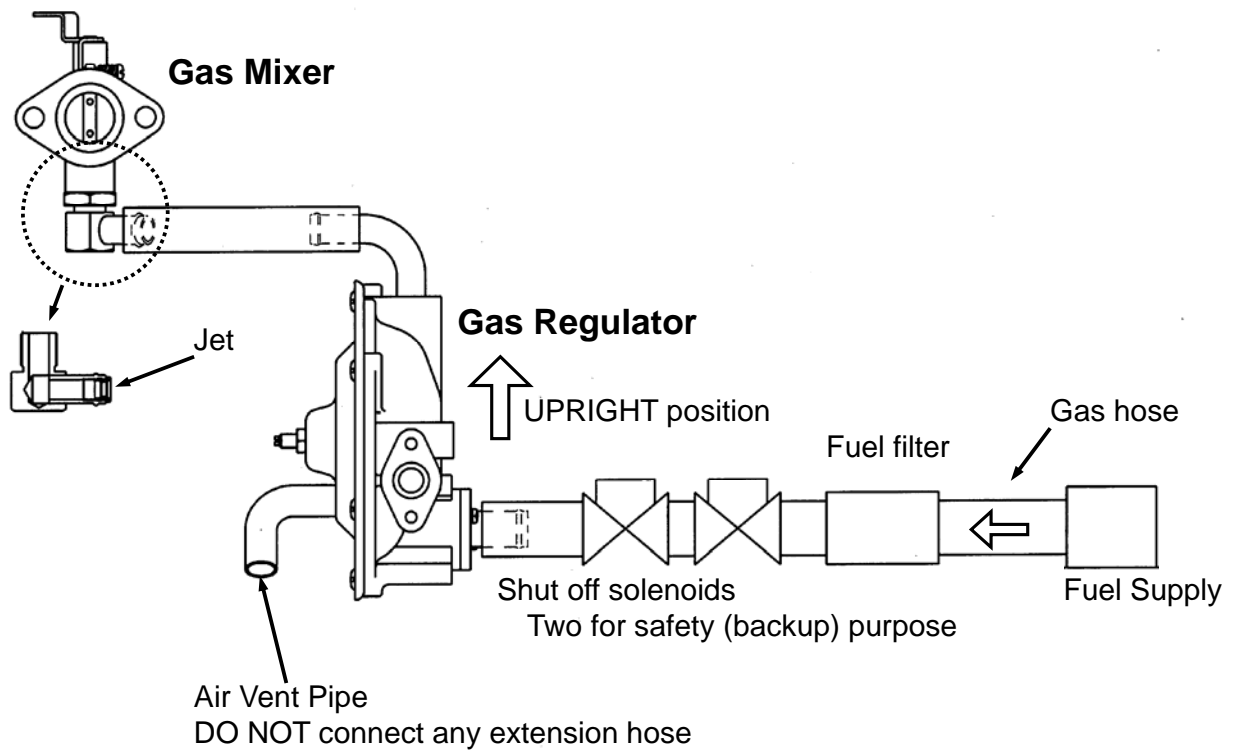
4. Application Check Item

The items as shown below must be managed for all engines, and these items must be informed to KUBOTA with Application Check results.

Refer to the attached sheet [**Application Check Sheet for DG972**].

- 1) The diameter of the jet (with the intake vacuum curve)
- 2) The calorific value of the gas
- 3) The supply pressure of gas
- 4) The serial number of the engine

5. Fuel diagram



NATURAL GAS ENGINE

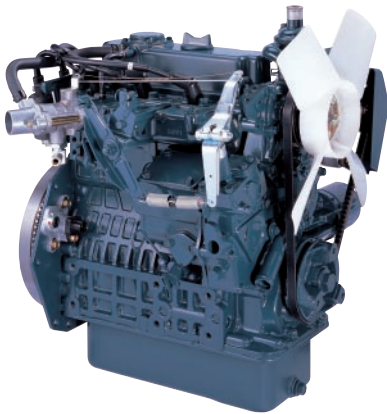
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2
EPA Tier

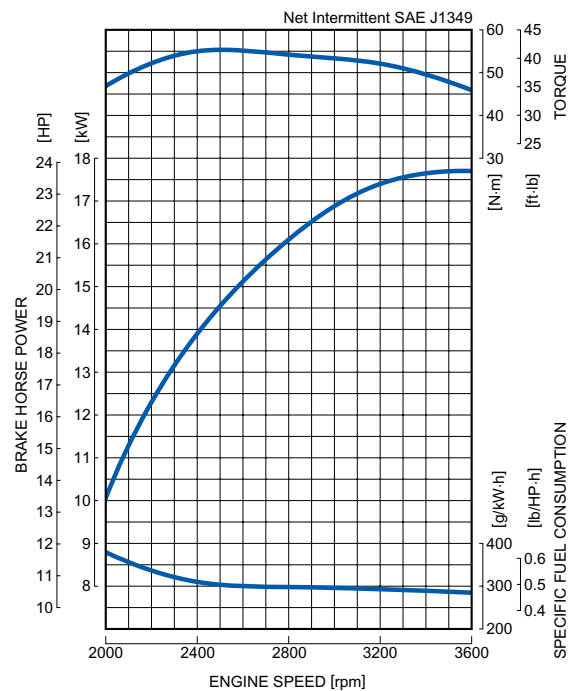
RATED POWER

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.

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.

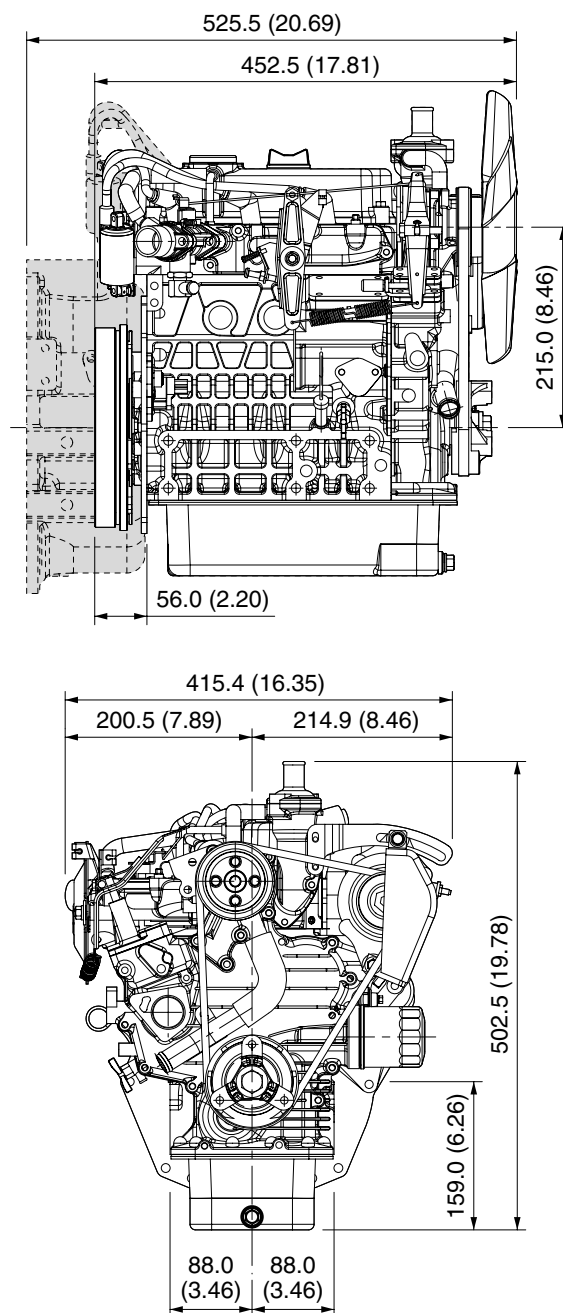
*Output: Net Intermittent SAE J1349

*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



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