June 8, 2016 Reference No. 082715

Ms. Beverly McKeone
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, West Virginia 25304

Dear Ms. Beverly McKeone:

Re: General Permit Registration G70-B Modification Application
Rock Run Well Pad
Antero Resources Corporation

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

A General Permit Registration Modification is requested due to the following planned operational changes:

1. Decrease in produced water production.
2. Addition of a Cimarron enclosed combustor.

Please refer to Table 14 in Attachment S - Emissions Calculations for the summary of changes in emissions of regulated air pollutants that will result from the above operational changes.

Enclosed are the following documents:

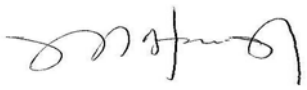
- Original copy of the G70-B General Permit Modification Application.
- Two CD copies of the G70-B General Permit Modification Application.
- The application fee with check no. 447328 in the amount of $1,500.00.

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040 USA
T 713 734 3090 **F** 713 734 3391 **W** www.ghd.com

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

Sincerely,

GHD Services Inc.



Manuel Bautista

MB/ma/248

Encl.

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

General Permit G70-B Modification Application

Decrease in produced water production and addition of a Cimarron enclosed combustor.

Rock Run Well Pad

Antero Resources Corporation

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040
082715 | Report No 248 | June 2016

Table of Contents

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475
Fax (304) 926-0479
www.dep.wv.gov

G70-B GENERAL PERMIT REGISTRATION APPLICATION

PREVENTION AND CONTROL OF AIR POLLUTION IN REGARD TO THE CONSTRUCTION, MODIFICATION, RELOCATION, ADMINISTRATIVE UPDATE AND OPERATION OF NATURAL GAS PRODUCTION FACILITIES LOCATED AT THE WELL SITE

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

SECTION 1. GENERAL INFORMATION

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

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

Applicant's Mailing Address: 1615 Wynkoop Street

City: Denver | State: CO | ZIP Code: 80202

Facility Name: Rock Run Well Pad

Operating Site Physical Address: 794 Tunnel Hill Rd.

City: West Union | Zip Code: 26456 | County: Doddridge

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: 39.30492
Longitude: -80.81464

SIC Code: 1311

NAICS Code: 211111

DAQ Facility ID No. (For existing facilities)
017 - 00108

CERTIFICATION OF INFORMATION

This G70-B 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 the 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, 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 G70-B Registration Application will be returned to the applicant. Furthermore, if the G70-B forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

I hereby certify that Barry Schatz 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 Division of Air Quality immediately.

I hereby certify that all information contained in this G70-B 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.

Responsible Official Signature:_____
Name and Title: Phone: Fax:
Email: Date:

If applicable:
Authorized Representative Signature: Barry Schatz
Name and Title: Barry Schatz/ Senior Environmental & Regulatory Manager Phone: 303-357-7276 Fax: 303-357-7315
Email: bschatz@anteroresources.com Date: 6/8/2016

If applicable:
Environmental Contact
Name and Title: Phone: Fax:
Email: Date:

OPERATING SITE INFORMATION	
Briefly describe the proposed new operation and/or any change(s) to the facility: Decrease in produced water production and addition of a Cimarron enclosed combustor.	
Directions to the facility: At the intersection of Harrisville-Pullman Oxford Road/Co Rd 9 and Right-Fork-White Oak Road turn right on Harrisville-Pullman Oxford Road/Co Rd 9 and go for 3.4 miles. Entrance to the Facility will be on the left.	
ATTACHMENTS AND SUPPORTING DOCUMENTS	
I have enclosed the following required documents:	
Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22). ☒ Check attached to front of application. ☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address): ☐ I wish to pay by credit card. Contact for payment (incl. name and email address): ☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update) ☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ and/or OOOO [1] ☐$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2] [1] Only one NSPS fee will apply. [2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ. *NSPS and NESHAP fees apply to new construction or if the source is being modified.*	
☒ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed in its entirety)** – Attachment A	
☐ Siting Criteria Waiver (if applicable) – Attachment B	☒ Current Business Certificate – Attachment C
☒ Process Flow Diagram – Attachment D	☒ Process Description – Attachment E
☒ Plot Plan – Attachment F	☒ Area Map – Attachment G
☒ G70-B Section Applicability Form – Attachment H	☒ Emission Units/ERD Table – Attachment I
☒ Fugitive Emissions Summary Sheet – Attachment J	
☒ Gas Well Affected Facility Data Sheet (if applicable) – Attachment K	
☒ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L	
☒ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment M	
☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N	
☒ Tanker Truck Loading Data Sheet (if applicable) – Attachment O	
☐ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P	
☐ Pneumatic Controllers Data Sheet – Attachment Q	
☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment R	
☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment S	
☒ Facility-wide Emission Summary Sheet(s) – Attachment T	
☒ Class I Legal Advertisement – Attachment U	
☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments	

GHD SERVICES INC.

▼ PLEASE DETACH AND RETAIN FOR YOUR RECORDS ▼

INVOICE NUMBER	DATE		VOUCHER NO.	AMOUNT
Account Number:		40WVDEPAQ	447328	
CR51716	5/17/2016	401005735		1,500.00

TOTAL : 1,500.00

THIS DOCUMENT IS PROTECTED BY A MICRO-PRINT SIGNATURE LINE, FLUORESCENT PAPER FIBERS, A WATERMARKED BACKER, AND IS REACTIVE TO CHEMICAL ALTERATION

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
50-7063-2213

5/17/2016

NO. 447328

PAY **********1,500 DOLLARS AND **********00 CENTS $**********1,500.00

TO THE ORDER OF
West Virginia Dept of Environmental
Protection - Division Air Quality
[illegible] Street SE
[illegible], WV 25304

GHD SERVICES INC.

AUTHORIZED SIGNATURES

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

⑈447328⑈ ⑆221370632⑆6100000118910⑈

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
Single Source Determination Form

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

Classifying multiple facilities as one "stationary source" under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of Building, structure, facility, or installation as given in §45-14-2.13 and §45-19-2.12. The definition states:

"Building, Structure, Facility, or Installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

Is there a facility owned by or associated with the natural gas industry located within one (1) mile of the proposed facility? Yes ☒ No ☐

If Yes, please complete the questionnaire on the following page (Attachment A).

Please provide a source aggregation analysis for the proposed facility below:

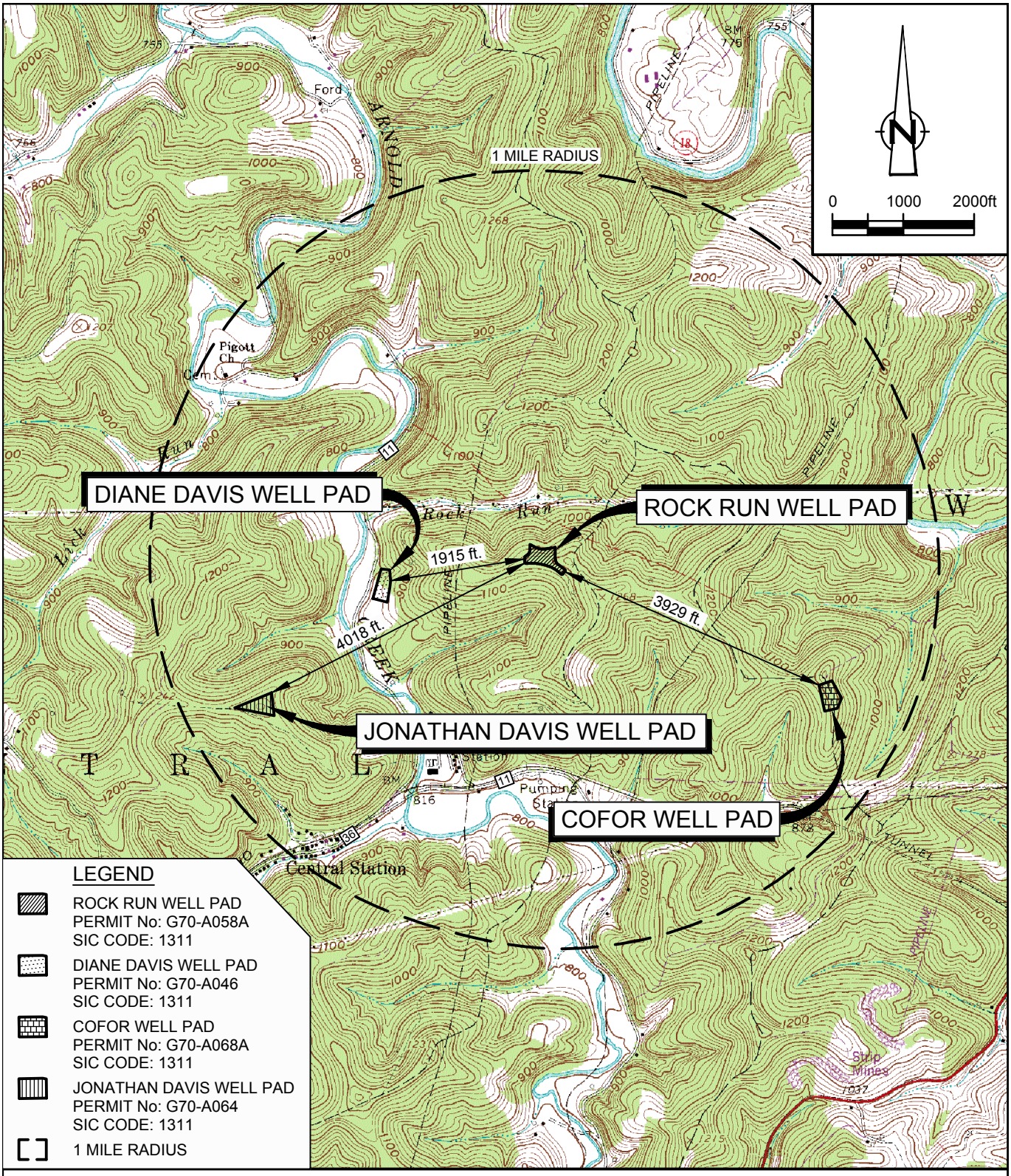
The Rock Run Well Pad calculation potential to emit included all the emissions sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Diane Davis Well Pad. This operates independently and is approximately 0.36 mile west of the facility. There are two other nearby sources, Cofor Well Pad and Jonathan Davis Well Pad that belong to the same industrial grouping and are under the same control but not located on contiguous or adjacent property. These well pads are located approximately 0.74 mile southeast and 0.76 mile southwest of Rock Run Well Pad respectively and both operate completely independent.

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

Answer each question with a detailed explanation to determine contiguous or adjacent properties which are under a common control and any support facilities. This section must be completed in its entirety.

Provide a map of contiguous or adjacent facilities (production facilities, compressor stations, dehydration facilities, etc.) which are under common control and those facilities that are not under common control but are support facilities. Please indicate the SIC code, permit number (if applicable), and the distance between facilities in question on the map.

Are the facilities owned by the same parent company or a subsidiary of the parent company? Provide the owners identity and the percentage of ownership of each facility. **Antero Resources has 100% ownership of each facility.**	Yes ☒	No ☐
Does an entity such as a corporation have decision making authority over the operation of a second entity through a contractual agreement or voting interest? Please explain.	Yes ☐	No ☒
Is there a contract for service relationship between the two (2) companies or, a support/dependency relationship that exists between the two (2) companies? Please explain.	Yes ☐	No ☒
Do the facilities share common workforces, plant managers, security forces, corporate executive officers or board executives?	Yes ☒	No ☐
Will managers or other workers frequently shuttle back and forth to be involved actively at both facilities?	Yes ☐	No ☒
Do the facilities share common payroll activities, employee benefits, health plans, retirement funds, insurance coverage, or other administrative functions? Please explain.	Yes ☐	No ☒
Does one (1) facility operation support the operation of the other facility?	Yes ☐	No ☒
Is one (1) facility dependent on the other? If one (1) facility shuts down, what are the limitations on the other to pursue outside business? Please explain. **No, these facilities operate completely independently.**	Yes ☐	No ☒
Are there any financial arrangements between the two (2) entities?	Yes ☐	No ☒
Are there any legal or lease agreements between the two (2) facilities?	Yes ☐	No ☒
Do the facilities share products, byproducts, equipment, or other manufacturing or air pollution control device equipment? Please explain. **No, these facilities operate completely independently.**	Yes ☐	No ☒
Do all the pollutant-emitting activities at the facilities belong to the same SIC Code? Please provide the SIC Codes. **1311**	Yes ☒	No ☐
Was the location of the new facility chosen primarily because of its proximity to the existing facility to integrate the operation of the two (2) facilities? Please explain. **No, these facilities operate completely independently.**	Yes ☐	No ☒
Will materials be routinely transferred between the two (2) facilities? Please explain the amount of transfer and how often the transfers take place and what percentages go to the various entities.	Yes ☐	No ☒
Does the facility influence production levels or compliance with environmental regulations at other facilities? Who accepts the responsibility for compliance with air quality requirements? Please explain. **No, these facilities operate completely independently.**	Yes ☐	No ☒



SOURCE: USGS QUADRANGLE MAP;
WEST UNION, WEST VIRGINIA

SITE COORDINATES: LAT. 39.304923, LONG. -80.814648

Attachment A

SINGLE SOURCE DETERMINATION MAP
ROCK RUN WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

GHD

82715-00(248)GN-WA004 MAY 20, 2016

Attachment B
Siting Criteria Waiver

Attachment B

Siting Waiver
Rock Run Well Pad
Antero Resources Corporation
Doddridge County, West Virginia

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

Attachment C
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

IN THE OFFICE OF SECRETARY OF STATE

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

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 — Contact Name
(303) 357-7310 — Phone Number

7. **Signature information** (See below ******Important Legal Notice Regarding Signature*):

Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person

Signature: Alvyn A. Schopp **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

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.

Jeffrey W. Bullock, Secretary of State

4520810 8100

130754186

AUTHENTICATION: 0496546

DATE: 06-10-13

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

State of Delaware
Secretary of State
Division of Corporations
Delivered 09:37 AM 06/10/2013
FILED 09:37 AM 06/10/2013
SRV 130754186 - 4520810 FILE

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:

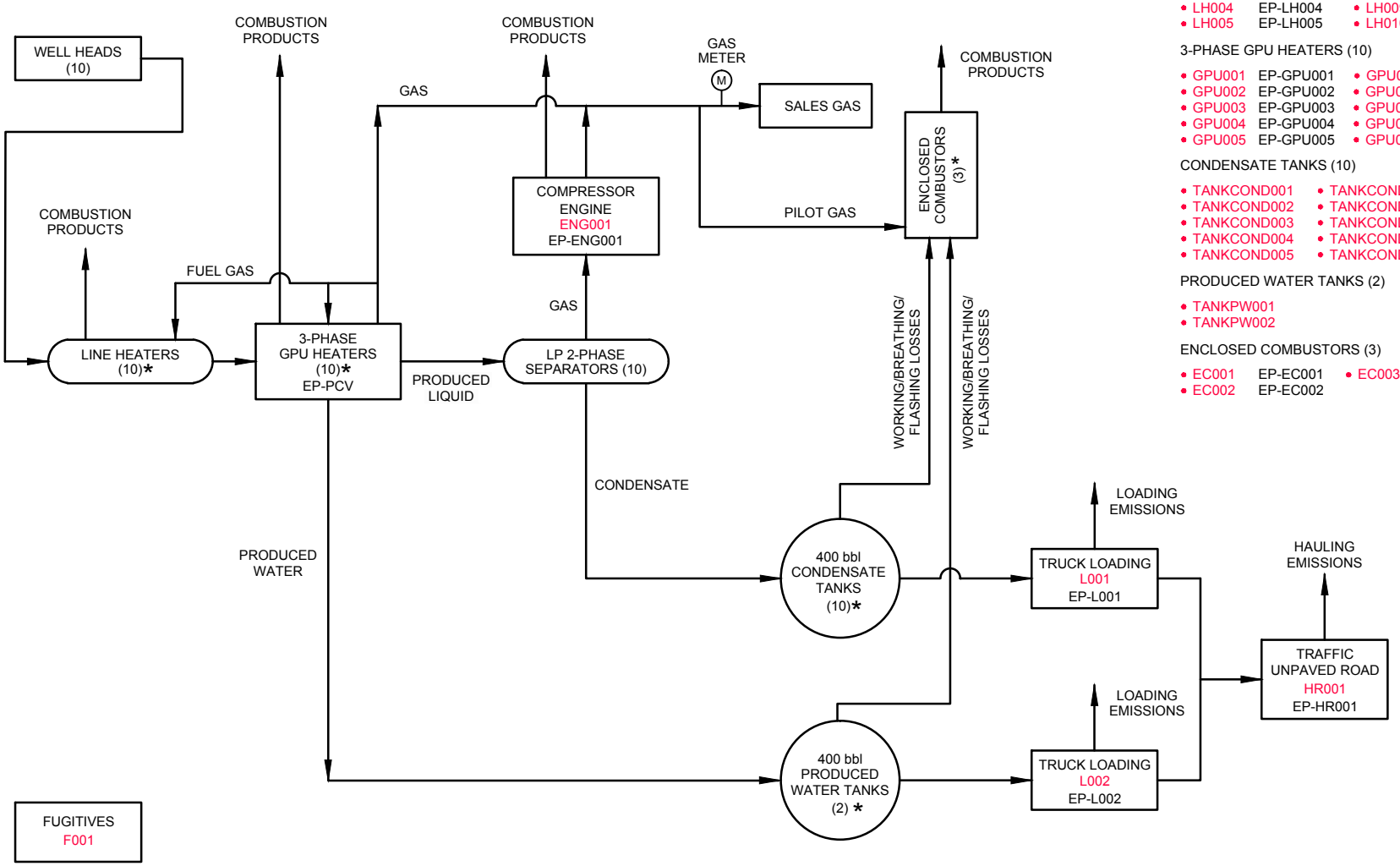
FIRST. The name of the Corporation is Antero Resources Corporation.

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 D
Process Flow Diagram



* LINE HEATERS (10)

• LH001	EP-LH001	• LH006	EP-LH006
• LH002	EP-LH002	• LH007	EP-LH007
• LH003	EP-LH003	• LH008	EP-LH008
• LH004	EP-LH004	• LH009	EP-LH009
• LH005	EP-LH005	• LH010	EP-LH010

3-PHASE GPU HEATERS (10)

• GPU001	EP-GPU001	• GPU006	EP-GPU006
• GPU002	EP-GPU002	• GPU007	EP-GPU007
• GPU003	EP-GPU003	• GPU008	EP-GPU008
• GPU004	EP-GPU004	• GPU009	EP-GPU009
• GPU005	EP-GPU005	• GPU010	EP-GPU010

CONDENSATE TANKS (10)

• TANKCOND001	• TANKCOND006
• TANKCOND002	• TANKCOND007
• TANKCOND003	• TANKCOND008
• TANKCOND004	• TANKCOND009
• TANKCOND005	• TANKCOND010

PRODUCED WATER TANKS (2)

- TANKPW001
- TANKPW002

ENCLOSED COMBUSTORS (3)

• EC001	EP-EC001	• EC003	EP-EC003
• EC002	EP-EC002		

Attachment D

PROCESS FLOW DIAGRAM - ANTERO RESOURCES ROCK RUN WELL PAD

Doddridge County, West Virginia

Attachment E
Process Description

Attachment E

Process Description
Rock Run Well Pad
Antero Resources Corporation
Doddridge 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 (LH001-010) and gas production units (GPU001-GPU010) 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.

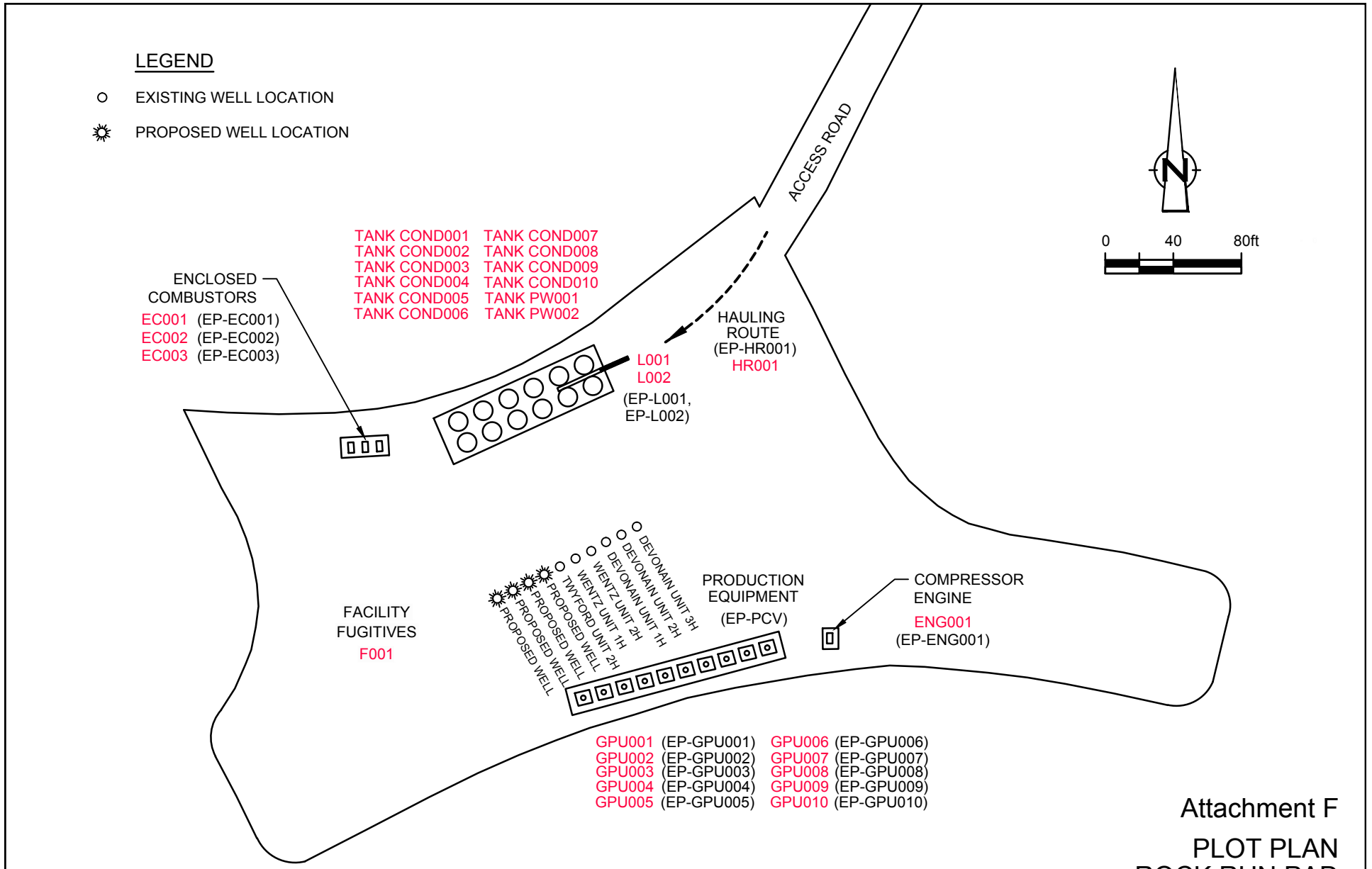
The gas from the three phase separators is metered and sent to the sales gas pipeline. The water flow to the produced water storage tanks (TANKPW001-002). The condensate is then sent to two phase low pressure separators where gas is further separated. The gas is routed to the gas fueled compressor engine (ENG001), compressed, metered and sent to the sales gas line. The condensate from the two phase separators flows to the condensate storage tanks (TANKSCOND001-010). 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 three enclosed combustors (EC001-003) 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 from Central Unit 2H, one of the wells in the Jonathan Davis Well Pad, and the gas from Hiley Unit 2H, one of the wells in the Diane Davis Well Pad. These extended analyses are considered representative of the materials from Rock Run Pad, being in the same Marcellus rock formation.

Attachment F
Plot Plan

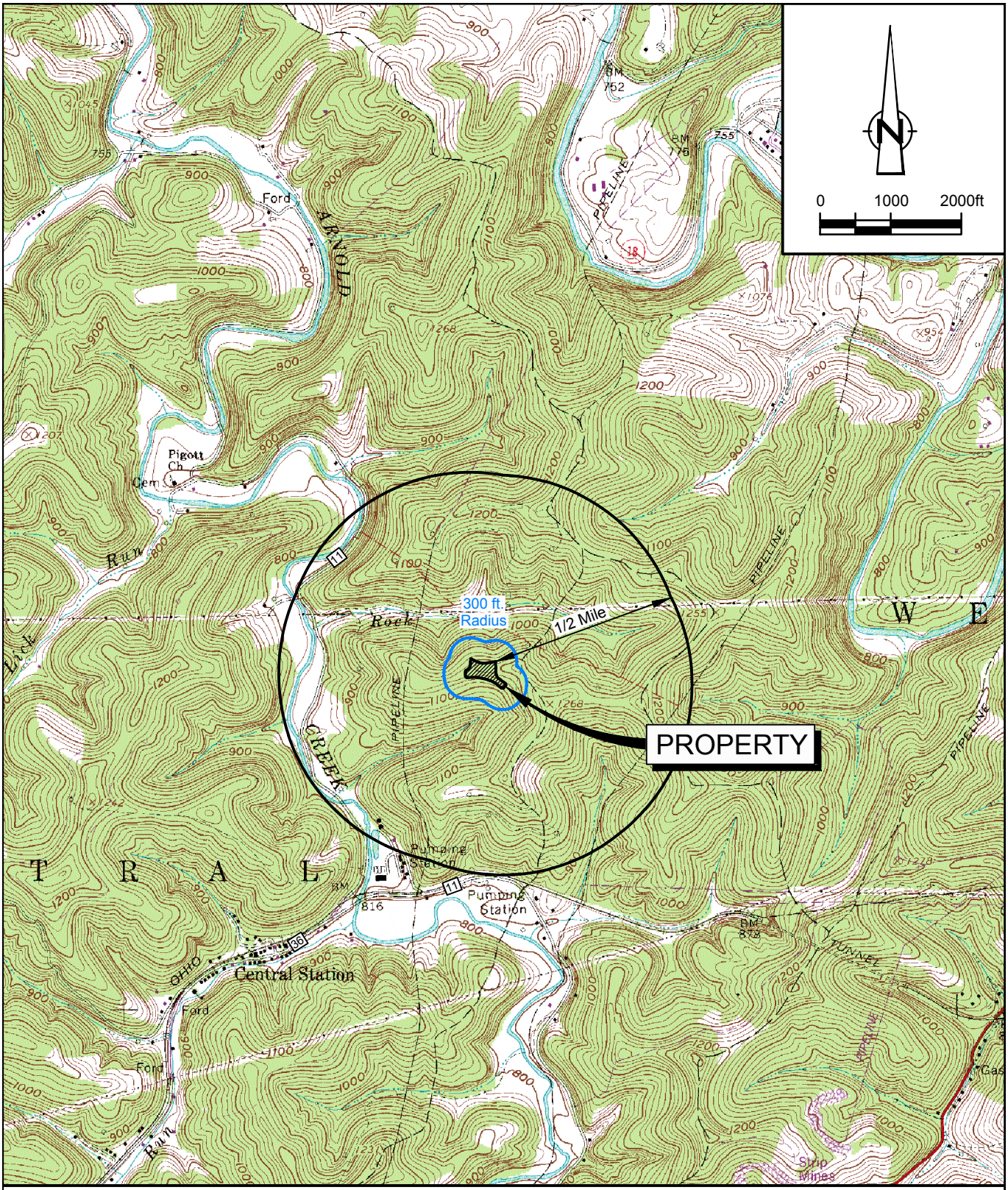


Attachment F

PLOT PLAN
ROCK RUN PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(248)GN-WA002 MAY 20, 2016

Attachment G
Area Map



SOURCE: USGS QUADRANGLE MAP;
WEST UNION, WEST VIRGINIA

SITE COORDINATES: LAT. 39.304923, LONG. -80.814648
SITE ELEVATION: 1181 ft AMSL

GHD

Attachment G

AREA MAP
ROCK RUN WELL PAD
ANTERO RESOURCES
Doddridge County, West Virginia

82715-00(248)GN-WA003 MAY 20, 2016

Attachment H
G70-B Section Applicability Form

ATTACHMENT H – G70-B SECTION APPLICABILITY FORM

General Permit G70-B Registration
Section Applicability Form

General Permit G70-B was developed to allow qualified applicants to seek registration for a variety of sources. These sources include gas well affected facilities, storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, centrifugal compressors, reciprocating compressors, reciprocating internal combustion engines (RICEs), tank truck loading, fugitive emissions, 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-B 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.

GENERAL PERMIT G70-B APPLICABLE SECTIONS	
☒Section 5.0	Gas Well Affected Facility (NSPS, Subpart OOOO)
☒Section 6.0	Storage Vessels Containing Condensate and/or Produced Water[1]
☐Section 7.0	Storage Vessel Affected Facility (NSPS, Subpart OOOO)
☐Section 8.0	Control Devices and Emission Reduction Devices not subject to NSPS Subpart OOOO and/or NESHAP Subpart HH
☒Section 9.0	Small Heaters and Reboilers not subject to 40CFR60 Subpart Dc
☐Section 10.0	Pneumatic Controllers Affected Facility (NSPS, Subpart OOOO)
☐Section 11.0	Centrifugal Compressor Affected Facility (NSPS, Subpart OOOO)[2]
☐Section 12.0	Reciprocating Compressor Affected Facility (NSPS, Subpart OOOO)[2]
☒Section 13.0	Reciprocating Internal Combustion Engines, Generator Engines, Microturbines
☒Section 14.0	Tanker Truck Loading[3]
☐Section 15.0	Glycol Dehydration Units[4]

1 Applicants that are subject to Section 6 may also be subject to Section 7 if the applicant is subject to the NSPS, Subpart OOOO control requirements or the applicable control device requirements of Section 8.

2 Applicants that are subject to Section 11 and 12 may also be subject to the applicable RICE requirements of Section 13.

3 Applicants that are subject to Section 14 may also be subject to control device and emission reduction device requirements of Section 8.

4 Applicants that are subject to Section 15 may also be subject to the requirements of Section 9 (reboilers). Applicants that are subject to Section 15 may also be subject to control device and emission reduction device requirements of Section 8.

Attachment I
Emission Units/ ERD Table

ATTACHMENT I – EMISSION UNITS / EMISSION REDUCTION DEVICES (ERD) TABLE

Include ALL emission units and air pollution control devices /ERDs that will be part of this permit application review. This information is required for all sources regardless of whether it is a construction, modification, or administrative update.

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed/ Modified	Manufac. Date[3]	Design Capacity	Type[4] and Date of Change	Control Device(s)[5]	ERD (s)[6]
GPU001, GPU002, GPU003, GPU004, GPU005, GPU006, GPU007, GPU008, GPU009, GPU010	EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009, EP-GPU010	Gas Production Unit Heater	2016		1.5 MMBtu/hr	Existing	N/A	
LH001, LH002, LH003, LH004, LH005, LH006, LH007, LH008, LH009, LH010	EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	Line Heater	2016		2.0 MMBtu/hr	Existing	N/A	
F001	F001	Fugitives	2016		N/A	Existing	N/A	
TANKCOND001-010	EP-EC001, EP-EC002, EP-EC003	Condensate Tank F/W/B	2016		400 bbl each	Existing	EC001, EC002, EC003	
TANKPW001-002	EP-EC001, EP-EC002, EP-EC003	PW Tank F/W/B	2016		400 bbl each	Existing	EC001, EC002, EC003	
L001	EP-L001	Loading (Condensate)	2016		200 bbl capacity (each)	Existing	N/A	
L002	EP-L002	Loading (Produced Water)	2016		200 bbl capacity (each)	Existing	N/A	
HR001	EP-HR001	Haul Truck	2016		40 ton capacity	Existing	N/A	
EC001	EP-EC001	Enclosed Combustor	2016		90 scf/min	Existing	N/A	
EC002	EP-EC002	Enclosed Combustor	2016		90 scf/min	Existing	N/A	
EC003	EP-EC003	Enclosed Combustor	2016		90 scf/min	New	N/A	
PCV	EP-PCV	Pneumatic CV	2016		6.6 scf/day/PCV	Existing	N/A	
ENG001	EP-ENG001	Compressor Engine	2016	2013	24 HP	Existing	Non-Selective Catalytic Reduction	

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 When required by rule.
4 New, modification, removal, existing.
5 For Control Devices use the following numbering system: 1C, 2C, 3C, ... or other appropriate designation.
6 For ERDs use the following numbering system: 1D, 2D, 3D, ... or other appropriate designation.

Attachment J
Fugitive Emissions Summary Sheet

ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions , etc.
Use extra pages for each associated source or equipment if necessary.

Source/Equipment:

Leak Detection Method Used	☐ Audible, visual, and	☑ Infrared (FLIR) cameras	☐ Other (please describe)	☐ None required

Component Type	Closed Vent System	Count	Monitor Frequency	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)		
						VOC	HAP	GHG (CO_2e)
Valves	☐ Yes ☑ No	500	Quarterly monitoring	EPA	gas	2.75	0.41	353.81
Valves	☐ Yes ☑ No	520	Quarterly monitoring	EPA	liquid	11.99	1.32	4.13
Connections (Not sampling)	☐ Yes ☑ No	590	Quarterly monitoring	EPA	gas	0.14	2.16E-02	18.56
Flanges	☐ Yes ☐ No	130	Quarterly monitoring	EPA	gas	0.06	9.26E-03	7.97
Loading	☐ Yes ☑ No	2	Quarterly monitoring	EPA	gas	4.22	4.39E-02	2.09

[1] Other equipment types may include compressor seals, relief valves, diaphragms, drains, meters, etc.

Please provide an explanation of the sources of fugitive emissions (e. g. pigging operations, equipment blowdowns, pneumatic controllers, etc.)

Please indicate if there are any closed vent bypasses (include component)

Specify all equipment used in the closed vent system (e. g. VRU, ERD, thief hatches, tanker truck loading, etc.)

Attachment K
Gas Well Affected Facility Data Sheet

ATTACHMENT K – 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).			
API Number	**Date of Flowback**	**Date of Well Completion**	**Green Completion and/or Combustion Device**
47017067180000	11/1/2016	9/1/2016	Green
47017067190000	11/1/2016	9/1/2016	Green
47017067200000	11/1/2016	9/1/2016	Green
47017064940000	11/1/2016	9/1/2016	Green
47017064760000	11/1/2016	9/1/2016	Green
47017065090000	11/1/2016	9/1/2016	Green
4 wells not permitted.			

Note: If future wells are planned and no API number is available please list as PLANNED.
If there are existing wells that commenced construction prior to August 23, 2011, please acknowledge as existing.

This is the same API (American Petroleum Institute) 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 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 L
Storage Vessel Data Sheet

ATTACHMENT L – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for each new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water . (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

☐ Composition of the representative sample used for the simulation
☐ For each stream that contributes to flashing emissions:
  ☐ Temperature and pressure (inlet and outlet from separator(s))
  ☐ Simulation-predicted composition
  ☐ Molecular weight
  ☐ Flow rate
☐ Resulting flash emission factor or flashing emissions from simulation
☐ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: Tanks	2. Tank Name: Condensate Tank 001-010
3. Emission Unit ID number: TANKCOND001-010	4. Emission Point ID number. EP-EC001, EP-EC002, EP-EC003
5. Date Installed , Modified or Relocated (for existing tanks) 2016 Was the tank manufactured after August 23, 2011? ☑ Yes ☐ No	6. Type of change: ☑ New construction ☐ New stored material ☐ Other ☐ Relocation

7A. Description of Tank Modification (if applicable)

7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material.
☐ Yes ☑ No

7C.Was USEPA Tanks simulation software utilized?
☐ Yes ☑ No

If Yes, please provide the appropriate documentation and items 8-42 below are not required.

TANK INFORMATION

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 (or Length) (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" and considers design liquid levels and overflow valve heights.: 400bbls

13A. Maximum annual throughput (gal/yr): 8431500	13B. Maximum daily throughput (gal/day): 23100
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 51	15. Maximum tank fill rate (gal/min) 168

16. Tank fill method ☐ Submerged ☑ Splash ☐ Bottom Loading

17. Is the tank system a variable vapor space system? ☐ Yes ☑ No

If yes, (A) What is the volume expansion capacity of the system (gal)?
(B) What are the number of transfers into the system per year?

18. Type of tank (check all that apply):

☑ Fixed Roof ☑ vertical ☐ horizontal ☑ 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
☐ other

ATTACHMENT L – STORAGE VESSEL DATA SHEET

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

- ☐ Does Not Apply
- ☐ Inert Gas Blanket of
- ☑ Vent to Vapor Combustion Device (vapor combustors, flares, thermal oxidizers, enclosed combustors)
- ☐ Conservation Vent (psig)
  Vacuum Pressure
- ☐ Emergency relief Valve (psig)
  Vacuum Pressure
- ☐ Thief Hatch Weighted ☐ Yes ☐ No

Complete appropriate Air Pollution Control Device Sheet

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

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emission Loss		[1]Estimation Method
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Please see Table 6 and Table 7									

TANK CONSTRUCTION & OPERATION INFORMATION

21. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy-coated ☑ Other (describe): Steel

21A. Shell Color: Green	21B. Roof Color: Green	21C. Year Last Painted 2016

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

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

23. Operating Pressure Range (psig): 0 psig, atmospheric
Must be listed for tanks using VRUs with closed vent system

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

25. Complete the following section for **Floating Roof Tanks** Does Not Apply

25A. Year Internal Floaters Installed:

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

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ Yes ☐ No

25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe)

25E. Is the Floating Roof equipped with a weather shield? ☐ Yes ☐ No

25F. Describe deck fittings

26. Complete the following section for Internal Floating Roof Tanks ☑ Does not apply

26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction

26C. Deck seam:
☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft wide ☐ 5 x 12 ft wide ☐ Other (describe)

26D. Deck seam length (ft)	26E. Area of deck (ft^2)	26F. For column supported tanks: Number of columns:	26G. For column supported tanks, Diameter of each column:

27. Closed Vent System with VRU ☐ Yes ☑ No

28. Closed Vent System with Enclosed Combustor? ☑ Yes ☐ No

ATTACHMENT L – STORAGE VESSEL DATA SHEET

SITE INFORMATION

29. Provide the city and state on which the data in this section are based.: Charleston, WV	
30. Daily Average Ambient Temperature (°F): 65.07	31. Annual Average Maximum Temperature (°F): 75.94
32. Annual Average Minimum Temperature (°F): 46.55	33. Average Wind Speed (miles/hr): 18.5mph
34. Annual Average Solar Insulation Factor (BTU/(ft2·day)) 1030.236	35. Atmospheric Pressure (psia): 14.8 (based off local conditions, could not find annual)

LIQUID INFORMATION

36. Average daily temperature range of bulk liquid (F):	65.08	36A. Minimum (°F):	46.56	36B. Maximum (°F)	75.94
37. Average operating pressure range of tank (psig):	0	37A. Minimum (psig)	0	37B. Maximum (psig)	0

38A. Minimum Liquid Surface Temperature (°F)	46.56	38B. Corresponding Vapor Pressure (psia)	1.83
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	2.67
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	3.30

41. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.

41A. Material Name or Composition	Condensate		
41B. CAS Number	mix of HC		
41C. Liquid Density (lb/gal)	5.4900		
41D. Liquid Molecular Weight (lb/lb-mole)	83.00		
41E. Vapor Molecular Weight (lb/lb-mole)	41.6113		
Maximum Vapor Pressure 41F. True (psia)	3.3028		
41G. Reid (psia)	4.4100		
Months Storage per Year 41H. From - To	year round		

ATTACHMENT L – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for each new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water . (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

☐ Composition of the representative sample used for the simulation
☐ For each stream that contributes to flashing emissions:
- ☐ Temperature and pressure (inlet and outlet from separator(s))
- ☐ Simulation-predicted composition
- ☐ Molecular weight
- ☐ Flow rate

☐ Resulting flash emission factor or flashing emissions from simulation
☐ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name: Tanks	2. Tank Name: Produced Water Tank 001-002
3. Emission Unit ID number: TANKPW001-002	4. Emission Point ID number. EP-EC001, EP-EC002, EP-EC003
5. Date Installed , Modified or Relocated (for existing tanks) 2016 Was the tank manufactured after August 23, 2011? ☑ Yes ☐ No	6. Type of change: ☑ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification (if applicable)	
7B. Will more than one material be stored in this tank? If so, a separate form must be completed for each material. ☐ Yes ☑ No	
7C.Was USEPA Tanks simulation software utilized? ☐ Yes ☑ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION

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 (or Length) (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" and considers design liquid levels and overflow valve heights.: 400bbls	
13A. Maximum annual throughput (gal/yr): 7511700	13B. Maximum daily throughput (gal/day): 20580
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume): 224	15. Maximum tank fill rate (gal/min) 168
16. Tank fill method ☐ Submerged ☑ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☑ No	
If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☑ Fixed Roof ☑ vertical ☐ horizontal ☑ 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	

ATTACHMENT L – STORAGE VESSEL DATA SHEET

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

☐ Does not apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket ☐ Carbon Adsorption

☑ Vent to Vapor Combustion Device (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig)
Vacuum Pressure

☐ Emergency relief Valve (psig)
Vacuum Pressure

☐ Thief Hatch Weighted ☐ Yes ☐ No

Complete appropriate Air Pollution Control Device Sheet

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

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emission Loss		[1] Estimation Method
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
Please see Table 6 and Table 7									

TANK CONSTRUCTION & OPERATION INFORMATION

21. Tank Shell Construction:
☐ Riveted ☐ Gunite lined ☐ Epoxy- ☑ Other(describe): Steel

21A. Shell Color: Green	21B. Roof Color: Green	21C. Year Last Painted 2016

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

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

23. Operating Pressure Range (psig): 0 psig, atmospheric
Must be listed for tanks using VRUs with closed vent system

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

25. Complete the following section for **Floating Roof Tanks** Does Not Apply

25A. Year Internal Floaters Installed:

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

25C. Is the Floating Roof equipped with a Secondary Seal? ☐ Yes ☐ No

25D. If YES, how is the secondary seal mounted? (check one)
☐ Shoe ☐ Rim ☐ Other(describe):

25E. Is the Floating Roof equipped with a weather shield? ☐ Yes ☐ No

25F. Describe deck fittings

26. Complete the following section for Internal Floating Roof Tanks ☑ Does not apply

26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction

26C. Deck seam:
☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ Other

26D. Deck seam length (ft)	26E. Area of deck (ft2)	26F. For column supported tanks: Number of columns:	26G. For column supported tanks, Diameter of each column:

27. Closed Vent System with VRU ☐ Yes ☑ No

28. Closed Vent System with Enclosed Combustor? ☑ Yes ☐ No

ATTACHMENT L – STORAGE VESSEL DATA SHEET

SITE INFORMATION

29. Provide the city and state on which the data in this section are based.: Charleston, WV	
30. Daily Average Ambient Temperature (°F): 65.07	31. Annual Average Maximum Temperature (°F): 75.94
32. Annual Average Minimum Temperature (°F): 46.55	33. Average Wind Speed (miles/hr): 5.9mph
34. Annual Average Solar Insulation Factor (BTU/(ft2·day)) 1030.236	35. Atmospheric Pressure (psia): 14.8 (based off local conditions, could not find annual)

LIQUID INFORMATION

36. Average daily temperature range of bulk liquid (F):	65.08	36A. Minimum (°F):	46.56	36B. Maximum (°F)	75.94
37. Average operating pressure range of tank (psig):	0	37A. Minimum (psig)	0	37B. Maximum (psig)	0

38A. Minimum Liquid Surface Temperature (°F)	46.56	38B. Corresponding Vapor Pressure (psia)	0.22
39A. Average Liquid Surface Temperature (°F)	65.08	39B. Corresponding Vapor Pressure (psia)	0.37
40A. Maximum Liquid Surface Temperature (°F)	75.94	40B. Corresponding Vapor Pressure (psia)	0.49

41. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.

41A. Material Name or Composition	Produced Water		
41B. CAS Number	mix of HC and water		
41C. Liquid Density (lb/gal)	8.3300		
41D. Liquid Molecular Weight (lb/lb-mole)	18.02		
41E. Vapor Molecular Weight (lb/lb-mole)	18.4811		
Maximum Vapor Pressure 41F. True (psia)	0.4924		
41G. Reid (psia)	1.0232		
Months Storage per Year 41H. From - To	year round		

Attachment M
Natural Gas Fired Fuel Burning Unit(s) Data Sheet

ATTACHMENT M – SMALL HEATERS AND REBOILERS NOT SUBJECT TO 40CFR60 SUBPART DC
DATA SHEET

Complete this data sheet for each small heater and reboiler not subject to 40CFR60 Subpart Dc at the facility. ***The Maximum Design Heat Input (MDHI) must be less than 10 MMBTU/hr.***

Emission Unit ID#	Emission Point ID#	Emission Unit Description (Manufacturer, model#)	Year Installed/ Modified	Type and Date of Change	Maximum Design Heat Input (MMBTU/hr)	Fuel Heating Value (BTU/scf)
GPU001	EP-GPU001	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU002	EP-GPU002	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU003	EP-GPU003	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU004	EP-GPU004	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU005	EP-GPU005	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU006	EP-GPU006	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU007	EP-GPU007	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU008	EP-GPU008	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU009	EP-GPU009	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
GPU010	EP-GPU010	Gas Production Unit Heater	2016	Existing	1.5	1216.9949
LH001	EP-LH001	Line Heater	2016	Existing	2	1216.9949
LH002	EP-LH002	Line Heater	2016	Existing	2	1216.9949
LH003	EP-LH003	Line Heater	2016	Existing	2	1216.9949
LH004	EP-LH004	Line Heater	2016	Existing	2	1216.9949
LH005	EP-LH005	Line Heater	2016	Existing	2	1216.9949
LH006	EP-LH006	Line Heater	2016	Existing	2	1216.9949
LH007	EP-LH007	Line Heater	2016	Existing	2	1216.9949
LH008	EP-LH008	Line Heater	2016	Existing	2	1216.9949
LH009	EP-LH009	Line Heater	2016	Existing	2	1216.9949
LH010	EP-LH010	Line Heater	2016	Existing	2	1216.9949

1. Enter the appropriate Emission Unit (or Source) identification number 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. Enter design heat input capacity in MMBtu/hr.

5. Enter the fuel heating value in BTU/standard cubic foot.

Attachment N
Internal Combustion Engine Data Sheet

ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID#	ENG001		
Engine Manufacturer/Model	Engine (Kubota DG972-E2)		
Manufacturers Rated bhp/rpm	24 HP @ 3600 rpm		
Source Status	ES		
Date Installed/ Modified/ Removed/ Relocated	2016		
Engine Manufacturer/ Reconstruction Date	2013		
Check all applicable Federal Rules for the engine (include EPA Certification of Conformity if applicable)	☑ 40CFR60 Subpart JJJJ ☑ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☑ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐ 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐ 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type	4SRB		
APCD Type	NSCR		
Fuel Type	RG		
H2S (gr/ 100 scf)	0		
Operating bhp/rpm	16.5 HP @ 2400 rpm		
BSFC (BTU/bhp-hr)	9773		
Hourly Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	193 ft^3/hr gal/hr		ft^3/hr gal/hr
Fuel Usage or Hours of Operation Metered	1.6907 $MMft^3/yr$ gal/yr		$MMft^3/yr$ gal/yr

Calculation Methodology	Pollutant	Hourly PTE (lb/hr)	Annual PTE (tons/year)	Hourly PTE (lb/hr)	Annual PTE (tons/year)	Hourly PTE (lb/hr)	Annual PTE (tons/year)
MD	NOx	0.3158	1.3831				
MD	CO	5.6445	24.7228				
AP	VOC	0.0069	0.0304				
AP	SO2	0.0001	0.0006				
AP	PM10	0.0022	0.0097				
AP	Formaldehyde	0.0048	0.0210				
AP	Total HAPs	0.0054	0.0235				
OT	GHG (CO2e)	27.1069	118.7281				

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

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

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

Certificate Number: DKBXS.9622HP-002

Effective Date: 11/20/2012

Expiration Date: 12/31/2013

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 11/20/2012

Revision Date: N/A

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

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

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

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

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

TECHNICAL INFORMATION

DG972-SAEH-S1

NATURAL GAS FUEL ENGINE

July, 2006

KUBOTA Corporation

CONTENTS

Specifications and dimensions are subject to change without prior notice.

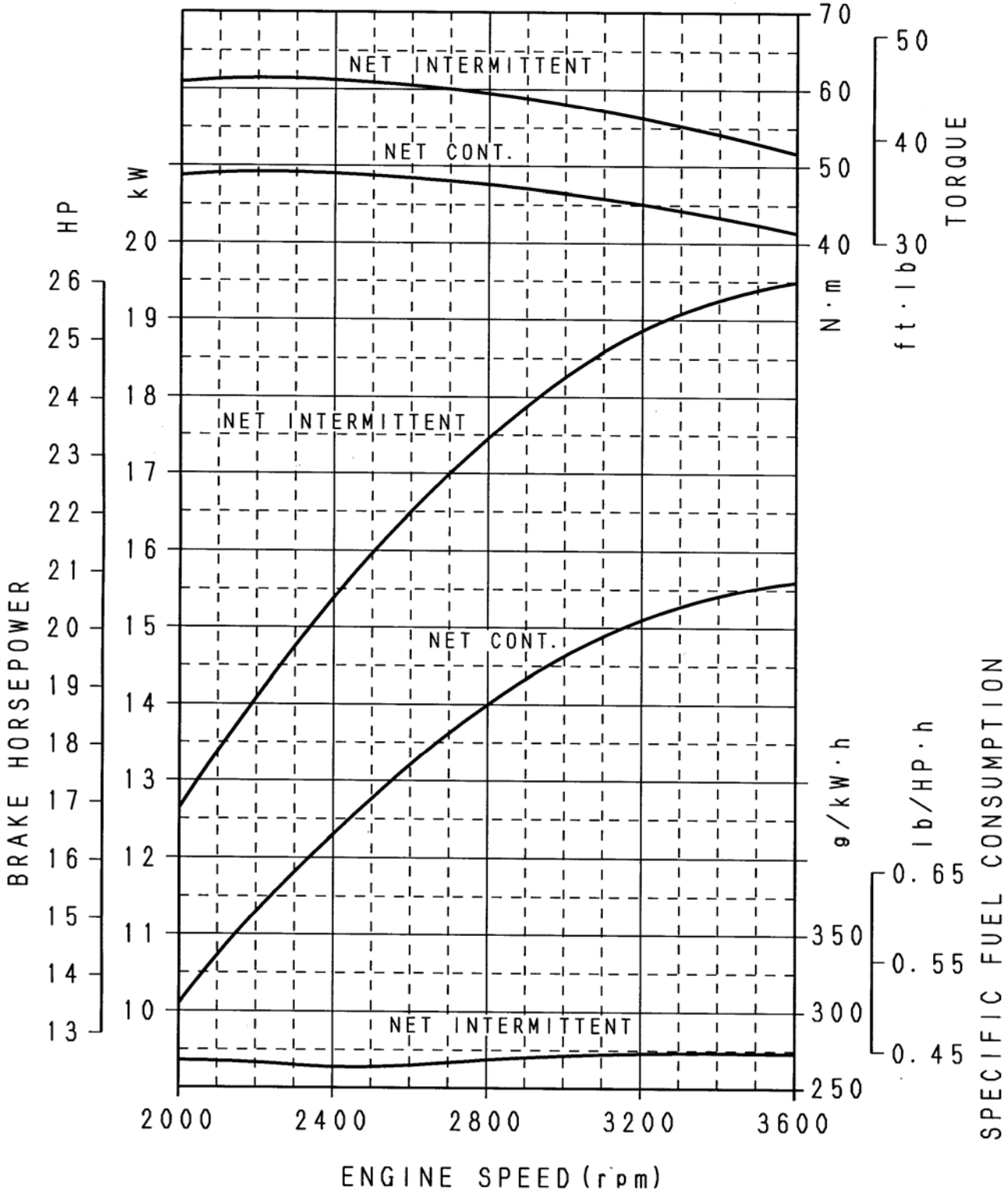
1. GENERAL SPECIFICATIONS

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

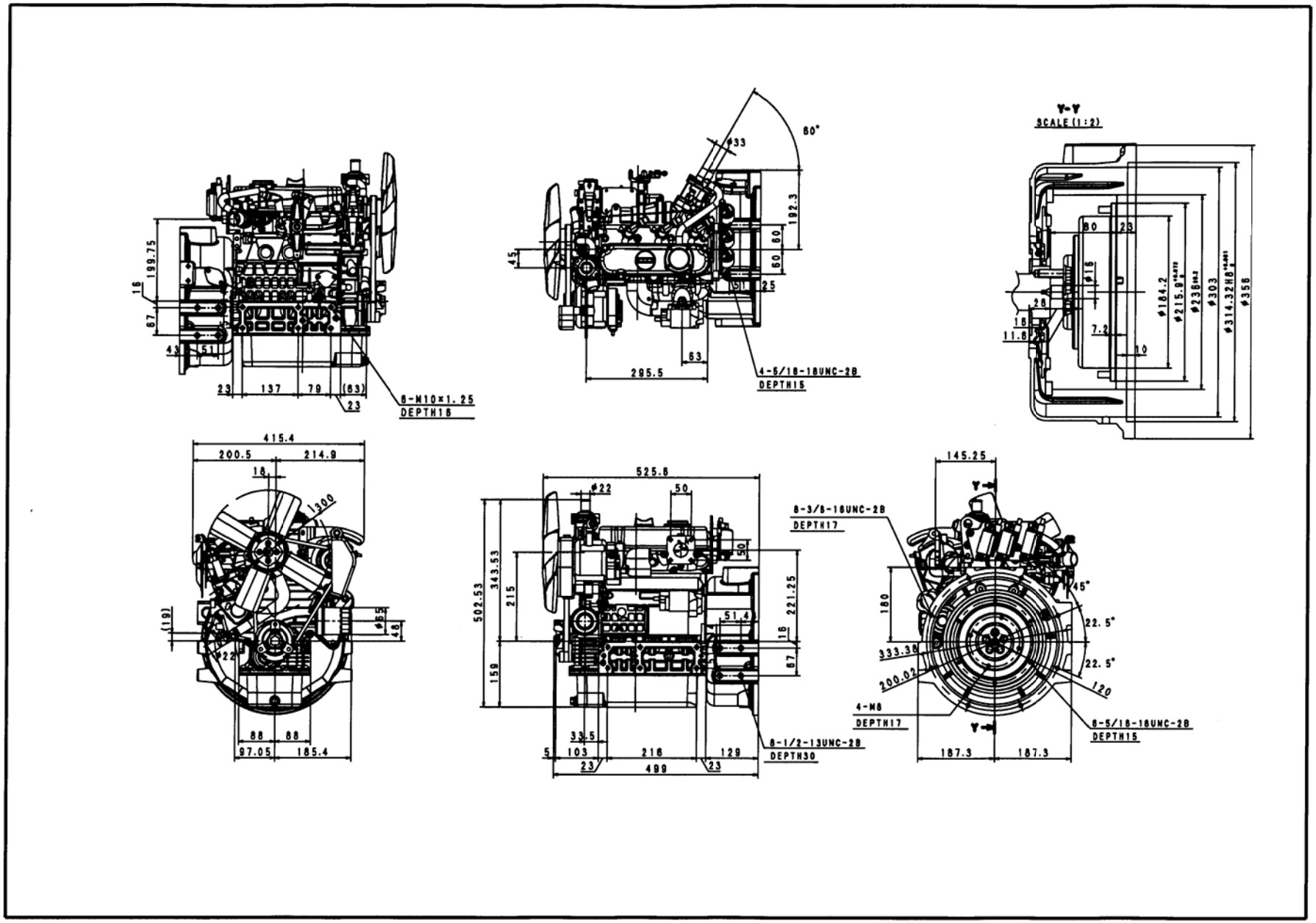
2. PERFORMANCE CURVES

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/m^3 (1236BTU/ft^3)
   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/m^3 (1236BTU/ft^3)
   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

$Q_1=Vh \bullet N \bullet C \bullet \eta \bullet 10^{-3}$

Q_1: Amount of intake air (m^3/min)
Vh: Total displacement (L)
N: Engine speed (rpm)
C: Coefficient=0.5
η: Intake efficiency
Natural Gas: 0.77

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

$1L=61.0237in^3=0.035315ft^3$
$1ft^3=28.3168L$
$1L/sec=3.6m^3/h=2.1189ft^3/min$

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

1. Conversion rates $1L=61.0237in^3=0.035315ft^3$
   $1ft^3=28.3168L$
   $1L/sec=3.6m^3/h=127.133ft^3/hr$

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•Ne•be•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

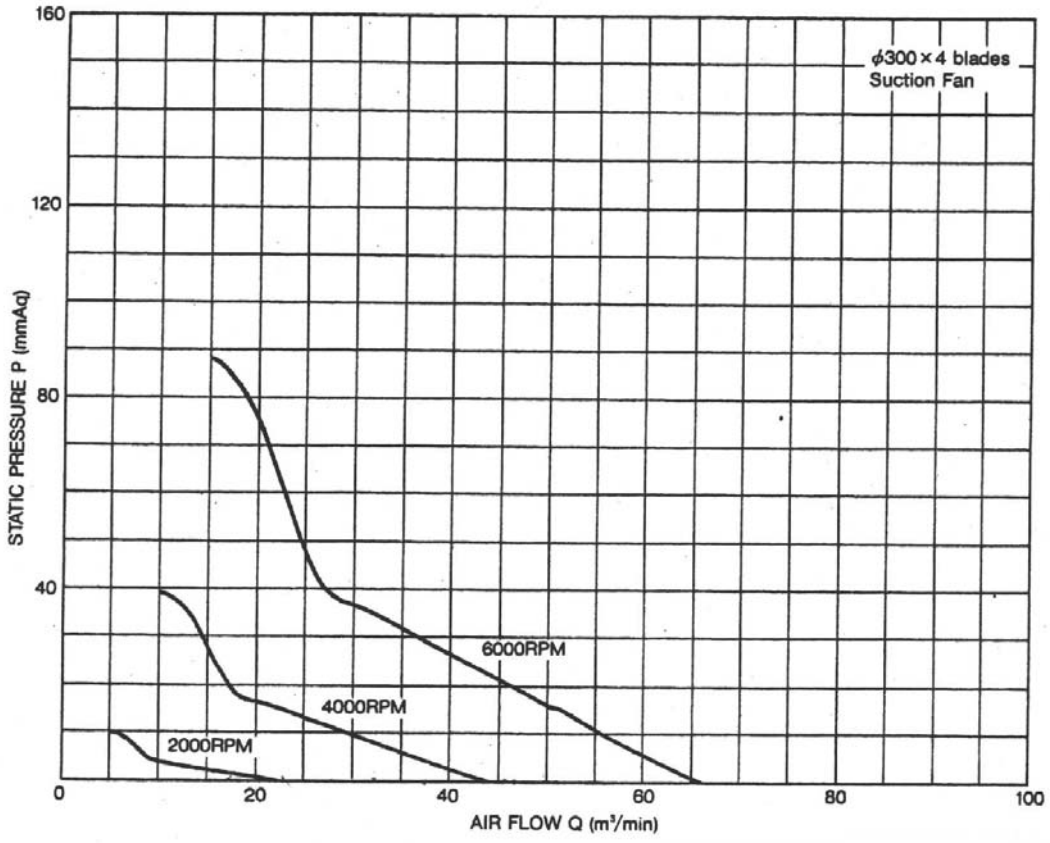
Be: Specific fuel consumption

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

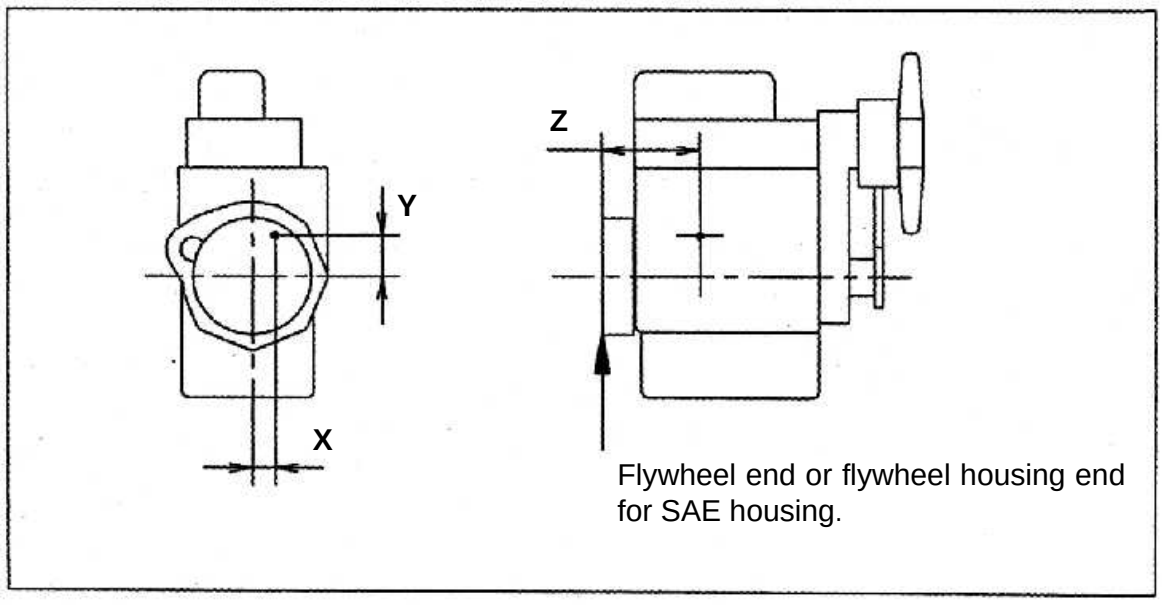
1. With standard flywheel and rear-end plate

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)

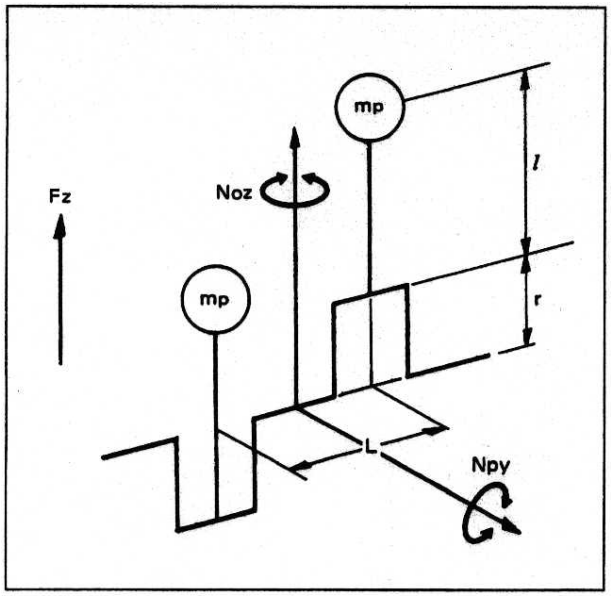
Note
Cooling water and lubricating oil weight is not included in above engine weight.



Flywheel end or flywheel housing end for SAE housing.

4-9) UNBALANCED FORCES OF ENGINES

1. Base data



FZ: Unbalanced inertia force
Npy, Noz: Unbalanced inertia couple
mp: Reciprocating mass
r: Crank radius
l: Center distance of connecting rod
L: Cylinder distance
ω: Angular velocity

ω=2πn/60	n: Engine speed(rpm)

l=0.098m r=0.0368m L=0.080m	Cylinder bore (mm)	mp (kg)
	74.5	0.37/9.80665

2. Unbalanced inertia force and couple

($x\omega^2$)

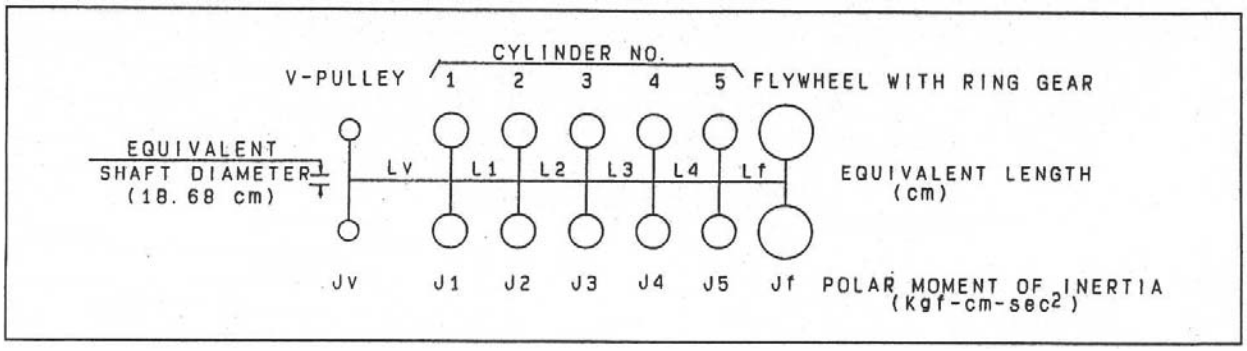
Model	No. of Cylinder	Cylinder Bore	Order	Fz	Npy	Noz
WG/DF/DG 972	3	74.5mm	1	0	0.000096	0.000096
			2	0	0.000072	0

▼An example of calculation

Calculation condition	ω^2	Fz, Npy, Noz		
			Order	Calculation
Engine model DG972 Engine speed 3600(rpm)	$[2 \times \pi \times 3600/60]^2$ =142122	Fz	1	0
			2	0
		Npy	1	0.000096 × 142122=13.6kg
			2	0.000072 × 142122=10.2kg
		Noz	1	0.000096 × 142122=13.6kg
			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]

			Tightening torque			Leak check pressure
	Qty.	Size	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 ϕ6.6 jet for the fuel calorific gas value of 11000kcal/m^3 (1236BTU/ft^3).
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/m^3 (1236BTU/ft^3)
supply pressure : 0.98 – 2.45kPa (7.35 – 18.38mmHg)

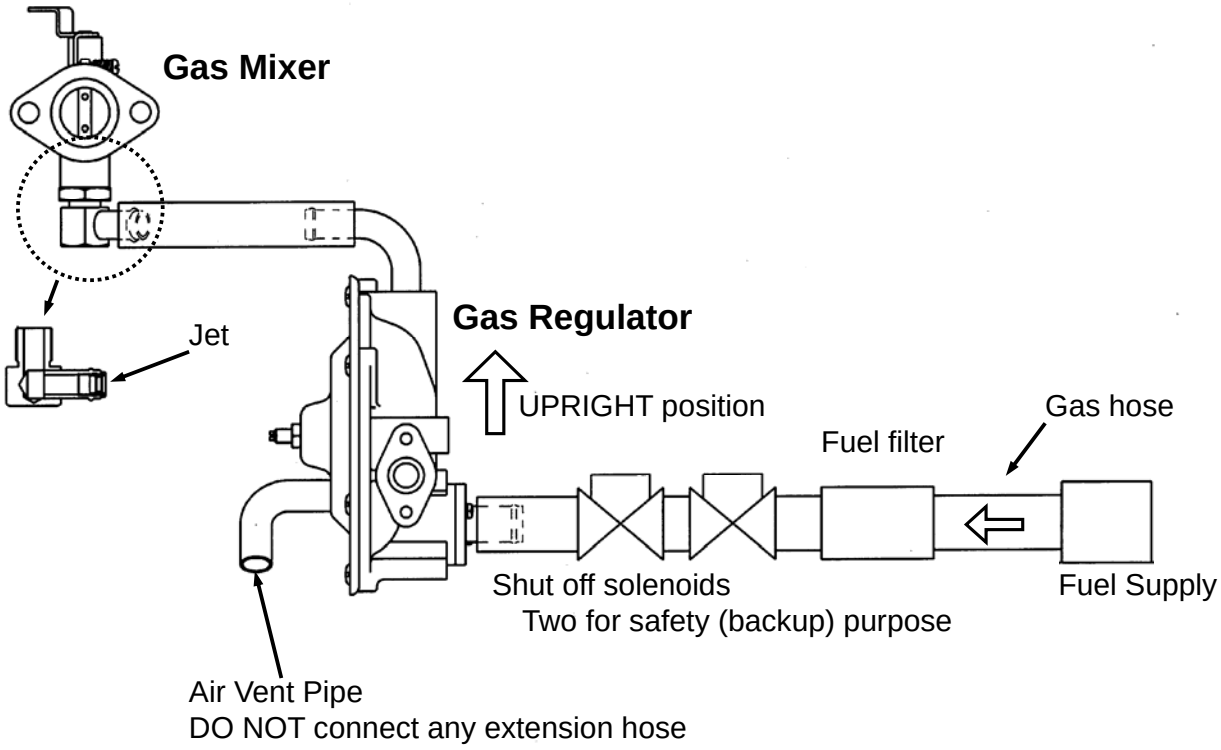
Equipments Vacuum Meter : Not KUBOTA supplied
Adjustable Jet : Service Tool

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

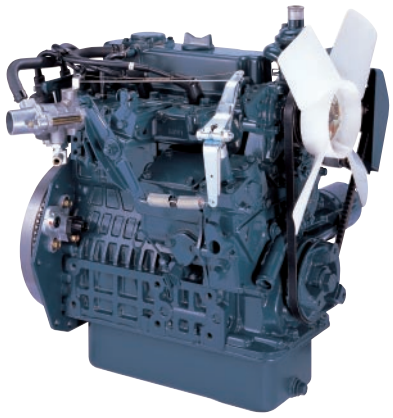
KUBOTA DG SERIES (3-cylinder)

DG972-E2

2 EPA Tier

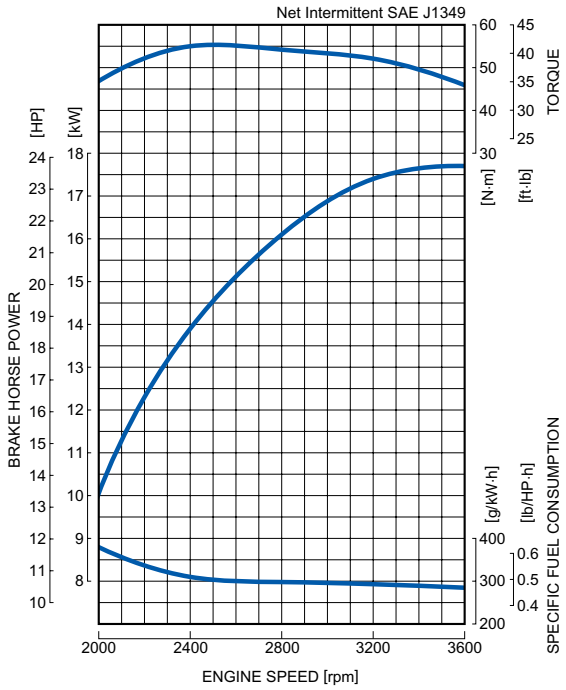
RATED POWER

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.

DG972-E2

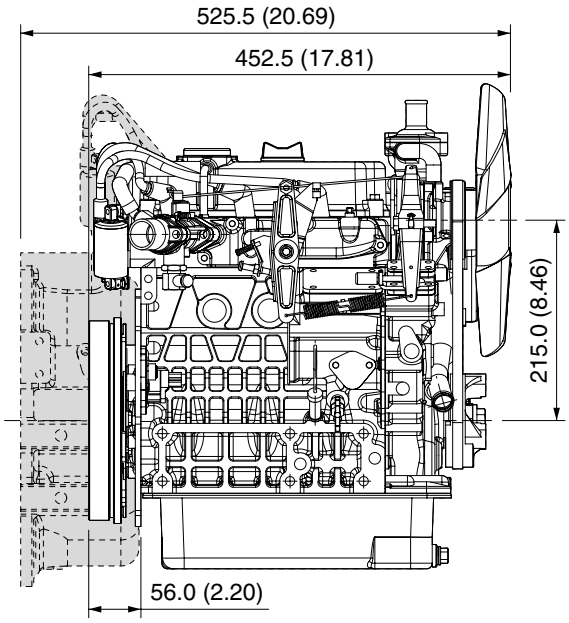
KUBOTA DG SERIES

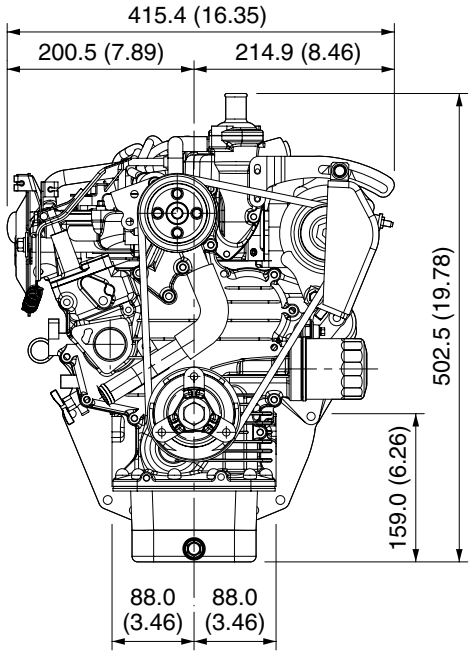
GENERAL SPECIFICATION

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

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

DIMENSIONS





Kubota

Your Driving Force
KUBOTA ENGINE

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

1334-01-COM '08.09. .STD

Attachment O
Tanker Truck Loading Data Sheet

ATTACHMENT O – TANKER TRUCK LOADING DATA S HEET

Complete this data sheet for each new or modified bulk liquid transfer area or loading rack at the facility. This is to be used for bulk liquid transfer operations to tanker trucks. Use extra pages if necessary.

Truck Loadout Collection Efficiencies

The following applicable capture efficiencies of a truck loadout are allowed:

- For tanker trucks passing the MACT level annual leak test – 99.2%
- For tanker trucks passing the NSPS level annual leak test – 98.7%
- For tanker trucks not passing one of the annual leak tests listed above – 70%

Compliance with this requirement shall be demonstrated by keeping records of the applicable MACT or NSPS Annual Leak Test certification for ***every*** truck and railcar loaded/unloaded. This requirement can be satisfied if the trucking company provided certification that its entire fleet was compliant. This certification must be submitted in writing to the Director of the DAQ. These additional requirements must be noted in the Registration Application.

Emission Unit ID#:	L001, L002	Emission Point ID#:	EP-L001, EP-L002	Year Installed/ Modified:	2016

Emission Unit Description: Condensate Loading, Produced Water Loading

Loading Area Data

Number of Pumps: 2 | Number of Liquids Loaded: 2 | Max number of trucks loading at one time: 2

Are Tanker trucks pressure tested for leaks at this any other location? ☑ Yes ☐ No ☐ Not Required

If Yes, Please 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.

Provide description of closed vent system and any bypasses

Are any of the following truck loadout systems utilized? Yes

☐ Closed System to Tanker Truck passing a MACT level annual leak test?

☑ Closed System to Tanker Truck passing a NSPS level annual leak test?

☑ Closed System to Tanker Truck not passing an annual leak test and has vapor return?

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

Time	Jan - Mar	Apr - Jun	Jul - Sept	Oct - Dec
Hours/day	4	4	4	4
Days/week	7	7	7	7

Bulk Liquid Data (use extra pages as necessary)

Liquid Name		Condensate	Produced Water	
Max. Daily Throughput (1000 gal/day)		23.10	20.58	
Max. Annual Throughput (1000 gal/yr)		8431.50	7511.70	
Loading Method		BF	BF	
Max. Fill Rate (gal/min)		168	168	
Average Fill Time (min/loading)		50	50	
Max. Bulk Liquid Temperature (F)		75.94	75.94	
True Vapor Pressure		3.30	0.49	
Cargo Vessel Condition		U	U	
Control Equipment or Method		None	None	
Max. Collection Efficiency (%)		0	0	
Max. Control Efficiency (%)		0	0	
Max VOC Emission Rate	Loading (lb/hr)	10.0805	0.0007	
	Annual (ton/yr)	4.2160	0.0003	
Max HAP Emission Rate	Loading (lb/hr)	0.1049	1.81E-06	
	Annual (ton/yr)	0.0439	6.74E-07	
Estimation Method		Promax	Promax	

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 servi O Other (describe)

4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets)

CA Carbon Adsorption VB Dedicated Vapor Balance (closed system)

ECD Enclosed Combustion Device F Flare

TO Thermal Oxidization or Incineration

5 EPA EPA Emission Factor in AP-42 MB Material Balance

TM Test Measurement based upon test data submittal O Other (describe)

Attachment R
Air Pollution Control Device – Emission Reduction Device Sheets

ATTACHMENT R – AIR POLLUTION CONTROL DEVICE / EMISSION REDUCTION DEVICE SHEETS

Complete the applicable air pollution control device sheet s for each flare, vapor combustor, thermal oxidizer, condenser, adsorption system, vapor recovery unit , BTEX Eliminator, Reboiler with and without Glow Plug, etc. at the facility. Use extra pages if necessary.

Emissions calculations must be performed using the most conservative control device efficiency.

The following five (5) rows are only to be completed if registering an alternative air pollution control device.

Emission Unit ID:	NA	Make/Model:	NA
Primary Control Device ID:	NA	Make/Model	NA
Control Efficiency (%):	NA	APCD/ERD Data Sheet Completed	☐ Yes ☐ No
Secondary Control Device ID:	NA	Make/Model	NA
Control Efficiency (%):	NA	APCD/ERD Data Sheet Completed	☐ Yes ☐ No

VAPOR COMBUSTION (Including Enclosed Combustors)

General Information

Control Device ID#:	EC001-003	Installation Date: ☑ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity		Maximum Design Heating Input (from mfg. spec sheet)	Design Heat Content
5458 sdfh	131000 scfd	12.0 MMBTU/hr	2300 BTU/scf

Control Device Information

Type of Vapor Combustion Control?

☑ Enclosed Combustion Device ☐ Elevated Flare ☐ Ground Flare
☐ Thermal Oxidizer

Manufacturer: Cimarron Model: 48" HV ECD		Hours of operation per year?	8760

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# NA

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
TANKCOND001-010	Condensate Tanks		
TANKPW001-002	Produced Water Tanks		

If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.

Assist Type (Flares only)	Flare height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☑ Non	25 feet	3.33 feet	☑ Yes ☐ No Provide determination

Waste Gas Information

Maximum Waste Gas Flow Rate	Heat Value of Waste Gas Stream	Exit Velocity of the Emission Stream
41.21 (scfm)	2,180.05 BTU/ft^3	0.0789 (ft/s)

Please see Attachment S, Tables 6 & 7 for VOC composition/ characteristics of the waste gas stream to be burned.

Pilot Gas Information

Number of Pilot Lights	Fuel Flow Rate to Pilot Flame per Pilot	Heat Input per Pilot	Will automatic re-ignition be used?
3	12.6 scfh	12800 BTU/hr	☑ Yes ☐ No

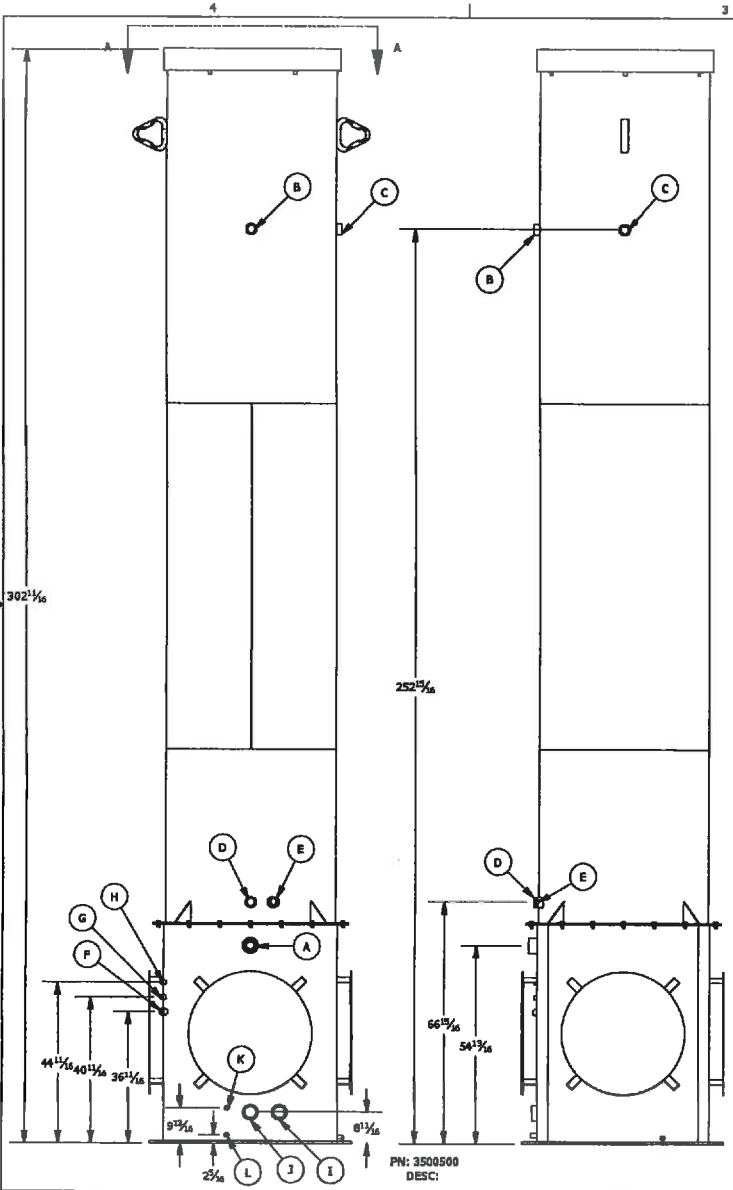
If automatic re-ignition is used, please describe the method. Flame Rectification, a thermocouple equivalent

Is pilot flame equipped with a monitor to detect the presence of the flame? ☑ Yes ☐ No	If Yes, What type? ☑ Thermocouple ☐ Infrared ☐ Ultraviolet ☐ Camera ☐ Other:

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).*

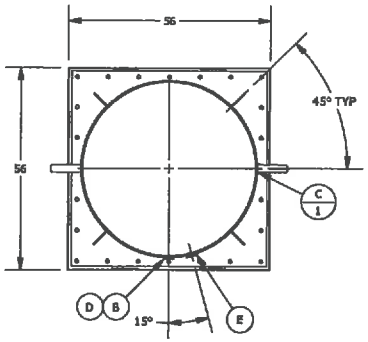
Additional information attached? ☑ Yes ☐ No Manufacturer's specs sheet

Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11 (b) and performance testing.



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

* >98% TVOC DRE, CERTIFIED USEPA 40 CFR 60, APPENDIX A, SOURCE EMMISIONS 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/in^2; 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.



VIEW A-A

PN: 3500500
DESC:

SCHEDULE OF NOZZLES				
MARK	QTY	DESCRIPTION	SERIES	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°
   CONTRICITY 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 S
Emissions Calculations

Table 1

Facility Information
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Oil and Gas Site General Information

Administrative Information	
Company Name	Antero Resources Corporation
Facility/Well Name	Rock Run Well Pad
Nearest City/Town	West Union
SIC Code	1311
Latitude/Longitude	39.304923, -80.814648
County	Doddridge County

Technical Information	
Max Condensate Site Throughput (bbl/day):	550
Max Produced Water Site Throughput (bbl/day):	490
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	10
IC Engines	1
Gas Production Unit Heaters	10
Line Heaters	10
Condensate Tanks	10
Produced Water Tanks	2
Loading Jobs	2
Enclosed Combustors	3

Table 2

Uncontrolled/Controlled Emissions Summary
Rock Run Well Pad
Doddridge County, 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, Engine, Gas Production Unit Heaters, Line Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling)[1]	3.4842	15.2606			97.125	425.41							1.3830	0.6511			0.4135	1.8110	0.0026	0.0113	6.76E-02	2.96E-01		
Flashing, Working and Breathing (F/W/B) Losses[2]	182.3426	798.6606			331.3825	1451.4553											24.3429	106.6219	0.0472	0.2068	0.2142	0.9383		
Engine Emissions[3]	6.93E-03	3.04E-02	3.16E-01	1.38E+00	2.71E+01	1.19E+02	5.64E+00	2.47E+01	1.38E-04	6.03E-04	2.22E-03	9.74E-03	2.22E-03	9.74E-03			5.38E-03	2.35E-02	3.70E-04	1.62E-03	4.57E-05	2.00E-04	4.80E-03	2.10E-02
Gas Production Unit Heater Emissions[4]	0.0678	0.2969	1.2325	5.3985	1,479.05	6,478.25	1.0353	4.5348	0.0074	0.0324	0.0937	0.4103	0.0937	0.4103	6.16E-06	2.70E-05	2.32E-02	1.02E-01	2.59E-05	1.13E-04			0.0009	0.0040
Line Heater Emissions[4]	0.0904	0.3959	1.6434	7.1981	1,972.07	8,637.67	1.3804	6.0464	0.0099	0.0432	0.1249	0.5471	0.1249	0.5471	8.22E-06	3.60E-05	3.09E-02	1.35E-01	3.45E-05	1.51E-04			0.0012	0.0054
TOTALS:	**185.9919**	**814.6444**	**3.1917**	**13.9797**	**3906.7378**	**17111.5114**	**8.0603**	**35.3039**	**0.0174**	**0.0762**	**0.2208**	**0.9671**	**1.6038**	**1.6182**	**1.44E-05**	**6.30E-05**	**24.8159**	**108.6936**	**0.0502**	**0.2200**	**0.2819**	**1.2347**	**0.0070**	**0.0305**
TOTALS (Excluding Fugitives):	**182.5077**	**799.3837**	**3.1917**	**13.9797**	**3809.6131**	**16686.1054**	**8.0603**	**35.3039**	**0.0174**	**0.0762**	**0.2208**	**0.9671**	**0.2208**	**0.9671**	**1.44E-05**	**6.30E-05**	**24.4024**	**106.8826**	**0.0476**	**0.2087**	**0.2143**	**0.9385**	**0.0070**	**0.0305**
UNCONTROLLED (Truck Loading Emissions)																								
Truck Loading Emissions[5]	10.0813	4.2162			5.0786	2.0853											0.1049	4.39E-02	0.0002	6.69E-05	0.0034	1.43E-03		
CONTROLLED EMISSIONS																								
Enclosed Combustor Emissions (from F/W/B losses)[6]	3.6471	15.9741	0.2510	1.0995	826.5296	3620.1995	0.2109	0.9236	2.27E-05	0.0001	0.0143	0.0627	0.0191	0.0836	1.26E-06	5.50E-06	0.4869	2.1327	0.0009	0.0041	0.0043	0.0188	2.84E-06	1.24E-05
Controlled Fugitive Emissions from Hauling													0.6915	0.3256										
TOTALS:	**3.65E+00**	**1.60E+01**	**2.51E-01**	**1.10E+00**	**8.27E+02**	**3.62E+03**	**2.11E-01**	**9.24E-01**	**2.27E-05**	**9.93E-05**	**1.43E-02**	**6.27E-02**	**7.11E-01**	**4.09E-01**	**1.26E-06**	**5.50E-06**	**4.87E-01**	**2.13E+00**	**9.44E-04**	**4.14E-03**	**4.28E-03**	**1.88E-02**	**2.84E-06**	**1.24E-05**
POTENTIAL TO EMIT[7]	**7.2963**	**36.1742**	**3.4427**	**15.0792**	**4401.8849**	**19282.3409**	**8.2711**	**36.2275**	**0.0174**	**0.0763**	**0.2351**	**1.0298**	**0.9314**	**1.3762**	**1.56E-05**	**6.85E-05**	**0.9599**	**4.2483**	**0.0040**	**0.0174**	**0.0720**	**0.3166**	**0.0070**	**0.0305**
POTENTIAL TO EMIT (Excluding Fugitives)	**3.8122**	**16.6973**	**3.4427**	**15.0792**	**4304.7602**	**18854.8496**	**8.2711**	**36.2275**	**0.0174**	**0.0763**	**0.2351**	**1.0298**	**0.2399**	**1.0506**	**1.56E-05**	**6.85E-05**	**0.5464**	**2.3934**	**0.0014**	**0.0060**	**0.0043**	**0.0190**	**0.0070**	**0.0305**

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 heater 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 550 barrels per day, VOC emissions would be 10.0813 pounds per hour when there are truck loading activities. Average hourly VOC emissions from truck loading is 0.9626 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, enclosed combustors, and fugitives. 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

Rock Run Well Pad

Doddridge County, West Virginia

Antero Resources Corporation

Pollutant		Emissions		Threshold Exceeded?		
		Uncontrolled	Controlled	Threshold	Uncontrolled	Controlled
VOC	lbs/hr	185.9919	7.2963	6	**Yes**	
	tons/yr	818.8606	36.1742	10	**Yes**	**Yes**
NO_X	lbs/hr	3.1917	3.4427	6		
	tons/yr	13.9797	15.0792	10	**Yes**	**Yes**
CO	lbs/hr	8.0603	8.2711	6	**Yes**	**Yes**
	tons/yr	35.3039	36.2275	10	**Yes**	**Yes**
SO_2	lbs/hr	0.0174	0.0174	6		
	tons/yr	0.0762	0.0763	10		
$PM_{2.5}$	lbs/hr	0.2208	0.2351	6		
	tons/yr	0.9671	1.0298	10		
PM_{10}	lbs/hr	1.6038	0.9314	6		
	tons/yr	1.6182	1.3762	10		
Lead	lbs/hr	1.44E-05	1.56E-05	6		
	tons/yr	6.30E-05	6.85E-05	10		
Total HAPs	lbs/hr	24.8159	0.9599	2	**Yes**	
	tons/yr	108.7374	4.2483	5	**Yes**	
Total TAPs	lbs/hr	0.0572	0.0109	1.14		
n-Hexane	lbs/hr	24.1242	0.8224			
	tons/yr	105.7052	3.6433			
Toluene	lbs/hr	0.2257	0.0266			
	tons/yr	0.9891	0.1171			
Ethylbenzene	lbs/hr	0.1268	0.0280			
	tons/yr	0.5561	0.1231			
Xylenes	lbs/hr	0.2819	0.0720			
	tons/yr	1.2362	0.3166			
Benzene	lbs/hr	0.0502	0.0040			
	tons/yr	0.2201	0.0174			

Enter any notes here:	1. Emissions are based on 98% Enclosed Combustor DRE operating 100% of the time. 2. Please see Attachment J-Fugitive Emissions Data Summary Sheet and Attachment T-Emission Points Summary Sheet for sitewide sources and breakdown of emission quantities.

Table 4

Fugitive Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

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

Gas Weight Fraction From Analysis:	VOC frac	0.127
	Benzene frac	0.000
	Toluene	0.000
	Ethylbenzene	0.000
	Xylenes	0.000
	n-Hexane	0.019
	HAPs	0.019
	Methane	0.653

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
500	Valves	Gas VOC	0.004500	0.29	5,499.07
		Non VOC	0.004500	1.96	37,862.93
		HAPs	0.004500	0.04	821.97
		CO2e	0.004500	36.72	707,625.67
590	Connectors	VOC	0.000200	0.01	288.40
		Non-VOC	0.000200	0.10	1,985.70
		HAPs	0.000200	0.00	43.11
		CO2e	0.000200	1.93	37,111.04
130	Flanges	VOC	0.000390	0.01	123.91
		Non-VOC	0.000390	0.04	853.18
		HAPs	0.000390	0.00	18.52
		CO2e	0.000390	0.827375	15945.165131
			Total VOCs:	0.31	5911.38
			Total THC:	2.42	46613.19

Light Liquid Weight Fraction From Analysis:	VOC frac	0.957
	Benzene frac	0.001
	Toluene	0.008
	Ethylbenzene	0.009
	Xylenes	0.024
	n-hexane	0.064
	HAPs	0.106
	Methane	0.013

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
520	Valves	Light Liquid VOC	0.002500	1.24	23,973.82
		Light Liquid Non-VOC	0.002500	0.06	1,079.78
		Light Liquid HAPs	0.002500	0.14	2,643.34
		CO2e	0.002500	0.43	8266.24
			Total VOC:	1.24	23,973.82
			Total THC:	1.30	25,053.60

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	29,885.19	3.41	14.94
Ethylbenzene		0.03	0.11
Toluene		0.02	0.10
Xylenes		0.07	0.30
n-Hexane		0.28	1.24
TAPs (Benzene)		0.00	0.01
HAPs		0.40	1.76
CO_{2e}	768,948.12	87.78	384.47

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
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Number of PCVs	40
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	264

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions (lbs/day)	(lbs/hr)	(tons/year)
H2S	0.00E+00	34.08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.4146	14.01	1.094544	2.88E-03	0.04	1.68E-03	0.01
Carbon Dioxide	0.1574	44.01	0.415536	1.10E-03	0.05	2.01E-03	8.79E-03
Methane	80.3799	16.04	212.202936	0.56	8.97	0.37	1.64
Ethane	14.4783	30.07	38.222712	0.10	3.03	0.13	0.55
Propane	2.385	44.1	6.2964	0.02	0.73	0.03	0.13
Isobutane	0.4736	58.12	1.250304	3.29E-03	0.19	0.01	0.03
n-Butane	0.8388	58.12	2.214432	5.84E-03	0.34	0.01	0.06
Isopentane	0.2265	72.15	0.59796	1.58E-03	0.11	4.74E-03	0.02
n-Pentane	0.2114	72.15	0.558096	1.47E-03	0.11	4.42E-03	0.02
2-Methylpentane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Methylpentane	0.00E+00	86.18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
n-Hexane	0.4345	86.18	1.14708	3.02E-03	0.26	0.01	0.05
Methylcyclopentane	0.00E+00	84.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzene	0.00E+00	78.11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Methylhexane	0.00E+00	100.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Methylhexane	0.00E+00	100.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Heptane	0.00E+00	100.21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methylcyclohexane	0.00E+00	98.186	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	0.00E+00	92.14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Octane	0.00E+00	114.23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene	0.00E+00	106.17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m & p-Xylene	0.00E+00	106.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Xylene	0.00E+00	106.16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nonane	0.00E+00	128.2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C10+	0.00E+00	174.28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	lb/hr	tpy
VOC Emissions	0.0726	0.3180
Benzene Emissions	0.00E+00	0.00E+00
Toluene Emissions	0.00E+00	0.00E+00
Ethylbenzene Emissions	0.00E+00	0.00E+00
Xylene Emissions	0.00E+00	0.00E+00
n-Hexane Emissions	0.0109	0.0475
HAPs Emissions	0.0109	0.0475
TAPs Emissions	0.00E+00	0.00E+00
CO_{2e} emissions	9.3452	40.9320

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

Table 6

Uncontrolled Flashing Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

# Hours Operational	8760

	Condensate Tank Flashing Losses			Produced Water Tank Flashing Losses		
	Vapor Mass Fraction	Flashing Losses		Vapor Mass Fraction	Flashing Losses	
	wt%	lbs/hr	tpy	wt%	lbs/hr	tpy
Water	0.0746	0.1826	0.7999	2.7406	0.0901	0.3946
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0047	0.0114	0.0501	0.2952	0.0097	0.0425
Carbon Dioxide	0.1655	0.4049	1.7736	3.2283	0.1061	0.4648
Methane	4.4945	10.9988	48.1747	61.8895	2.0345	8.9113
Ethane	25.7498	63.0139	276.0009	22.1224	0.7272	3.1853
Propane	20.1421	49.2910	215.8945	5.7386	0.1886	0.8263
Isobutane	7.8675	19.2530	84.3283	0.4985	0.0164	0.0718
n-Butane	15.5578	38.0725	166.7573	1.8725	0.0616	0.2696
Isopentane	5.9060	14.4529	63.3036	0.4213	0.0139	0.0607
n-Pentane	5.8352	14.2797	62.5453	0.3961	0.0130	0.0570
2-Methylpentane	0.6511	1.5933	6.9787	0.0198	0.0007	0.0029
3-Methylpentane	0.4349	1.0644	4.6620	0.0354	0.0012	0.0051
n-Hexane	9.6656	23.6534	103.6017	0.2325	0.0076	0.0335
Methylcyclopentane	0.1561	0.3820	1.6730	0.0372	0.0012	0.0054
Benzene	0.0188	0.0460	0.2016	0.0306	0.0010	0.0044
2-Methylhexane	0.4940	1.2090	5.2952	0.0132	0.0004	0.0019
3-Methylhexane	0.4093	1.0015	4.3866	0.0114	0.0004	0.0016
Heptane	0.7596	1.8589	8.1420	0.0222	0.0007	0.0032
Methylcyclohexane	0.4146	1.0145	4.4435	0.0647	0.0021	0.0093
Toluene	0.0807	0.1974	0.8645	0.1230	0.0040	0.0177
Octane	0.7606	1.8613	8.1524	0.0132	0.0004	0.0019
Ethylbenzene	0.0398	0.0973	0.4263	0.0597	0.0020	0.0086
m & p-Xylene	0.0383	0.0936	0.4100	0.0569	0.0019	0.0082
o-Xylene	0.0459	0.1124	0.4922	0.0709	0.0023	0.0102
Nonane	0.1703	0.4167	1.8253	0.0046	0.0002	0.0007
C10+	0.0628	0.1538	0.6735	0.0016	0.0001	0.0002
Total VOCs	69.511	170.10	745.1	9.724	0.3197	1.4001
Total CO_{2e}		275.37	1,206.1		50.97	223.2
Total TAPs (Benzene)		0.0460	0.2016		0.0010	0.0044
Toluene		0.1974	0.8645		0.0040	0.0177
Ethylbenzene		0.0973	0.4263		0.0020	0.0086
Xylenes		0.2060	0.9022		0.0042	0.0184
n-Hexane		23.653	103.602		0.0076	0.0335
Total HAPs		24.200	105.996		0.0189	0.0826
Total	100.00	244.72	1,071.9	100.00	3.287	14.40

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

Table 7

Uncontrolled Working and Breathing Losses
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Condensate Tank Information	
Number of Tanks	10
Maximum Working Losses (lbs/hr)	8.2249
Maximum Breathing Losses (lbs/hr)	10.6704
# Hours Operational	8760

	Condensate 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
H2S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0002	1.53E-05	6.71E-05	0.0000	0.0001	0.0000	0.0002
Carbon Dioxide	0.1711	0.0141	0.0617	0.0183	0.0800	0.0323	0.1416
Methane	1.0518	0.0865	0.3789	0.1122	0.4916	0.1987	0.8705
Ethane	35.7006	2.9363	12.8612	3.8094	16.6852	6.7457	29.5464
Propane	23.0364	1.8947	8.2989	2.4581	10.7664	4.3528	19.0653
Isobutane	8.3589	0.6875	3.0113	0.8919	3.9067	1.5794	6.9180
n-Butane	16.3149	1.3419	5.8775	1.7409	7.6250	3.0828	13.5025
Isopentane	5.7771	0.4752	2.0812	0.6164	2.7000	1.0916	4.7812
n-Pentane	5.6367	0.4636	2.0306	0.6015	2.6344	1.0651	4.6650
2-Methylpentane	0.6125	0.0504	0.2207	0.0654	0.2863	0.1157	0.5069
3-Methylpentane	0.4078	0.0335	0.1469	0.0435	0.1906	0.0771	0.3375
n-Hexane	0.6161	0.0507	0.2219	0.0657	0.2879	0.1164	0.5099
Methylcyclopentane	0.1355	0.0111	0.0488	0.0145	0.0633	0.0256	0.1122
Benzene	0.0010	8.22E-05	0.0004	0.0001	0.0005	0.0002	0.0008
2-Methylhexane	0.0300	2.46E-03	0.0108	0.0032	0.0140	0.0057	0.0248
3-Methylhexane	0.3737	0.0307	0.1346	0.0399	0.1747	0.0706	0.3093
Heptane	0.6407	0.0527	0.2308	0.0684	0.2994	0.1211	0.5302
Methylcyclohexane	0.3486	0.0287	0.1256	0.0372	0.1629	0.0659	0.2885
Toluene	0.0092	7.57E-04	3.32E-03	0.0010	0.0043	0.0017	0.0076
Octane	0.5893	0.0485	0.2123	0.0629	0.2754	0.1113	0.4877
Ethylbenzene	0.0085	6.98E-04	3.06E-03	0.0009	0.0040	0.0016	0.0070
m & p-Xylene	0.0105	8.65E-04	3.79E-03	0.0011	0.0049	0.0020	0.0087
o-Xylene	0.0109	8.98E-04	0.0039	0.0012	0.0051	0.0021	0.0090
Nonane	0.1197	0.0098	0.0431	0.0128	0.0560	0.0226	0.0991
C10+	0.0382	3.14E-03	0.0138	0.0041	0.0178	0.0072	0.0316
Total VOCs	63.076	5.1880	22.723	6.7305	29.4795	11.9185	52.203
Total CO_{2e}		2.1768	9.5343	2.8240	12.3691	5.0008	21.903
Total TAPs (Benzene)		8.22E-05	3.60E-04	0.0001	0.0005	0.0002	0.0008
Toluene		7.57E-04	3.32E-03	0.0010	0.0043	0.0017	0.0076
Ethylbenzene		6.98E-04	3.06E-03	0.0009	0.0040	0.0016	0.0070
Xylenes		1.76E-03	0.0077	0.0023	0.0100	0.0040	0.0177
n-Hexane		0.0507	0.2219	0.0657	0.2879	0.1164	0.5099
Total HAPs		0.0540	0.2364	0.0700	0.3067	0.1240	0.5431
Total	100.00	8.2249	36.0251	10.6704	46.7364	18.8953	82.761

Table 7

Uncontrolled Working and Breathing Losses
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0356
Maximum Breathing Losses (lbs/hr)	0.0083

	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
H2S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0056	2.00E-06	8.75E-06	4.68E-07	2.05E-06	2.47E-06	1.08E-05
Carbon Dioxide	4.1378	0.0015	0.0064	0.0003	0.0015	0.0018	0.0080
Methane	3.2716	0.0012	0.0051	0.0003	0.0012	0.0014	0.0063
Ethane	1.0793	0.0004	0.0017	0.0001	0.0004	0.0005	0.0021
Propane	0.0682	2.43E-05	0.0001	5.68E-06	2.49E-05	3.00E-05	0.0001
Isobutane	0.0007	2.64E-07	1.16E-06	6.18E-08	2.71E-07	3.26E-07	1.43E-06
n-Butane	0.0042	1.49E-06	6.54E-06	3.50E-07	1.53E-06	1.84E-06	8.07E-06
Isopentane	0.0002	8.42E-08	3.69E-07	1.97E-08	8.63E-08	1.04E-07	4.55E-07
n-Pentane	0.0002	5.77E-08	2.53E-07	1.35E-08	5.92E-08	7.12E-08	3.12E-07
2-Methylpentane	1.55E-06	5.52E-10	2.42E-09	1.29E-10	5.66E-10	6.82E-10	2.99E-09
3-Methylpentane	6.71E-06	2.39E-09	1.05E-08	5.59E-10	2.45E-09	2.95E-09	1.29E-08
n-Hexane	7.04E-07	2.51E-10	1.10E-09	5.87E-11	2.57E-10	3.09E-10	1.35E-09
Methylcyclopentane	1.52E-05	5.40E-09	2.37E-08	1.26E-09	5.54E-09	6.67E-09	2.92E-08
Benzene	3.83E-05	1.36E-08	5.97E-08	3.19E-09	1.40E-08	1.68E-08	7.37E-08
2-Methylhexane	1.70E-08	6.03E-12	2.64E-11	1.41E-12	6.19E-12	7.44E-12	3.26E-11
3-Methylhexane	2.20E-07	7.82E-11	3.42E-10	1.83E-11	8.02E-11	9.65E-11	4.23E-10
Heptane	3.14E-07	1.12E-10	4.88E-10	2.61E-11	1.14E-10	1.38E-10	6.03E-10
Methylcyclohexane	5.64E-06	2.01E-09	8.79E-09	4.70E-10	2.06E-09	2.48E-09	1.08E-08
Toluene	7.42E-05	2.64E-08	1.16E-07	6.18E-09	2.71E-08	3.26E-08	1.43E-07
Octane	3.64E-08	1.29E-11	5.66E-11	3.03E-12	1.33E-11	1.60E-11	6.99E-11
Ethylbenzene	2.03E-05	7.20E-09	3.16E-08	1.69E-09	7.39E-09	8.89E-09	3.89E-08
m & p-Xylene	2.15E-05	7.67E-09	3.36E-08	1.79E-09	7.86E-09	9.46E-09	4.14E-08
o-Xylene	2.81E-05	9.99E-09	4.38E-08	2.34E-09	1.02E-08	1.23E-08	5.40E-08
Nonane	5.93E-09	2.11E-12	9.24E-12	4.94E-13	2.16E-12	2.60E-12	1.14E-11
C10+	2.97E-10	1.06E-13	4.63E-13	2.47E-14	1.08E-13	1.30E-13	5.71E-13
Total VOCs	0.0738	2.63E-05	0.0001	6.15E-06	2.69E-05	3.24E-05	0.0001
Total CO_{2e}		0.0306	0.1339	0.0072	0.0313	0.0377	0.1652
Total TAPs (Benzene)		1.36E-08	5.97E-08	3.19E-09	1.40E-08	1.68E-08	7.37E-08
Toluene		2.64E-08	1.16E-07	6.18E-09	2.71E-08	3.26E-08	1.43E-07
Ethylbenzene		7.20E-09	3.16E-08	1.69E-09	7.39E-09	8.89E-09	3.89E-08
Xylenes		1.77E-08	7.73E-08	4.13E-09	1.81E-08	2.18E-08	9.54E-08
n-Hexane		2.51E-10	1.10E-09	5.87E-11	2.57E-10	3.09E-10	1.35E-09
Total HAPs		6.51E-08	2.85E-07	1.52E-08	6.68E-08	8.04E-08	3.52E-07
Total	100.00	0.0356	0.1558	0.0083	0.0365	0.0439	0.1923

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

Table 8

Loading Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Annual Loading	Oil Truck Loading	Water Truck Loading
RVP	4.41	1.0232
Annual Average Temp (F)	65.08	65.08
S (saturation factor)	0.6	0.6
P (true vapor pressure)	2.67	0.37
M (MW of vapor)	41.61	18.48
Collection Efficiency (%)	0.00	0.00
Loading Loss (lb/10^3 gal)*	1.59	0.10
Maximum Throughput (gallons/hr)**	10,080	10,080
Average Throughput (gallons/yr)	8,431,500	7,511,700
Loading Emissions (lbs/hr)	15.98	0.99
Loading Emissions (tpy)	6.68	0.37

	Condensate Tank Loading Losses			Produced Water Tank Loading Losses		
	Vapor Mass Fraction	Loading Losses		Vapor Mass Fraction	Loading Losses	
	wt%	lbs/hr	tpy	wt%	lbs/hr	tpy
H2S	0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nitrogen	0.0002	2.98E-05	1.24E-05	0.0056	5.55E-05	2.07E-05
Carbon Dioxide	0.1711	0.0274	1.14E-02	4.1378	4.09E-02	1.52E-02
Methane	1.0518	0.1681	7.03E-02	3.2716	3.23E-02	1.20E-02
Ethane	35.7006	5.7055	2.3862	1.0793	1.07E-02	3.97E-03
Propane	23.0364	3.6816	1.54E+00	0.0682	6.74E-04	2.51E-04
Isobutane	8.3589	1.3359	5.59E-01	0.0007	7.33E-06	2.73E-06
n-Butane	16.3149	2.6074	1.09E+00	0.0042	4.15E-05	1.55E-05
Isopentane	5.7771	0.9233	3.86E-01	0.0002	2.34E-06	8.71E-07
n-Pentane	5.6367	0.9008	3.77E-01	0.0002	1.60E-06	5.97E-07
2-Methylpentane	0.6125	0.0979	4.09E-02	1.55E-06	1.53E-08	5.72E-09
3-Methylpentane	0.4078	0.0652	2.73E-02	6.71E-06	6.63E-08	2.47E-08
n-Hexane	0.6161	0.0985	4.12E-02	7.04E-07	6.96E-09	2.59E-09
Methylcyclopentane	0.1355	0.0217	9.06E-03	1.52E-05	1.50E-07	5.59E-08
Benzene	0.0010	0.0002	6.68E-05	0.0000	3.79E-07	1.41E-07
2-Methylhexane	0.0300	0.0048	2.00E-03	1.70E-08	1.68E-10	6.24E-11
3-Methylhexane	0.3737	0.0597	2.50E-02	2.20E-07	2.17E-09	8.09E-10
Heptane	0.6407	0.1024	4.28E-02	3.14E-07	3.10E-09	1.15E-09
Methylcyclohexane	0.3486	0.0557	2.33E-02	5.64E-06	5.57E-08	2.08E-08
Toluene	0.0092	0.0015	6.15E-04	0.0001	7.33E-07	2.73E-07
Octane	0.5893	0.0942	3.94E-02	3.64E-08	3.59E-10	1.34E-10
Ethylbenzene	0.0085	0.0014	5.67E-04	2.03E-05	2.00E-07	7.46E-08
m & p-Xylene	0.0105	0.0017	7.03E-04	2.15E-05	2.13E-07	7.93E-08
o-Xylene	0.0109	0.0017	7.30E-04	2.81E-05	2.77E-07	1.03E-07
Nonane	0.1197	0.0191	8.00E-03	5.93E-09	5.86E-11	2.18E-11
C10+	0.0382	0.0061	2.55E-03	2.97E-10	2.94E-12	1.09E-12
Total VOCs	63.0762	10.0805	4.2160	0.0738	7.29E-04	2.72E-04
Total CO_{2e}		4.2296	1.7689		0.8490	0.3163
Total TAPs (Benzene)		0.0002	6.68E-05		3.79E-07	1.41E-07
Toluene		0.0015	6.15E-04		7.33E-07	2.73E-07
Ethylbenzene		0.0014	5.67E-04		2.00E-07	7.46E-08
Xylenes		0.0034	1.43E-03		4.90E-07	1.83E-07
n-Hexane		0.0985	4.12E-02		6.96E-09	2.59E-09
Total HAPs		0.1049	4.39E-02		1.81E-06	6.74E-07
Total	100.0000	15.9815	6.6839	100.0000	0.9880	0.3681

Enter any notes here

Vapor mass fractions and loading losses from Promax output

Using equation L_L = 12.46 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

** Maximum throughput in gallons per hour obtained from actual transfer rate of 200 barrels in 50 minutes. (10,080 gal/hr = 200 bbl / 50 min x 42 gal/bbl x 60 min/hr)

Loading emissions are vented to the atmosphere.

Table 9

Gas Production Unit Heater and Line Heater Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Gas Production Unit Heater Emissions

Number of Units	10
GPU Heater Rating (MMBtu/hr)	1.50
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,217

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.233	5.399
CO	84	1.035	4.535
CO_2	120,000	1479.053	6478.252
Lead	0.0005	6.16E-06	2.70E-05
N_2O	2.2	0.027	0.119
PM (Total)	7.6	0.094	0.410
SO_2	0.6	0.007	0.032
TOC	11	0.136	0.594
Methane	2.3	0.028	0.124
VOC	5.5	0.068	0.297
HAPS			
2-Methylnaphthalene	2.40E-05	2.96E-07	1.30E-06
Benzene	2.10E-03	2.59E-05	1.13E-04
Dichlorobenzene	1.20E-03	1.48E-05	6.48E-05
Fluoranthene	3.00E-06	3.70E-08	1.62E-07
Fluorene	2.80E-06	3.45E-08	1.51E-07
Formaldehyde	7.50E-02	9.24E-04	4.05E-03
Hexane	1.80E+00	2.22E-02	9.72E-02
Naphthalene	6.10E-04	7.52E-06	3.29E-05
Phenanathrene	1.70E-05	2.10E-07	9.18E-07
Toluene	3.40E-03	4.19E-05	1.84E-04

Line Heater Emissions

Number of Units	10
Line Heater Rating (MMBtu/hr)	2.00
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,217

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	1.643	7.198
CO	84	1.380	6.046
CO_2	120,000	1972.071	8637.670
Lead	0.0005	8.22E-06	3.60E-05
N_2O	2.2	0.036	0.158
PM (Total)	7.6	0.125	0.547
SO_2	0.6	0.010	0.043
TOC	11	0.181	0.792
Methane	2.3	0.038	0.166
VOC	5.5	0.090	0.396
HAPS			
2-Methylnaphthalene	2.40E-05	3.94E-07	1.73E-06
Benzene	2.10E-03	3.45E-05	1.51E-04
Dichlorobenzene	1.20E-03	1.97E-05	8.64E-05
Fluoranthene	3.00E-06	4.93E-08	2.16E-07
Fluorene	2.80E-06	4.60E-08	2.02E-07
Formaldehyde	7.50E-02	1.23E-03	5.40E-03
Hexane	1.80E+00	2.96E-02	1.30E-01
Naphthalene	6.10E-04	1.00E-05	4.39E-05
Phenanathrene	1.70E-05	2.79E-07	1.22E-06
Toluene	3.40E-03	5.59E-05	2.45E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.158	0.693
TOTAL Uncontrolled HAPs	0.054	0.237
TOTAL Uncontrolled TAPs (Benzene)	6.04E-05	2.65E-04
TOTAL Uncontrolled Toluene	9.78E-05	4.28E-04
TOTAL Uncontrolled Hexane	5.18E-02	2.27E-01
TOTAL Uncontrolled TAPs (Formaldehyde)	2.16E-03	9.45E-03
TOTAL CO_{2e} Emissions	3,471.63	15,205.75

Enter any notes here:
All Emission Factors based off AP-42 Sec 1.4 Natural Gas Combustion

Table 10

Enclosed Combustor Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

General Information	
Unit Name:	EC001, EC002, EC003

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_2O	2.20
Lead	5.00E-04

Constants	
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H_2S 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_2S percent destruction efficiency (%)	98

Enclosed Combustor operating hours	8760
No. of Enclosed Combustors	3

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)	37.8	--	2,231.73	67.50	172.32	0.90	2,510.26
Maximum Expected Annual Volumetric Flow Rate of Stream (scf/yr)	331,128.00	--	19,549,984.32	591,309.55	1,509,516.87	7,896.59	21,989,835.32
Heating Content (Btu/ft3)	1,217		2,251.94	1,036.65	2,186.31	45.73	2,180.05

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	-
H2S	-	-	0.000	0.000	0.000	0.000	0.000
Total VOC	-	-	170.104	0.320	11.918	0.000	182.34
Benzene	-	-	0.046	0.001	0.000	0.000	0.047
Toluene	-	-	0.197	0.004	0.002	0.000	0.203
Ethylbenzene	-	-	0.097	0.002	0.002	0.000	0.101
Xylenes	-	-	0.206	0.004	0.004	0.000	0.214
n-Hexane	-	-	23.653	0.008	0.116	0.000	23.777
HAPs	-	-	24.200	0.019	0.124	0.000	24.343
Total Mass Flow	-	-	244.716	3.287	18.895	0.044	266.943
Mass Flow Rates of the Vapors Sent to this Control Device, Annual Basis (tpy)							
H2S	-	-	0.000	0.000	0.000	0.000	0.000
Total VOC	-	-	745.057	1.400	52.203	0.000	798.661
Benzene	-	-	0.202	0.004	0.001	0.000	0.207
Toluene	-	-	0.864	0.018	0.008	0.000	0.890
Ethylbenzene	-	-	0.426	0.009	0.007	0.000	0.442
Xylenes	-	-	0.902	0.018	0.018	0.000	0.938
n-Hexane	-	-	103.602	0.033	0.510	0.000	104.145
HAP	-	-	105.996	0.083	0.543	0.000	106.622
Total Mass Flow	-	-	1071.857	14.399	82.761	0.192	1169.209

Table 10

Enclosed Combustor Emissions
Rock Run Well Pad
Doddridge County, 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	0.004	-	0.223	0.007	0.017	0.000	0.25
CO	0.003	-	0.187	0.006	0.014	0.000	0.21
PM2.5	0.000	-	0.013	0.000	0.001	0.000	0.01
PM10	0.000	-	0.017	0.001	0.001	0.000	0.02
H2S	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	4.536	-	-	-	-	-	4.54
Total VOC	0.000	-	3.402	0.006	0.238	0.000	3.65
Benzene	0.000	-	0.001	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.004	0.000	0.000	0.000	0.00
Ethylbenzene	0.000	-	0.002	0.000	0.000	0.000	0.00
Xylenes	0.000	-	0.004	0.000	0.000	0.000	0.00
n-Hexane	0.000	-	0.473	0.000	0.002	0.000	0.48
HAP	0.000	-	0.484	0.000	0.002	0.000	0.49
N_2O	0.000	-	0.005	0.000	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	0.017	-	0.977	0.030	0.075	0.000	1.10
CO	0.014	-	0.821	0.025	0.063	0.000	0.92
PM2.5	0.001	-	0.056	0.002	0.004	0.000	0.06
PM10	0.001	-	0.074	0.002	0.006	0.000	0.08
H_2S	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	19.868	-	-	-	-	-	19.87
Total VOC	0.001	-	14.901	0.028	1.044	0.000	15.97
Benzene	0.000	-	0.004	0.000	0.000	0.000	0.00
Toluene	0.000	-	0.017	0.000	0.000	0.000	0.02
Ethylbenzene	0.000	-	0.009	0.000	0.000	0.000	0.01
Xylenes	0.000	-	0.018	0.000	0.000	0.000	0.02
n-Hexane	0.000	-	2.072	0.001	0.010	0.000	2.08
HAP	0.000	-	2.120	0.002	0.011	0.000	2.13
N_2O	0.000	-	0.022	0.001	0.002	0.000	0.02
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	3.65	15.97
NOx	2.51E-01	1.10E+00
CO	2.11E-01	9.24E-01
PM2.5	1.43E-02	6.27E-02
PM10	1.91E-02	8.36E-02
H_2S	1.21E-05	5.28E-05
SO_2	2.27E-05	9.93E-05
Benzene (TAPs)	9.44E-04	4.14E-03
Toluene	4.06E-03	1.78E-02
Ethylbenzene	2.02E-03	8.84E-03
Xylenes	4.28E-03	1.88E-02
Hexanes	4.76E-01	2.08E+00
Formaldehyde (TAPs)	2.84E-06	1.24E-05
HAPs	0.49	2.13
CO_2e	826.53	3620.20
N_2O	5.52E-03	2.42E-02
Lead	1.26E-06	5.50E-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
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Enclosed Combustor CO_2 and CH_4 Emissions

Components	Mole fraction of oil flash gas constituents[a]	Volume of oil flash gas sent to Enclosed Combustor *scf/year*	Mole fraction of water flash gas constituents[a]	Volume of water flash gas sent to Enclosed Combustor *scf/year*	Mole fraction of oil tank vapors constituents[a]	Volume of oil tank vapor sent to Enclosed Combustor *scf/year*	Mole fraction of water tank vapors constituents[a]	Volume of water tank vapors sent to Enclosed Combustor *scf/year*	Component volume of gas sent to Enclosed Combustor *scf/year*	Number of carbon atoms	Combustion Efficiency	Combusted CO_2 Volume[b] *scf/year*	Uncombusted CO_2 and CH_4 Volume[b] *scf/year*	Volume GHGs Emitted *scf/year*
CO_2	0.002	19,549,984	0.0146	591,310	0.0016	1,509,517	0.017	7,897	42,810	1	0	--	42,810	60,821,637
Methane	0.120	19,549,984	0.7669	591,310	0.0273	1,509,517	0.038	7,897	2,850,677	1	0.98	2,793,663	57,014	57,014
Ethane	0.368	19,549,984	0.1462	591,310	0.4940	1,509,517	0.007	7,897	8,031,559	2	0.98	15,741,855	--	
Propane	0.196	19,549,984	0.0259	591,310	0.2174	1,509,517	0.000	7,897	4,183,308	3	0.98	12,298,924	--	
i-Butane	0.058	19,549,984	0.0017	591,310	0.0598	1,509,517	0.000	7,897	1,229,391	4	0.98	4,819,214	--	
n-Butane	0.115	19,549,984	0.0064	591,310	0.1168	1,509,517	0.000	7,897	2,430,568	4	0.98	9,527,826	--	
Pentane	0.070	19,549,984	0.0023	591,310	0.0658	1,509,517	0.000	7,897	1,468,826	5	0.98	7,197,246	--	
Hexane	0.054	19,549,984	0.0007	591,310	0.0079	1,509,517	0.000	7,897	1,061,182	6	0.98	6,239,747	--	
Benzene	0.000	19,549,984	0.0001	591,310	0.0000	1,509,517	0.000	7,897	2,078	6	0.98	12,220	--	
Heptanes	0.008	19,549,984	0.0002	591,310	0.0050	1,509,517	0.000	7,897	162,774	7	0.98	1,116,629	--	
Toluene	0.000	19,549,984	0.0003	591,310	0.0000	1,509,517	0.000	7,897	7,579	7	0.98	51,990	--	
Octane	0.005	19,549,984	0.0002	591,310	0.0036	1,509,517	0.000	7,897	97,037	8	0.98	760,767	--	
Ethyl benzene	0.000	19,549,984	0.0001	591,310	0.0000	1,509,517	0.000	7,897	3,266	8	0.98	25,602	--	
Xylenes	0.000	19,549,984	0.0002	591,310	0.0001	1,509,517	0.000	7,897	6,934	8	0.98	54,364	--	
Nonane	0.001	19,549,984	0.0000	591,310	0.0004	1,509,517	0.000	7,897	11,758	9	0.98	103,704	--	
Decane plus	0.000	19,549,984	0.0000	591,310	0.0001	1,509,517	0.000	7,897	3,579	10	0.98	35,077	--	
											Subtotal	**60,778,828**	--	

Pollutant	Volume Emitted *scf/year*	Density of GHG[c] *lb/scf*	Conversion Factor *lb/ton*	GWF	Emissions[c] *lbs/hr*	Emissions[c] *(tons/yr)*
CO_2	60,821,637	0.12	2000	1	805.14	3,526.53
CH_4	57,014	0.09	2000	25	0.61	2.65
				CO_2e Emissions	**820.3**	**3592.83**

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
Rock Run Well Pad
Doddridge County, 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)	550
PW Production (bbl/day)	490
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 (miles/hr)	Vehicle Miles Travelled (miles/year)	PM (lbs/VMT)	PM10 (lbs/VMT)
Tanker Trucks Condensate	10	40	10	0.3880	1	1004	0.3880	389.5520	3.8175	1.7179
Tanker Trucks PW	10	40	10	0.3880	1	895	0.3880	347.2600	3.8175	1.7179
Pick Up Truck	4	3	10	0.3200	1	730	0.3200	233.6000	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	1.4812	1487.1262	0.7436	0.6665	669.2068	0.3346	0.7406	743.5631	0.3718	0.3333	334.6034	0.1673
Tanker Trucks PW	1.4812	1325.6753	0.6628	0.6665	596.5539	0.2983	0.7406	662.8376	0.3314	0.3333	298.2769	0.1491
Pick Up Truck	0.1109	80.9844	0.0405	0.0499	36.4430	0.0182	0.0555	40.4922	0.0202	0.0250	18.2215	0.0091
Total Emissions	3.0733	2,893.7858	1.4469	1.3830	1,302.2036	0.6511	1.5367	1,446.8929	0.7234	0.6915	651.1018	0.3256

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

Table 13

Engine Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

Kubota DG972-E2

Power (hp)	24
Fuel consumption (lbs/BHP-hr)	0.449
Heat Content of Fuel (Btu/scf)	1216.9949
Density of NG (lb/scf)	0.056
Operating Hours/year	8760
No. of Engines	1

Pollutant	Emission Factors (g/hp-hr)	Emission Factors (lb/MMBtu)	lb/hr	tpy
NOx[1]	5.97		0.3158	1.3831
CO[2]	106.7		5.6445	24.7228
CO_2		110.000	25.7603	112.83
$PM_{2.5}$		9.500E-03	0.0022	0.0097
PM_{10}		9.500E-03	0.0022	0.0097
PM (Total)		9.910E-03	0.0023	0.0102
SO_2		5.880E-04	0.0001	0.0006
TOC		0.358	0.0838	0.3672
Methane		0.230	0.0539	0.2359
VOC[3]		0.0296	0.0069	0.0304
HAPS				
Benzene		1.58E-03	3.70E-04	1.62E-03
Ethylbenzene		2.48E-05	5.81E-06	2.54E-05
Formaldehyde		2.05E-02	4.80E-03	2.10E-02
Naphthalene		9.71E-05	2.27E-05	9.96E-05
Toluene		5.58E-04	1.31E-04	5.72E-04
Xylene		1.95E-04	4.57E-05	2.00E-04

	lb/hr	tpy
TOTAL Uncontrolled VOC	6.93E-03	3.04E-02
TOTAL Uncontrolled NOx	3.16E-01	1.38E+00
TOTAL Uncontrolled HAPs	5.38E-03	2.35E-02
TOTAL Uncontrolled TAPs (Benzene)	3.70E-04	1.62E-03
TOTAL Uncontrolled Toluene	1.31E-04	5.72E-04
TOTAL Uncontrolled Ethylbenzene	5.81E-06	2.54E-05
TOTAL Uncontrolled Xylenes	4.57E-05	2.00E-04
TOTAL Uncontrolled TAPs (Formaldehyde)	4.80E-03	2.10E-02
TOTAL CO_{2e} Emissions	2.71E+01	1.19E+02

Enter Any Notes Here:

1. Emission factor used for the 24 HP engine's NOx is the 40 CFR 1054 standard indicated on the EPA's Certificate of Conformity. See Appendix N.
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.

Table 14

Change in Regulated Air Pollutants Emissions
Rock Run Well Pad
Doddridge County, West Virginia
Antero Resources Corporation

	Potential Emissions		Initial Permit Application Emissions		Change in Emissions	
Pollutant	**Hourly PTE**	**Yearly PTE**	**Hourly PTE**	**Yearly PTE**	**Hourly PTE**	**Yearly PTE**
PM	1.7765	1.7741	1.8110	2.3372	-0.0345	-0.5631
PM10	0.9314	1.3762	0.9657	1.7122	-0.0344	-0.3360
VOC (uncontrolled)	185.9919	818.8606	340.3151	1497.1283	-154.3233	-678.2677
CO	8.2711	36.2275	8.6509	37.8910	-0.3798	-1.6635
NOx	3.4427	15.0792	3.8949	17.0596	-0.4521	-1.9804
SO2	0.0174	0.0763	0.0173	0.0759	7.64E-05	3.35E-04
Pb	1.56E-05	6.85E-05	1.79E-05	7.84E-05	-2.26E-06	-9.90E-06
HAPs	0.9599	4.2483	0.9174	4.0366	0.0426	0.2117
TAPs	0.0109	0.0479	0.0165	0.0724	-5.57E-03	-0.0245

Notes:
1. Change in emissions due to the decrease in produced water production and addition of a Cimarron enclosed combustor.
2. Change in permit from G70A to G70B.

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

Simulation Report

Project: 248 - Rock Run PROMAX SCENARIO 3.pmx

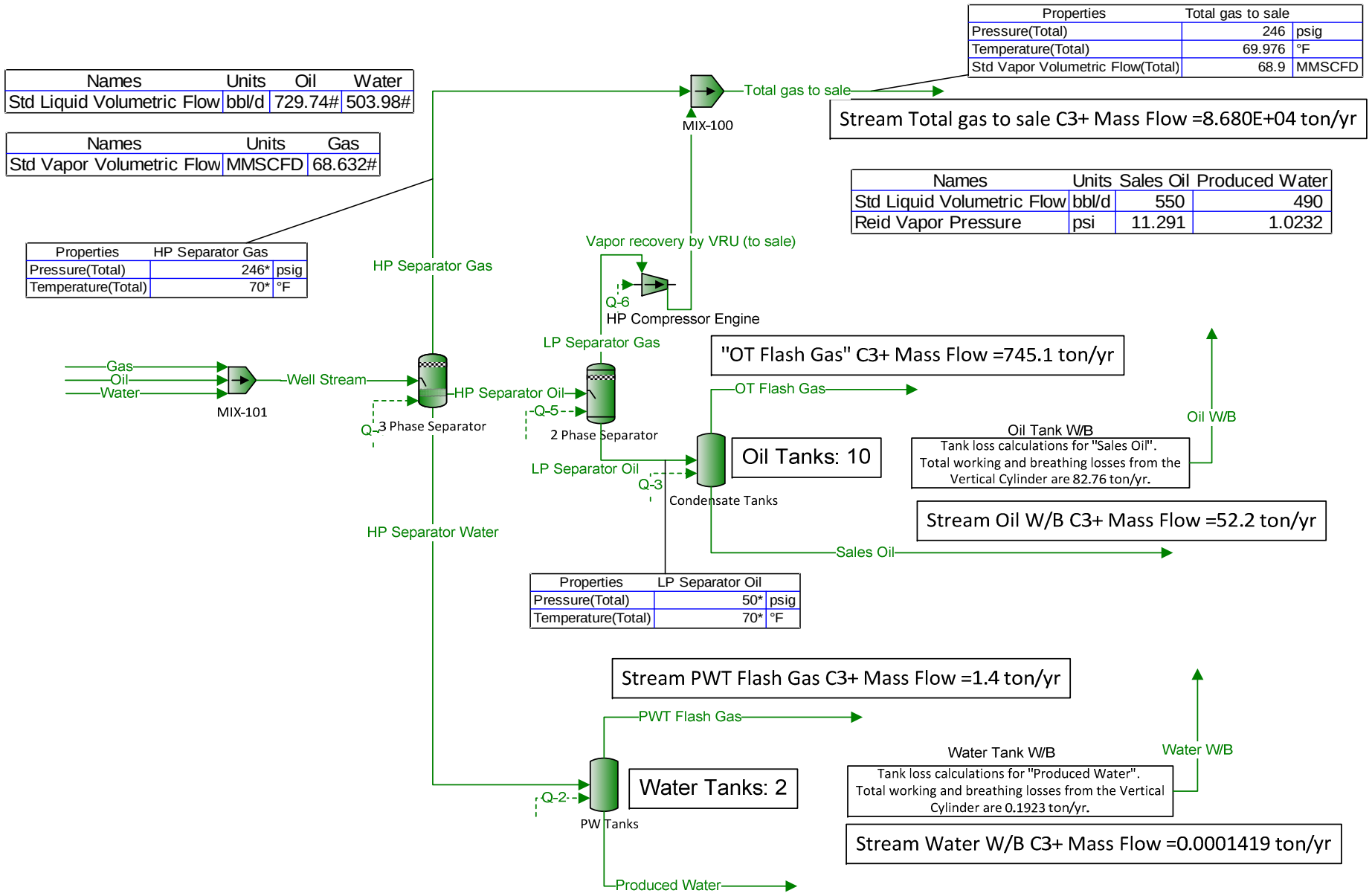
Licensed to Conestoga-Rovers & Associates, Inc. and Affiliates

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

ProMax Filename:
ProMax Version: 3.2.13330.0
Simulation Initiated: 5/31/2016 4:07:27 PM

Bryan Research & Engineering, Inc.
Chemical Engineering Consultants
P.O. Box 4747 Bryan, Texas 77805
Office: (979) 776-5220
FAX: (979) 776-4818
mailto:sales@bre.com
http://www.bre.com/

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


Names Units Oil Water
Std Liquid Volumetric Flow bbl/d 729.74# 503.98#
Names Units Gas
Std Vapor Volumetric Flow MMSCFD 68.632#
Properties HP Separator Gas
Pressure(Total) 246* psig
Temperature(Total) 70* °F
Properties Total gas to sale
Pressure(Total) 246 psig
Temperature(Total) 69.976 °F
Std Vapor Volumetric Flow(Total) 68.9 MMSCFD
Total gas to sale
MIX-100
Stream Total gas to sale C3+ Mass Flow =8.680E+04 ton/yr
Names Units Sales Oil Produced Water
Std Liquid Volumetric Flow bbl/d 550 490
Reid Vapor Pressure psi 11.291 1.0232
Vapor recovery by VRU (to sale)
HP Separator Gas
Q-6
HP Compressor Engine
LP Separator Gas
"OT Flash Gas" C3+ Mass Flow =745.1 ton/yr
Gas
Oil
Water
MIX-101
Well Stream
HP Separator Oil
Q-5
Q-4
3 Phase Separator
2 Phase Separator
OT Flash Gas
Oil W/B
Oil Tank W/B
Tank loss calculations for "Sales Oil".
Total working and breathing losses from the Vertical Cylinder are 82.76 ton/yr.
Oil Tanks: 10
LP Separator Oil
Q-3
Condensate Tanks
Stream Oil W/B C3+ Mass Flow =52.2 ton/yr
HP Separator Water
Sales Oil
Properties LP Separator Oil
Pressure(Total) 50* psig
Temperature(Total) 70* °F
Stream PWT Flash Gas C3+ Mass Flow =1.4 ton/yr
PWT Flash Gas
Water W/B
Water Tank W/B
Tank loss calculations for "Produced Water".
Total working and breathing losses from the Vertical Cylinder are 0.1923 ton/yr.
Water Tanks: 2
Q-2
PW Tanks
Stream Water W/B C3+ Mass Flow =0.0001419 ton/yr
Produced Water

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0*	0.149874	0.0443355	99.9564	0.246046	0.0194391	0*	7.59485E-05*	0.178154	99.9967	3.03011	0.00316640	0.149970	0.246046	100*	93.7961*	5.08447
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		0.4146*	0.413217	0.0115574	8.97137E-05	0.0997105	0.000676934	0.0150002*	0.000276666*	0.00717370	2.45848E-06	0.209879	1.08355E-05	0.412904	0.0997105	0*	0.00370451*	0.389348
Carbon Dioxide		0.1574*	0.156690	0.0420148	0.00131558	0.241535	0.0173886	0.0260003*	0.161817*	0.161696	0.000708426	1.46110	0.00259317	0.156775	0.241535	0*	1.73760*	0.148025
Methane		80.3799*	80.1125	6.90768	0.0337961	53.3631	1.17385	6.88607*	2.72813*	12.0487	0.00184958	76.8433	0.0588832	80.0858	53.3631	0*	3.76892*	75.5257
Ethane		14.4783*	14.4523	7.43229	0.00650352	31.2860	4.48811	8.32208*	49.4046*	36.8283	0.000411106	14.6546	1.17234	14.4691	31.2860	0*	0.663364*	13.6779
Propane		2.385*	2.43474	4.29228	0.00115803	7.42103	3.90611	8.76109*	21.7385*	19.6443	8.03533E-05	2.59222	2.29251	2.43972	7.42103	0*	0.0286030*	2.33031
Isobutane		0.4736*	0.481254	2.06388	7.28606E-05	1.57172	2.12463	2.53203*	5.98440*	5.82133	1.84253E-06	0.170823	1.74561	0.482342	1.57172	0*	0.000236038*	0.471012
n-Butane		0.8388*	0.867212	5.28867	0.000282025	2.86147	5.58824	7.16507*	11.6803*	11.5116	1.52427E-05	0.641711	4.98094	0.869202	2.86147	0*	0.00133448*	0.862204
Isopentane		0.2265*	0.241033	3.50982	5.02530E-05	0.776053	3.84724	4.26104*	3.33191*	3.52039	1.89371E-06	0.116321	3.88075	0.241567	0.776053	0*	0.00626OE-05*	0.257106
n-Pentane		0.2114*	0.232768	4.51950	4.72204E-05	0.748759	4.98491	5.70106*	3.25090*	3.47822	1.76256E-06	0.109342	5.13939	0.233283	0.748759	0*	4.15639E-05*	0.257969
2-Methylpentane		0*	0.0214923	0.975391	1.94228E-06	0.0669106	1.08752	2.73903*	0.295762*	0.324923	3.52134E-08	0.00458714	1.16571	0.0215376	0.0669106	0*	3.32957E-07*	0.0285981
3-Methylpentane		0*	0.0143331	0.724086	3.57086E-06	0.0445421	0.807960	1.88702*	0.196926*	0.217062	1.70358E-07	0.00817946	0.868543	0.0143632	0.0445421	0*	1.43943E-06*	0.0197023
n-Hexane		0.4345*	0.320686	19.9425	2.26676E-05	0.983735	22.2825	6.22406*	0.297490*	4.82364	3.28011E-07	0.0537340	24.0725	0.321348	0.983735	0*	1.51056E-07*	0.472857
Methylcyclopentane		0*	0.00520830	0.341509	4.21420E-06	0.0162493	0.381654	0.750008*	0.0670156*	0.0797578	5.50951E-07	0.00881183	0.412607	0.00521932	0.0162493	0*	3.33462E-06*	0.00783079
Benzene		0*	0.000673526	0.0440215	2.75301E-05	0.00211943	0.0491934	0.0970010*	0.000532308*	0.0103540	2.42994E-05	0.00779506	0.0531755	0.000674969	0.00211943	0*	9.06448E-06*	0.00101278
2-Methylhexane		0*	0.0146742	2.06680	1.11066E-06	0.0427552	2.31662	3.01903*	0.0124449*	0.212031	1.70803E-08	0.00263042	2.53240	0.0147022	0.0427552	0*	3.12757E-09*	0.0315216
3-Methylhexane		0*	0.0121541	1.79656	9.61265E-07	0.0354375	2.01393	2.57003*	0.155195*	0.175650	1.54408E-08	0.00227502	2.20241	0.0121773	0.0354375	0*	4.05414E-08*	0.0268335
Heptane		0*	0.0229752	4.20919	1.86746E-06	0.0659330	4.72057	5.52506*	0.266061*	0.326021	3.01623E-08	0.00441932	5.17114	0.0230180	0.0659330	0*	5.78236E-08*	0.0576868
Methylcyclohexane		0*	0.0124534	2.29400	6.00422E-06	0.0365945	2.57262	3.00503*	0.147728*	0.181580	5.43505E-07	0.0131353	2.81777	0.0124774	0.0365945	0*	1.06171E-06*	0.0313754
Toluene		0*	0.00256924	0.580167	7.95694E-05	0.00758310	0.650839	0.708007*	0.00415867*	0.0376447	6.85408E-05	0.0265958	0.713709	0.00257425	0.00758310	0*	1.48807E-05*	0.00739227
Octane		0*	0.0214376	11.4367	9.69374E-07	0.0577036	12.8412	11.3141*	0.214662*	0.286354	1.03901E-08	0.00230667	14.1284	0.0214738	0.0577036	0*	5.88179E-09*	0.118130
Ethylbenzene		0*	0.00116819	0.743104	3.07647E-05	0.00323161	0.834424	0.715007*	0.00332722*	0.0161101	2.61181E-05	0.0112028	0.918324	0.00117025	0.00323161	0*	3.52577E-06*	0.00746536
m-Xylene		0*	0.00113205	0.853160	3.01951E-05	0.00310272	0.958079	0.802008*	0.00412082*	0.0154956	2.57674E-05	0.0106756	1.05472	0.00113402	0.00310272	0*	3.75097E-06*	0.00837373
o-Xylene		0*	0.00135949	1.14505	4.89425E-05	0.00372290	1.28592	1.06201*	0.00427812*	0.0186013	4.34275E-05	0.0133088	1.41585	0.00136184	0.00372290	0*	4.88906E-06*	0.0110884
Nonane		0*	0.00451038	6.97682	3.01049E-07	0.0114004	7.83654	6.12906*	0.0388417*	0.0571004	5.10011E-09	0.000711855	8.63414	0.00451725	0.0114004	0*	8.54834E-10*	0.0639932
C10+		0*	0.00155057	11.7589	8.70166E-08	0.00356895	13.2098	9.78410*	0.0104652*	0.0178012	1.35082E-09	0.000206054	14.5623	0.00155259	0.00356895	0*	3.61691E-11*	0.102155
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	lbmol/h
Water		0*	11.3333	0.0304775	396.799	0.0185827	0.0118949	0*	3.44875E-07*	0.0101375	396.794	0.00500087	0.00175736	11.3519	0.0185827	408.162*	0.00222807*	408.162
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		31.2428*	31.2471	0.00794487	0.000356138	0.00753655	0.000414218	0.0125725*	1.25631E-06*	0.000408525	9.75539E-06	0.00034638Z	6.01370E-05	31.2546	0.00753065	0*	8.79984E-08*	31.2554
Carbon Dioxide		11.8611*	11.8488	0.0288822	0.00522248	0.0182420	0.0106402	0.0217924*	0.000734796*	0.00920095	0.00281108	0.00241140	0.00143921	11.8670	0.0182420	0*	4.12757E-05*	11.8829
Methane		6057.15*	6058.04	4.74854	0.134161	4.03025	0.718285	5.77163*	0.0123882*	0.685605	0.00733927	0.126822	0.0326802	6062.07	4.03025	0*	8.95285E-05*	6062.92
Ethane		1091.03*	1092.87	5.10917	0.0258171	2.36288	2.74629	6.97524*	0.224342*	2.09564	0.00163129	0.0241858	0.650651	1095.24	2.36288	0*	1.57578E-05*	1098.01
Propane		179.725*	184.113	2.95064	0.00459703	0.560474	2.39016	7.34320*	0.0987127*	1.11782	0.000318847	0.00427818	1.27234	184.674	0.560474	0*	6.79448E-07*	187.068
Isobutane		35.6888*	36.3920	1.41877	0.000289236	0.118704	1.30007	2.12224*	0.0271746*	0.331251	7.31127E-06	0.000281925	0.968817	36.5107	0.118704	0*	5.60694E-09*	37.8111
n-Butane		63.2090*	65.5778	3.63558	0.00111956	0.216113	3.41947	6.00548*	0.0530393*	0.655041	6.04842E-05	0.00105908	2.76443	65.7939	0.216113	0*	3.16997E-08*	69.2145
Isopentane		17.0682*	18.2267	2.41275	0.000199490	0.0588115	2.35414	3.57144*	0.0151299*	0.200321	7.51439E-06	0.00019197Ó	1.15382	18.2853	0.0586115	0*	1.44014E-09*	20.6397
n-Pentane		15.9304*	17.6017	3.10684	0.000187452	0.0565501	3.05029	4.77840*	0.0147620*	0.197921	6.99396E-06	0.000180458	2.85236	17.6583	0.0565501	0*	9.87325E-10*	20.7088
2-Methylpentane		0*	1.62523	0.670512	7.71031E-06	0.00505343	0.665459	2.29575*	0.00134303*	0.0184891	1.39729E-07	7.57058E-06	0.646970	1.63028	0.00505343	0*	7.90918E-12*	2.29575
3-Methylpentane		0*	1.08385	0.497758	1.41753E-05	0.00336405	0.494394	1.58163*	0.000894221*	0.0123514	6.75993E-07	1.34993E-05	0.482042	1.08722	0.00336405	0*	3.41928E-11*	1.58163
n-Hexane		32.7424*	24.2500	13.7090	8.99838E-05	0.0742967	13.6348	5.21676*	0.00135087*	0.274479	1.30157E-06	8.86822E-05	13.3603	24.3243	0.0742967	0*	3.58823E-12*	37.9592
Methylcyclopentane		0*	0.393847	0.234763	1.67292E-05	0.00122723	0.233536	0.628627*	0.000304312*	0.00453845	2.18621E-06	1.45430E-05	0.228997	0.395074	0.00122723	0*	7.92120E-11*	0.628627
Benzene		0*	0.0508314	0.0302617	0.000160787	0.00160070	0.0301016	0.0813224*	2.41716E-06*	0.00058974	9.64213E-05	0.00029124	0.0510915	0.00160070	0.00160070	0*	2.15321E-10*	0.0813024
2-Methylhexane		0*	1.10965	1.42078	4.40901E-06	0.00322909	1.41755	2.53043*	5.65111E-05*	0.0120652	6.77758E-08	4.34123E-06	1.40548	1.11288	0.00322909	0*	7.42937E-14*	2.53043
3-Methylhexane		0*	0.919080	1.23501	3.81595E-06	0.00267642	1.23233	2.15409*	0.000704725*	0.00999498	6.12700E-08	3.75468E-06	1.22234	0.921757	0.00267642	0*	9.63038E-13*	2.15409
Heptane		0*	1.73736	2.89352	7.41329E-06	0.00497960	2.88854	4.63088*	0.00120816*	0.0185515	1.19686E-07	7.29361E-06	2.86998	1.74234	0.00497960	0*	1.37356E-12*	4.63088
Methylcyclohexane		0*	0.941712	1.57696	2.38351E-05	0.00276380	1.57420	2.51870*	0.000670818*	0.0103324	2.15666E-06	2.16784E-05	1.56387	0.944476	0.00276380	0*	2.52202E-11*	2.51870
Toluene		0*	0.194284	0.398824	0.000315868	0.000572715	0.398251	0.593424*	1.88841E-05*	0.00214210	0.000271974	4.38935E-05	0.396109	0.194857	0.000572715	0*	3.53482E-10*	0.593424
Octane		0*	1.62109	7.86195	3.84814E-06	0.00435808	7.85759	9.48305*	0.000974759*	0.0162944	4.12287E-08	3.80691E-06	7.84130	1.62545	0.00435808	0*	1.39718E-13*	9.48305
Ethylbenzene		0*	0.0883373	0.510832	0.000122127	0.000244068	0.510587	0.599291*	1.51086E-05*	0.000916711	0.000103638	1.84890E-05	0.509671	0.0885813	0.000244068	0*	8.37526E-11*	0.599291
m-Xylene		0*	0.0856050	0.586487	0.000119866	0.000234333	0.586252	0.672212*	1.87123E-05*	0.000881745	0.000102247	1.76190E-05	0.585371	0.0858393	0.000234333	0*	8.91021E-11*	0.672212
o-Xylene		0*	0.102803	0.787138	0.000194288	0.000281173	0.786857	0.890136*	1.94265E-05*	0.00105847	0.000172323	2.19648E-05	0.785798	0.103084	0.000281173	0*	1.16137E-10*	0.890136
Nonane		0*	0.341071	4.79607	1.19508E-06	0.000861020	4.79521	5.13714*	0.000176377*	0.00324918	2.02376E-08	1.17484E-06	4.79196	0.341932	0.000861020	0*	2.03061E-14*	5.13714
C10+		0*	0.117253	8.08339	3.45431E-07	0.000269546	8.08312	8.20065*	4.75216E-05*	0.00101294	5.36016E-09	3.40071E-07	8.08211	0.117523	0.000269546	0*	8.59175E-16*	8.20065
Mass Fraction		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Water		0*	0.134854	0.00908128	99.9490	0.168290	0.00366485	0*	3.28813E-05*	0.0746293	99.9946	2.74056	0.000565099	0.134898	0.168290	100*	91.4319*	4.46726
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		0.582504*	0.578151	0.00368111	0.000139494	0.106049	0.000198450	0.00503353*	0.000186256*	0.00467284	3.82280E-06	0.295171	3.00698E-06	0.577531	0.106049	0*	0.00561524*	0.531934
Carbon Dioxide		0.347420*	0.344419	0.0210234	0.00321362	0.403579	0.00800849	0.0137068*	0.171143*	0.165469	0.00173058	3.22825	0.00113056	0.344496	0.403579	0*	4.13779*	0.317714
Methane		64.6729*	64.1902	1.25996	0.0300932	32.5022	0.197071	1.32329*	1.05178*	4.49451	0.00164701	61.8895	0.00935791	64.1486	32.5022	0*	3.27160*	59.0909
Ethane		21.8344*	21.7048	2.54095	0.0108542	35.7167	1.41228	2.99752*	35.7006*	25.7498	0.000686156	22.1224	0.349214	21.7232	35.7167	0*	1.07930*	20.0583
Propane		5.27458*	5.36224	2.15198	0.00283429	12.4240	1.80251	4.62769*	23.0364*	20.1421	0.000196675	5.73862	1.00144	5.37151	12.4240	0*	0.0682463*	5.01145
Isobutane		1.38057*	1.39706	1.36390	0.000235053	3.46822	1.29230	1.76287*	8.35894*	7.86750	5.94377E-06	0.498457	1.00509	1.39977	3.46822	0*	0.000742328*	1.33515
n-Butane		2.44514*	2.51747	3.49496	0.000909831	6.31442	3.39904	4.98854*	16.3149*	15.5578	4.91762E-05	1.87250	2.86794	2.52245	6.31442	0*	0.00419686*	2.44403
Isopentane		0.819599*	0.868568	2.87917	0.000201244	2.12580	2.90480	3.68261*	5.77712*	5.90598	7.58389E-06	0.421336	2.77371	0.870217	2.12580	0*	0.000236679*	0.904690
n-Pentane		0.764959*	0.838785	3.70744	0.000189099	2.05103	3.76379	4.92715*	5.63665*	5.83523	7.05867E-06	0.396056	3.67331	0.840375	2.05103	0*	0.000162262*	0.907718
2-Methylpentane		0*	0.0925044	0.955688	9.29023E-06	0.218917	0.980754	2.82742*	0.612511*	0.651081	1.68438E-07	0.0198456	0.995154	0.0926703	0.218917	0*	1.55254E-06*	0.120192
3-Methylpentane		0*	0.0616907	0.709459	1.70800E-05	0.145732	0.728638	1.94792*	0.407825*	0.434949	8.14885E-07	0.0353873	0.741466	0.618009	0.145732	0*	6.71190E-06*	0.0828046
n-Hexane		1.87792*	1.38026	19.5397	0.000108422	3.21857	20.0949	6.42493*	0.616090*	9.66563	1.56900E-06	0.232473	20.5505	1.38267	3.21857	0*	7.04355E-07*	1.98732
Methylcyclopentane		0*	0.0218926	0.326783	1.96856E-05	0.00539205	0.336134	0.756101*	0.175540*	0.156080	2.57375E-06	0.0372314	0.540999	0.0219320	0.0539205	0*	1.51852E-05*	0.0218413
Benzene		0*	0.00262766	0.0390964	0.000119359	0.00628547	0.0402126	0.0907620*	0.000999237*	0.0188061	0.000105357	0.0305686	0.0411477	0.00263246	0.00628547	0*	3.83117E-05*	0.00385823
2-Methylhexane		0*	0.0734393	2.35466	6.17715E-06	0.162655	2.42923	3.62372*	0.0299679*	0.494022	9.49996E-08	0.0132325	2.51377	0.0735564	0.162655	0*	1.69573E-08*	0.154042
3-Methylhexane		0*	0.0608269	2.04679	5.34626E-06	0.134816	2.11184	3.08478*	0.373716*	0.409256	8.58806E-08	0.0114446	2.18621	0.0609240	0.134816	0*	2.19810E-07*	0.131132
Heptane		0*	0.114983	4.79544	1.03863E-05	0.250831	4.95005	6.63168*	0.640688*	0.759615	1.67761E-07	0.0222316	5.13309	0.115161	0.250831	0*	3.13511E-07*	0.281908
Methylcyclohexane		0*	0.0610708	2.56093	3.27218E-05	0.136416	2.64341	3.53435*	0.348578*	0.414563	2.96212E-06	0.0647484	2.74077	0.0611697	0.136416	0*	5.64062E-06*	0.150243
Toluene		0*	0.0173534	0.607703	0.000406088	0.0255271	0.627558	0.781402*	0.00302839*	0.0806533	0.000305142	0.123025	0.651447	0.0174927	0.0255271	0*	7.41884E-05*	0.0371180
Octane		0*	0.122306	14.8536	6.14606E-06	0.250253	15.3504	15.4813*	0.589274*	0.760590	6.58787E-08	0.0132282	15.9877	0.122474	0.250253	0*	3.63543E-08*	0.658097
Ethylbenzene		0*	0.00619428	0.896986	0.000181287	0.0130257	0.927059	0.909291*	0.00848890*	0.0397696	0.000153912	0.0597099	0.965816	0.00620325	0.0130257	0*	2.02538E-05*	0.0386533
m-Xylene		0*	0.00600270	1.02983	0.000177930	0.0125062	1.06444	1.01993*	0.0105137*	0.0382527	0.000151846	0.0569003	1.10927	0.00601123	0.0125062	0*	2.15475E-05*	0.0433566
o-Xylene		0*	0.00720865	1.38216	0.000288402	0.0150060	1.42867	1.35058*	0.0109150*	0.0459195	0.000255915	0.0709351	1.48907	0.00721888	0.0150060	0*	2.80853E-05*	0.0574123
Nonane		0*	0.0288925	10.1739	2.14310E-06	0.0555134	10.5181	9.41629*	0.119719*	0.170289	3.63082E-08	0.0045835	10.9701	0.0289274	0.0555134	0*	5.93237E-09*	0.400280
C10+		0*	0.0117561	20.2951	7.33170E-07	0.0205690	20.9849	17.7911*	0.0381776*	0.0628338	1.13820E-08	0.0015703 4	21.8988	0.0117676	0.0205690	0*	2.97085E-10*	0.756288
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	lb/h	lb/h
Water		0*	204.173	0.549061	7148.44	0.334772	0.214289	0*	6.21302E-06*	0.182630	7148.35	0.0900921	0.0316593	204.508	0.334772	7353.16*	0.0401393*	7353.16
H2S		0*	0	0	0	0	0	0*	0*	0	0	0	0	0	0	0*	0*	0
Nitrogen		875.217*	875.337	0.222563	0.00997663	0.210959	0.0116037	0.352199*	3.51936E-05*	0.0114352	0.000273282	0.0097033 5	0.000168464	875.548	0.210959	0*	2.46513E-06*	875.569
Carbon Dioxide		522.002*	521.460	1.27109	0.229839	0.802821	0.468268	0.959072*	0.0323380*	0.404929	0.123714	0.106124	0.0633391	522.263	0.802821	0*	0.00181652*	522.961
Methane		97171.5*	97185.8	76.1782	2.15227	64.6552	11.5231	92.5912*	0.198737*	10.9988	0.117740	2.03453	0.524271	97250.5	64.6552	0*	0.00143626*	97264.1
Ethane		32806.3*	32861.7	153.628	0.776296	71.0496	82.5784	209.739*	6.74574*	63.0139	0.0490515	0.727245	19.5645	32932.7	71.0496	0*	0.0004738230	33016.1
Propane		7925.09*	8118.58	130.110	0.202709	24.7145	105.396	323.803*	4.35280*	49.2910	0.00140598	0.188649	56.1048	8143.30	24.7145	0*	0.0990705*	8248.90
Isobutane		2074.31*	2115.18	82.4622	0.0168110	6.89936	75.5628	123.349*	1.57945*	19.2530	0.000424947	0.0163861	56.3098	2122.08	6.89936	0*	3.25888E-07*	2197.66
n-Butane		3673.85*	3811.53	211.308	0.0650713	12.5610	198.747	349.052*	3.08276*	38.0725	0.00351547	0.0615558	160.675	3824.09	12.5610	0*	1.84246E-06*	4022.90
Isopentane		1231.45*	1315.04	174.077	0.0143930	4.22875	169.848	257.675*	1.09160*	14.4529	0.000542152	0.0138508	155.395	1319.27	4.22875	0*	1.03904E-07*	1489.13
n-Pentane		1149.36*	1269.94	224.154	0.0135244	4.08002	220.074	344.756*	1.06506*	14.2797	0.000504606	0.0130198	205.795	1274.02	4.08002	0*	7.12343E-08*	1494.11
2-Methylpentane		0*	140.054	57.7816	0.000664439	0.435481	57.3461	197.837*	0.115736*	1.59330	1.20412E-05	0.000652398	55.7528	140.490	0.435481	0*	6.81577E-10*	197.837
3-Methylpentane		0*	93.4014	42.8944	0.00122156	0.289898	42.6045	136.297*	0.0770598*	1.06439	5.82539E-05	0.00116331	41.5402	93.6913	0.289898	0*	4.09457E-09*	136.297
n-Hexane		2821.59*	2089.75	1181.38	0.00775439	6.40255	1174.98	449.557*	0.116412*	23.6534	0.000112163	0.00764222	1151.33	2096.16	6.40255	0*	3.09217E-10*	3271.14
Methylcyclopentane		0*	33.1460	19.7575	0.00140792	0.103283	19.6543	52.9049*	0.0256107*	0.381954	0.000183990	0.0012239 3	19.2723	33.2492	0.103283	0*	6.66644E-09*	52.9049
Benzene		0*	3.97835	2.36379	0.00853658	0.0125034	2.35129	6.35068*	0.000188809*	0.0460214	0.00753168	0.0010049 0	2.30527	3.99085	0.0125034	0*	1.68191E-08*	6.35068
2-Methylhexane		0*	111.189	142.365	0.000441791	0.323561	142.041	253.554*	0.00566252*	1.20895	6.79126E-06	0.000435000	140.832	111.513	0.323561	0*	7.44437E-12*	253.554
3-Methylhexane		0*	92.0936	123.750	0.000382365	0.268182	123.482	215.844*	0.0706148*	1.00152	6.13937E-06	0.000376226	122.481	92.3618	0.268182	0*	9.64982E-11*	215.844
Heptane		0*	174.087	289.936	0.000742827	0.498965	289.437	464.024*	0.121060*	1.85890	1.19928E-05	0.000730834	287.578	174.586	0.498965	0*	1.37634E-10*	464.024
Methylcyclohexane		0*	92.4630	154.836	0.00234027	0.271367	154.564	247.301*	0.0658650*	1.01450	0.000211754	0.0021285 2	153.550	92.7344	0.271367	0*	2.47627E-09*	247.301
Toluene		0*	17.9010	36.7470	0.0291036	0.0527691	36.6942	54.6771*	0.00173995*	0.197369	0.0250593	0.00404428	36.4969	17.9538	0.0527691	0*	3.25693E-08*	54.6771
Octane		0*	185.175	898.059	0.000439567	0.497817	897.561	1083.23*	0.111345*	1.86129	4.70949E-06	0.000434858	895.700	185.673	0.497817	0*	1.59598E-11*	1083.23
Ethylbenzene		0*	9.37832	54.2324	0.0129656	0.0259115	54.2065	63.6237*	0.00160400*	0.0973226	0.0110028	0.00196288	54.1092	9.40424	0.0259115	0*	8.89159E-09*	63.6237
m-Xylene		0*	9.08825	62.2644	0.0127256	0.0248780	62.2395	71.3653*	0.00198659*	0.0936104	0.0108550	0.00187052	62.1459	9.11313	0.0248780	0*	9.45952E-09*	71.3653
o-Xylene		0*	10.9141	83.5665	0.0206266	0.0298507	83.5367	94.5012*	0.00206242*	0.112372	0.0182947	0.00233190	83.4243	10.9440	0.0298507	0*	1.23297E-08*	94.5012
Nonane		0*	43.7441	615.120	0.000153275	0.110430	615.010	658.864*	0.0226212*	0.416724	2.59557E-06	0.000150679	614.593	43.8545	0.110430	0*	2.60436E-12*	658.864
C10+		0*	17.7990	1227.06	5.24364E-05	0.0409170	1227.02	1244.86*	0.00721379*	0.153764	8.13672E-07	5.16227E-05	1226.86	17.8399	0.0409170	0*	1.30423E-13*	1244.86

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Properties	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	Units																	
Temperature	°F	85*	70*	70	70	70	70*	85*	75.9425*	75.94*	75.94	75.94*	75.94	69.9757	70*	85*	75.9425*	84.3577
Pressure	psig	1000*	246*	246	246	50	50*	1000*	12.0728	0*	0	0*	0	246	246*	1000*	-14.2232	1000
Mole Fraction Vapor	%	100	100	0	0	100	0	100*	100	0	0	100	0	100	96.5453	0	100*	93.5164
Mole Fraction Light Liquid	%	0	0	100	100	0	100	100	0	100	0	0	100	0	3.35318	100	0	1.46459
Mole Fraction Heavy Liquid	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.101486	0	0	5.01897
Molecular Weight	lb/lbmol	19.9387	20.0218	87.9520	18.0164	26.3389	95.5567	83.4812	41.6113	43.0059	18.0157	19.9187	100.945	20.0281	26.3389	18.0153	18.4811	20.5043
Mass Density	lb/ft^3	4.32365	0.979242	42.4173	62.2575	0.308291	43.1316	41.8210	0.199242	0.111706	62.2171	0.0510972	43.4306	0.979650	1.39281	62.1797	0.00152071	4.72927
Molar Flow	lbmol/h	7535.65	7561.91	68.7429	396.972	7.55252	61.1904	83.8161	0.454091	5.69029	396.806	0.165039	55.5001	7569.47	7.55252	408.162	0.00237544	8027.63
Mass Flow	lb/h	150251	151403	6046.08	7152.02	198.925	5847.15	6997.07	18.8953*	244.716	7148.73	3.28736	5602.43	151602	198.925	7353.16	0.0439008*	164601
Vapor Volumetric Flow	ft^3/h	34750.9	154612	142.538	114.878	645.252	135.565	167.310	94.8360	2190.71	114.900	64.3355	128.997	154751	142.823	118.257	28.8685	34804.8
Liquid Volumetric Flow	gpm	4332.58	19276.3	17.7709	14.3225	80.4470	16.9017	20.8594	11.8237	273.127	14.3252	8.02105	16.0828	19293.6	17.8065	14.7437	3.59920	4339.30
Std Vapor Volumetric Flow	MMSCFD	68.6319*	68.8711	0.626085	3.61547	0.0687855	0.557299	0.763366	0.00413569	0.0518251	3.61397	0.00150312	0.505474	68.9399	0.0687855	3.71739	2.16346E-05	73.1126
Std Liquid Volumetric Flow	sgpm	902.580	906.144	18.1089	14.3109	1.05193	17.0570	21.2840*	0.0815879	1.01533	14.2917	0.0192748	16.0417	907.196	1.05193	14.6995*	9.70513E-05	938.563
Compressibility		0.800541	0.937729	0.0950971	0.0132722	0.972401	0.0252158	0.346523	0.972620	0.984317	0.000740330	0.996662	0.00594254	0.937676	0.867305	0.0502957	0.999551	0.753533
Specific Gravity		0.688428	0.691297	0.680103	0.998212	0.909412	0.691555	0.670542	1.43673	1.48488	0.997564	0.687737	0.696349	0.691515		0.996965	0.638103	
API Gravity				74.9562	10.0540		71.6344	75.4800			10.0152		69.4540			9.89088		
Enthalpy	Btu/h	-2.59488E+08	-2.57876E+08	-5.62380E+06	-4.88151E+07	-279655	-5.31854E+06	-6.51150E+06	-20068.5	-259221	-4.87714E+07	-6172.33	-5.00444E+06	-2.58160E+08	-284022	-5.00818E+07	-242.124	-3.16082E+08
Mass Enthalpy	Btu/lb	-1727.04	-1703.25	-930.157	-6825.36	-1405.83	-909.596	-930.604	-1062.09	-1059.27	-6822.38	-1877.59	-893.262	-1702.88	-1427.78	-6810.92	-5515.26	-1920.29
Mass Cp	Btu/(lb*°F)	0.666398	0.518237	0.505741	0.983020	0.453431	0.499236	0.514270	0.411071	0.410660	0.982732	0.479999	0.498937	0.518191	0.499256	0.980410	0.441028	0.676429
Ideal Gas CpCv Ratio		1.25518	1.25828	1.06260	1.32581	1.20465	1.05766	1.06469	1.13333	1.12772	1.32555	1.26330	1.05404	1.25822	1.20465	1.32512	1.32229	1.25038
Dynamic Viscosity	cP	0.0131176	0.0109100	0.338354	0.995497	0.00990555	0.390109	0.311368	0.00856851	0.00848792	0.924429	0.0108385	0.416041	0.0109090		0.840365	0.0102944	
Kinematic Viscosity	cSt	0.189402	0.695528	0.497975	0.998222	2.00585	0.564637	0.464791	2.68475	4.74354	0.927562	13.2419	0.598026	0.695171		0.843719	422.604	
Thermal Conductivity	Btu/(h*ft*°F)	0.0225305	0.0182277	0.0680893	0.346411	0.0150865	0.0688441	0.0657872	0.0108834	0.0111154	0.349782	0.0174375	0.0690620	0.0182243		0.353848	0.0122286	
Surface Tension	lbf/ft			0.00118250?	0.005039357		0.00133967?	0.000655230?			0.004997107		0.001382567			0.00492858		
Net Ideal Gas Heating Value	Btu/ft^3	1095.41	1098.01	4462.27	0.465563	1416.66	4838.18	4240.57	2186.31	2251.94	0.0345932	1036.65	5103.34	1098.33	1416.66	0	45.7295	1072.55
Net Liquid Heating Value	Btu/lb	20795.4	20755.8	19080.1	-1049.45	20304.5	19038.4	19095.0	19782.8	19717.3	-1058.98	19669.7	19008.8	20755.2	20304.5	-1059.76	-34.7922	19746.8
Gross Ideal Gas Heating Value	Btu/ft^3	1209.03	1211.84	4806.99	50.8016	1553.29	5208.59	4569.95	2378.03	2448.40	50.3461	1146.02	5491.58	1212.18	1553.29	50.31	97.7714	1185.21
Gross Liquid Heating Value	Btu/lb	22958.1	22913.1	20566.1	10.7881	22272.9	20508.0	20590.2	21531.2	21450.6	0.789731	21753.2	20466.9	22912.3	22272.9	0	1033.82	21831.8

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Vapor**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction		%	%			%			%	%		%		%	%		%	%
Water		0	0.149874			0.246046			7.59485E-05	0.178154		3.03011		0.149970	0.148603		93.7961	0.0758372
H2S		0	0			0			0	0		0		0	0		0	0
Nitrogen		0.4146	0.413217			0.0997105			0.000276666	0.00717370		0.209879		0.412904	0.103157		0.00370451	0.415472
Carbon Dioxide		0.1574	0.156690			0.241535			0.161817	0.161696		1.46110		0.156775	0.248068		1.73760	0.156362
Methane		80.3799	80.1125			53.3631			2.72813	12.0487		76.8433		80.0858	55.0797		3.76892	80.3672
Ethane		14.4783	14.4523			31.2860			49.4046	36.8283		14.6546		14.4691	31.7957		0.663364	14.3639
Propane		2.385	2.43474			7.42103			21.7385	19.6443		2.59222		2.43972	7.24927		0.0286030	2.38554
Isobutane		0.4736	0.481254			1.57172			5.98440	5.82133		0.170823		0.482342	1.42461		0.000236038	0.464696
n-Butane		0.8388	0.867212			2.86147			11.6803	11.5116		0.641711		0.869202	2.46578		0.00133448	0.831017
Isopentane		0.2265	0.241033			0.776053			3.33191	3.52039		0.116321		0.241567	0.551978		6.06260E-05	0.229493
n-Pentane		0.2114	0.232768			0.748759			3.25090	3.47822		0.109342		0.233283	0.488096		4.15639E-05	0.220788
2-Methylpentane		0	0.0214923			0.0669106			0.295762	0.324923		0.00458714		0.0215376	0.0289182		3.32957E-07	0.0207946
3-Methylpentane		0	0.0143331			0.0445421			0.196926	0.217062		0.00817946		0.0143632	0.0181476		1.43943E-06	0.0139199
n-Hexane		0.4345	0.320686			0.983735			0.297490	4.82364		0.0537340		0.321348	0.352344		1.51056E-07	0.317770
Methylcyclopentane		0	0.00520830			0.0162493			0.0670156	0.0797578		0.00881183		0.00521932	0.00579036		3.33462E-06	0.00507705
Benzene		0	0.000673526			0.00211943			0.000532308	0.0103540		0.00779506		0.000674969	0.000804153		9.06448E-06	0.000653111
2-Methylhexane		0	0.0146742			0.0427552			0.0124449	0.212031		0.00263042		0.0147022	0.00878623		3.12757E-09	0.0165999
3-Methylhexane		0	0.0121541			0.0354375			0.155195	0.175650		0.00227502		0.0121773	0.00703612		4.05414E-08	0.0137951
Heptane		0	0.0229752			0.0659330			0.266061	0.326021		0.00441932		0.0230180	0.0111234		5.78236E-08	0.0274367
Methylcyclohexane		0	0.0124534			0.0365945			0.147728	0.181580		0.0131353		0.0124774	0.00618051		1.06171E-06	0.0142816
Toluene		0	0.00758310			0.0207338			0.00415867	0.0376447		0.0265958		0.00257425	0.00113565		1.48807E-05	0.00300704
Octane		0	0.0214376			0.0577036			0.214662	0.286354		0.00230667		0.0214738	0.00395962		5.88179E-09	0.0344653
Ethylbenzene		0	0.00116819			0.00323161			0.00332722	0.0161101		0.0112028		0.00117025	0.000196744		3.52577E-06	0.00183060
m-Xylene		0	0.00113205			0.00310272			0.00412082	0.0154956		0.0106756		0.00113402	0.000162091		3.75097E-06	0.00186869
o-Xylene		0	0.00135949			0.00372290			0.00427812	0.0186013		0.0133088		0.00136184	0.000176619		4.88906E-06	0.00229022
Nonane		0	0.00451038			0.0114004			0.0388417	0.0571004		0.000711855		0.00451725	0.000271172		8.54834E-10	0.0101112
C10+		0	0.00155057			0.00356895			0.0104652	0.0178012		0.000206054		0.00155259	1.99527E-05		3.61691E-11	0.00579645
Molar Flow		lbmol/h	lbmol/h			lbmol/h			lbmol/h	lbmol/h		lbmol/h		lbmol/h	lbmol/h		lbmol/h	lbmol/h
Water		0	11.3333			0.0185827			3.44875E-07	0.0101375		0.00500087		11.3519	0.0108355		0.00222807	5.69321
H2S		0	0			0			0	0		0		0	0		0	0
Nitrogen		31.2428	31.2471			0.00753065			1.25631E-06	0.000408205		0.000346382		31.2546	0.00752180		8.79984E-08	31.1901
Carbon Dioxide		11.8611	11.8488			0.0182420			0.000734796	0.00920095		0.00241140		11.8670	0.0180881		4.12757E-05	11.7383
Methane		6057.15	6058.04			4.03025			0.0123882	0.685605		0.126822		6062.07	4.01619		8.95285E-05	6033.29
Ethane		1091.03	1092.87			2.36288			0.224342	2.09564		0.0241858		1095.24	2.31842		1.57578E-05	1078.32
Propane		179.725	184.113			0.560474			0.0987127	1.11782		0.00427818		184.674	0.528588		6.79448E-07	179.086
Isobutane		35.6888	36.3920			0.118704			0.0271746	0.331251		0.000281925		36.5107	0.103877		5.60694E-09	34.8855
n-Butane		63.2090	65.5778			0.216113			0.0530393	0.655041		0.00105908		65.7939	0.179794		3.16997E-08	62.3857
Isopentane		17.0682	18.2267			0.0586115			0.0151299	0.200321		0.000191976		18.2853	0.0402480		1.44014E-09	17.2284
n-Pentane		15.9304	17.6017			0.0565501			0.0147620	0.197921		0.000180458		17.6583	0.0355900		9.87325E-10	16.5749
2-Methylpentane		0	1.62523			0.00505343			0.00134303	0.0184891		7.57058E-06		1.63028	0.00210860		7.90918E-12	1.56108
3-Methylpentane		0	1.08385			0.0336405			0.000894221	0.0123514		1.34993E-05		1.08722	0.00132325		3.41928E-11	1.04499
n-Hexane		32.7424	24.2500			0.0742967			0.00135087	0.274479		8.86822E-05		24.3243	0.0256915		3.58823E-12	23.8555
Methylcyclopentane		0	0.393847			0.00122723			0.000304312	0.00453845		1.45430E-05		0.395074	0.000422210		7.92120E-11	0.381141
Benzene		0	0.0509314			0.000160070			2.41716E-06	0.000589174		1.28649E-05		0.0510915	5.86357E-05		2.15321E-10	0.0490300
2-Methylhexane		0	1.10965			0.00322909			5.65111E-05	0.0120652		4.34123E-06		1.11288	0.000640657		7.42937E-14	1.24618
3-Methylhexane		0	0.919080			0.00267642			0.000704725	0.00999498		3.75468E-06		0.921757	0.000513046		9.63038E-13	1.03562
Heptane		0	1.73736			0.00498560			0.00120816	0.0185515		7.29361E-06		1.74234	0.000811074		1.37356E-12	2.05971
Methylcyclohexane		0	0.941712			0.00276380			0.000670818	0.0103324		2.16784E-05		0.944476	0.000450658		2.52202E-11	1.07214
Toluene		0	0.194284			0.000572715			1.88841E-05	0.00214210		4.38935E-05		0.194857	8.28068E-05		3.53482E-10	0.225743
Octane		0	1.62109			0.00435808			0.000974759	0.0162944		3.80691E-06		1.62545	0.000288720		1.39718E-13	2.58736
Ethylbenzene		0	0.0883373			0.000244068			1.51086E-05	0.000916711		1.84890E-05		0.0885813	1.43458E-05		8.37526E-11	0.137426
m-Xylene		0	0.0856050			0.000234333			1.87123E-05	0.000881745		1.76190E-05		0.0858393	1.18190E-05		8.91021E-11	0.140285
o-Xylene		0	0.102803			0.000281173			1.94265E-05	0.00105847		2.19648E-05		0.103084	1.28783E-05		1.16137E-10	0.171930
Nonane		0	0.341071			0.000861020			0.00176377	0.00324918		0.00141932		1.17484E-06	0.0219332		1.97728E-05	2.030615E-14	0.759062
C10+		0	0.117253			0.000269546			4.75216E-05	0.00101294		3.40071E-07		0.117523	1.45487E-06		8.59175E-16	0.435148
Mass Fraction		%	%			%			%	%		%		%	%		%	%
Water		0	0.134854			0.168290			3.28813E-05	0.0746293		2.74056		0.134898	0.106407		91.4319	0.0683405
H2S		0	0			0			0	0		0		0	0		0	0
Nitrogen		0.582504	0.578151			0.106049			0.000186256	0.00467284		0.295171		0.577531	0.114860		0.00561524	0.582188
Carbon Dioxide		0.347420	0.344419			0.403579			0.171143	0.165469		3.22825		0.344496	0.433932		4.13779	0.344217
Methane		64.6729	64.1902			32.5022			1.05178	4.49451		61.8895		64.1486	35.1210		3.27160	64.4918
Ethane		21.8344	21.7048			35.7167			35.7006	25.7498		22.1224		21.7232	38.0008		1.07930	21.6046
Propane		5.27458	5.36224			12.4240			23.0364	20.1421		5.73862		5.37151	12.7056		0.0682463	5.26183
Isobutane		1.38057	1.39706			3.46832			8.35894	7.86750		0.498457		1.39977	3.29112		0.000742328	1.35103
n-Butane		2.44514	2.51747			6.31442			16.3149	15.5578		1.87250		2.52245	5.69640		0.00419686	2.41606
Isopentane		0.819599	0.868568			2.12580			5.77712	5.90598		0.421336		0.870217	1.58291		0.000236679	0.828235
n-Pentane		0.764959	0.838785			2.05103			5.63665	5.83523		0.396056		0.840375	1.39971		0.00162262	0.796819
2-Methylpentane		0	0.0925044			0.218917			0.612511	0.651081		0.0198456		0.0926703	0.0990511		1.55254E-06	0.0896374
3-Methylpentane		0	0.0616907			0.145732			0.407825	0.434949		0.0353873		0.0618009	0.0621594		6.71190E-06	0.0600033
n-Hexane		1.87792	1.38026			3.21857			0.616090	9.66563		0.232473		1.38267	1.20685		7.04355E-07	1.36978
Methylcyclopentane		0	0.0218926			0.0519205			0.135540	0.156080		0.0372314		0.0219320	0.0193693		1.51852E-05	0.0213732
Benzene		0	0.00262766			0.00628547			0.000999237	0.0188061		0.0305686		0.0263246	0.00249667		3.83117E-05	0.00255187

2-Methylhexane	0	0.0734393	0.162655	0.0299679	0.494022	0.0132325	0.0735564	0.0349932	1.69573E-08	0.0832025		
3-Methylhexane	0	0.0608269	0.134816	0.373716	0.409256	0.0114446	0.0609240	0.0280230	2.19810E-07	0.0691444		
Heptane	0	0.114983	0.250831	0.640688	0.759615	0.0222316	0.115161	0.0443015	3.13511E-07	0.137519		
Methylcyclohexane	0	0.0610708	0.136416	0.348578	0.414563	0.0647484	0.0611697	0.0241201	5.64062E-06	0.0701427		
Toluene	0	0.0118234	0.0265271	0.00920839	0.0806523	0.123025	0.0118427	0.00415900	7.41884E-05	0.0138591		
Octane	0	0.122306	0.250253	0.589274	0.760590	0.0132282	0.122474	0.0179777	3.63543E-08	0.196930		
Ethylbenzene	0	0.00619428	0.0130257	0.00848890	0.0397696	0.0597099	0.00620325	0.000830209	2.02538E-05	0.00972139		
m-Xylene	0	0.00600270	0.0125062	0.0105137	0.0382527	0.0569003	0.00601123	0.000683983	2.15475E-05	0.00992370		
o-Xylene	0	0.00720865	0.0150060	0.0109150	0.0459195	0.0709351	0.00721888	0.000745285	2.80853E-05	0.0121622		
Nonane	0	0.0288925	0.0555134	0.119719	0.170289	0.00458359	0.0289274	0.00138237	5.93237E-09	0.0648681		
C10+	0	0.0117561	0.0205690	0.0381776	0.0628338	0.00157034	0.0117676	0.000120386	2.97085E-10	0.0440138		
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**		
Water	0	204.173	0.334772	6.21302E-06	0.182630	0.0900921	204.508	0.195205	0.0401393	102.565		
H2S	0	0	0	0	0	0	0	0	0	0		
Nitrogen	875.217	875.337	0.210959	3.51936E-05	0.0114352	0.00970335	875.548	0.210711	2.46513E-06	873.742		
Carbon Dioxide	522.002	521.460	0.802821	0.0323380	0.404929	0.106124	522.263	0.796048	0.00181652	516.597		
Methane	97171.5	97185.8	64.6552	0.198737	10.9988	2.03453	97250.5	64.4296	0.00143626	96788.8		
Ethane	32806.3	32861.7	71.0496	6.74574	63.0139	0.727245	32932.7	69.7126	0.000473823	32424.0		
Propane	7925.09	8118.58	24.7145	4.35280	49.2910	0.188649	8143.30	23.3084	2.99607E-05	7896.91		
Isobutane	2074.31	2115.18	6.89936	1.57945	19.2530	0.0163861	2122.08	6.03756	3.25888E-07	2027.62		
n-Butane	3673.85	3811.53	12.5610	3.08276	38.0725	0.0615558	3824.09	10.4501	1.84246E-06	3626.00		
Isopentane	1231.45	1315.04	4.22875	1.09160	14.4529	0.0138508	1319.27	2.90385	1.03904E-07	1243.01		
n-Pentane	1149.36	1269.94	4.08002	1.06506	14.2797	0.0130198	1274.02	2.56778	7.12343E-08	1195.86		
2-Methylpentane	0	140.054	0.435481	0.115736	1.59330	0.000652398	140.490	0.181710	6.81577E-10	134.527		
3-Methylpentane	0	93.4014	0.289898	0.0770598	1.06439	0.00116331	93.6913	0.114032	2.94657E-09	90.0525		
n-Hexane	2821.59	2089.75	6.40255	0.116412	23.6534	0.00764222	2096.16	2.21397	3.09217E-10	2055.75		
Methylcyclopentane	0	33.1460	0.103283	0.0256107	0.381954	0.00122393	33.2492	0.0355330	6.66644E-09	32.0767		
Benzene	0	3.97835	0.0125034	0.000188809	0.0460214	0.00100490	3.99085	0.00458014	1.68191E-08	3.82982		
2-Methylhexane	0	111.189	0.323561	0.00566252	1.20895	0.000435000	111.513	0.0641950	7.44437E-12	124.870		
3-Methylhexane	0	92.0936	0.268182	0.0706148	1.00152	0.000376226	92.3618	0.0514082	9.64982E-11	103.771		
Heptane	0	174.087	0.498965	0.121060	1.85890	0.000730834	174.586	0.0812712	1.37634E-10	206.387		
Methylcyclohexane	0	92.4630	0.271367	0.0658650	1.01450	0.00212852	92.7344	0.0442483	2.47627E-09	105.270		
Toluene	0	17.9010	0.0527691	0.00173995	0.197369	0.00404428	17.9538	0.00762969	3.25693E-08	20.7996		
Octane	0	185.175	0.497817	0.111345	1.86129	0.000434858	185.673	0.0329800	1.59598E-11	295.550		
Ethylbenzene	0	9.37832	0.0259115	0.00160400	0.0973226	0.00196288	9.40424	0.00152302	8.89159E-09	14.5898		
m-Xylene	0	9.08825	0.0248780	0.00198659	0.0936104	0.00187052	9.11313	0.00125477	9.45952E-09	14.8934		
o-Xylene	0	10.9141	0.0298507	0.00206242	0.112372	0.00233190	10.9440	0.00136723	1.23297E-08	18.2530		
Nonane	0	43.7441	0.110430	0.0226212	0.416724	0.000150679	43.8545	0.00253596	2.60436E-12	97.3535		
C10+	0	17.7990	0.0409170	0.00721379	0.153764	5.16227E-05	17.8399	0.000220849	1.30423E-13	66.0555		

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**
Phase: **Vapor**	**From Block:**	**--**	**3 Phase Separator**	**3 Phase Separator**	**3 Phase Separator**	**2 Phase Separator**	**2 Phase Separator**	**--**	**--**	**Condensate Tanks**	**PW Tanks**	**PW Tanks**	**Condensate Tanks**	**MIX-100**	**HP Compressor Engine**	**--**	**--**	**MIX-101**
	To Block:	**MIX-101**	**MIX-100**	**2 Phase Separator**	**PW Tanks**	**HP Compressor Engine**	**Condensate Tanks**	**MIX-101**	**--**	**--**	**--**	**--**	**--**	**--**	**MIX-100**	**MIX-101**	**--**	**3 Phase Separator**
Property	**Units**																	
Temperature	°F	85	70			70		75.9425	75.94		75.94			69.9757	70	75.9425	84.3577	
Pressure	psig	1000	246			50		12.0728	0		0			246	246	-14.2232	1000	
Mole Fraction Vapor	%	100	100			100		100	100		100			100	100	100	100	
Mole Fraction Light Liquid	%	0	0			0		0	0		0			0	0	0	0	
Mole Fraction Heavy Liquid	%	0	0			0		0	0		0			0	0	0	0	
Molecular Weight	lb/lbmol	19.9387	20.0218			26.3389		41.6113	43.0059		19.9187			20.0281	25.1591	18.4811	19.9915	
Mass Density	lb/ft^3	4.32365	0.979242			0.308291		0.199242	0.111706		0.0510972			0.979650	1.28822	0.00152071	4.35087	
Molar Flow	lbmol/h	7535.65	7561.91			7.55252		0.454091	5.69029		0.165039			7569.47	7.29160	0.00237544	7507.15	
Mass Flow	lb/h	150251	151403			198.925		18.8953	244.716		3.28736			151602	183.450	0.0439008	150079	
Vapor Volumetric Flow	ft^3/h	34750.9	154612			645.252		94.8360	2190.71		64.3355			154751	142.406	28.8685	34494.0	
Liquid Volumetric Flow	gpm	4332.58	19276.3			80.4470		11.8237	273.127		8.02105			19293.6	17.7546	3.59920	4300.55	
Std Vapor Volumetric Flow	MMSCFD	68.6319	68.8711			0.0687855		0.00413569	0.0518251		0.00150312			68.9399	0.0664092	2.16346E-05	68.3723	
Std Liquid Volumetric Flow	sgpm	902.580	906.144			1.05193		0.0815879	1.01533		0.0192748			907.196	0.998509	9.70513E-05	899.241	
Compressibility		0.800541	0.937729			0.972401		0.972620	0.984317		0.996662			0.937676	0.895719	0.999551	0.798582	
Specific Gravity		0.688428	0.691297			0.909412		1.43673	1.48488		0.687737			0.691515	0.868676	0.638103	0.690252	
API Gravity																		
Enthalpy	Btu/h	-2.59488E+08	-2.57876E+08			-279655		-20068.5	-259221		-6172.33			-2.58160E+08	-266524	-242.124	-2.59176E+08	
Mass Enthalpy	Btu/lb	-1727.04	-1703.25			-1405.83		-1062.09	-1059.27		-1877.59			-1702.88	-1452.84	-5515.26	-1726.93	
Mass Cp	Btu/(lb*°F)	0.666398	0.518237			0.453431		0.411071	0.410660		0.479999			0.518191	0.494051	0.441028	0.667433	
Ideal Gas CpCv Ratio		1.25518	1.25828			1.20465		1.13333	1.12772		1.26330			1.25822	1.21390	1.32229	1.25476	
Dynamic Viscosity	cP	0.0131176	0.0109100			0.00990555		0.00856851	0.00848792		0.0108385			0.0109090	0.0104103	0.0102944	0.0131225	
Kinematic Viscosity	cSt	0.189402	0.695528			2.00585		2.68475	4.74354		13.2419			0.695171	0.504493	422.604	0.188286	
Thermal Conductivity	Btu/(hr*ft*°F)	0.0225305	0.0182277			0.0150865		0.0108834	0.0111154		0.0174375			0.0182243	0.0161650	0.0122286	0.0225162	
Surface Tension	lbf/ft																	
Net Ideal Gas Heating Value	Btu/ft^3	1095.41	1098.01			1416.66		2186.31	2251.94		1036.65			1098.33	1358.84	45.7295	1097.19	
Net Liquid Heating Value	Btu/lb	20795.4	20755.8			20304.5		19782.8	19717.3		19669.7			20755.2	20395.4	-34.7922	20772.7	
Gross Ideal Gas Heating Value	Btu/ft^3	1209.03	1211.84			1553.29		2378.03	2448.40		1146.02			1212.18	1491.32	97.7714	1210.94	
Gross Liquid Heating Value	Btu/lb	22958.1	22913.1			22272.9		21531.2	21450.6		21753.2			22912.3	22393.6	1033.82	22931.9	

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Composition	**Status:**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**	**Solved**
Phase: **Light Liquid**	**From Block:**	**--**	**3 Phase Separator**	**3 Phase Separator**	**3 Phase Separator**	**2 Phase Separator**	**2 Phase Separator**	**--**	**--**	**Condensate Tanks**	**PW Tanks**	**PW Tanks**	**Condensate Tanks**	**MIX-100**	**HP Compressor Engine**	**--**	**--**	**MIX-101**
	To Block:	**MIX-101**	**MIX-100**	**2 Phase Separator**	**PW Tanks**	**HP Compressor Engine**	**Condensate Tanks**	**MIX-101**	**--**	**--**	**--**	**--**	**--**	**--**	**MIX-100**	**MIX-101**	**--**	**3 Phase Separator**
Mole Fraction				**%**	**%**		**%**	**%**			**%**		**%**		**%**	**%**		**%**
Water				0.0443355	99.9564		0.0194391	0			99.9967		0.00316640		0.0338777	100		0.0591062
H2S				0	0		0	0			0		0		0	0		0
Nitrogen				0.0115574	8.97137E-05		0.000676934	0.0150002			2.45848E-06		1.08355E-05		0.00349210	0		0.0543366
Carbon Dioxide				0.0420148	0.00131558		0.0173886	0.0260003			0.000708426		0.00259317		0.0607044	0		0.111520
Methane				6.90768	0.0337961		1.17385	6.88607			0.00184958		0.0588832		5.55210	0		24.8431
Ethane				7.43229	0.00650352		4.48811	8.32208			0.000411106		1.17234		17.5577	0		16.6987
Propane				4.29228	0.00115803		3.90611	8.76109			8.03533E-05		2.29251		12.5907	0		6.78322
Isobutane				2.06388	7.28608E-05		2.12463	2.53203			1.84253E-06		1.74561		5.85482	0		2.48805
n-Butane				5.28867	0.000282025		5.58824	7.16507			1.52427E-05		4.98094		14.3411	0		5.80699
Isopentane				3.50982	5.02530E-05		3.84724	4.26104			1.89371E-06		3.88075		7.25114	0		2.90130
n-Pentane				4.51950	4.72204E-05		4.98491	5.70106			1.76256E-06		5.13939		8.27648	0		3.51587
2-Methylpentane				0.975391	1.94228E-06		1.08752	2.73903			3.52134E-08		1.16571		1.16282	0		0.624855
3-Methylpentane				0.724086	3.57086E-06		0.807960	1.88702			1.70358E-07		0.868543		0.805844	0		0.456421
n-Hexane				19.9425	2.26676E-05		22.2825	6.22406			3.28011E-07		24.0725		19.1926	0		11.9957
Methylcyclopentane				0.341509	4.21420E-06		0.381654	0.750008			5.50951E-07		0.412607		0.317876	0		0.210487
Benzene				0.0440215	2.75301E-05		0.0491934	0.0970010			2.42994E-05		0.0531755		0.0400524	0		0.0273730
2-Methylhexane				2.06680	1.11066E-06		2.31662	3.01903			1.70803E-08		2.53240		1.02209	0		1.09231
3-Methylhexane				1.79656	9.61265E-07		2.01393	2.57003			1.54408E-08		2.20241		0.854246	0		0.951309
Heptane				4.20919	1.86746E-06		4.72057	5.52506			3.01623E-08		5.17114		1.64602	0		2.18689
Methylcyclohexane				2.29400	6.00422E-06		2.57262	3.00503			5.43505E-07		2.81777		0.913386	0		1.23034
Toluene				0.580167	7.95694E-05		0.650839	0.708007			6.85408E-05		0.713709		0.193448	0		0.312521
Octane				11.4367	9.69374E-07		12.8412	11.3141			1.03901E-08		14.1284		1.60686	0		5.86508
Ethylbenzene				0.743104	3.07647E-05		0.834424	0.715007			2.61181E-05		0.918324		0.0907098	0		0.392761
m-Xylene				0.853160	3.01951E-05		0.958079	0.802008			2.57674E-05		1.05472		0.0878635	0		0.452349
o-Xylene				1.14505	4.89425E-05		1.28592	1.06201			4.34275E-05		1.41585		0.105941	0		0.610735
Nonane				6.97682	3.01049E-07		7.83654	6.12906			5.10011E-09		8.63414		0.332182	0		3.72374
C10+				11.7589	8.70166E-08		13.2098	9.78410			1.35082E-09		14.5623		0.105860	0		6.60490
Molar Flow				**lbmol/h**	**lbmol/h**		**lbmol/h**	**lbmol/h**			**lbmol/h**		**lbmol/h**		**lbmol/h**	**lbmol/h**		**lbmol/h**
Water				0.0304775	396.799		0.0118949	0			396.794		0.00175736		8.57950E-05	408.162		0.0694922
H2S				0	0		0	0			0		0		0	0		0
Nitrogen				0.00794487	0.000356138		0.000414218	0.0125725			9.75539E-06		6.01370E-06		8.84371E-06	0		0.0638846
Carbon Dioxide				0.0288822	0.00522248		0.0106402	0.0217924			0.00281108		0.00143921		0.000153733	0		0.131116
Methane				4.74854	0.134161		0.718285	5.77163			0.00733927		0.0326802		0.0140607	0		29.2085

Ethane	5.10917	0.0258171	2.74629	6.97524	0.00163129	0.650651	0.0444648	0	19.6329
Propane	2.95064	0.00459703	2.39016	7.34320	0.000318847	1.27234	0.0318859	0	7.97516
Isobutane	1.41877	0.000289236	1.30007	2.12224	7.31127E-06	0.968817	0.0148273	0	2.92525
n-Butane	3.63558	0.00111956	3.41947	6.00548	6.04842E-05	2.76443	0.0363187	0	6.82738
Isopentane	2.41275	0.000199490	2.35414	3.57144	7.51436E-06	2.15382	0.0183635	0	3.41112
n-Pentane	3.10684	0.000187452	3.05029	4.77840	6.99396E-06	2.85236	0.0209601	0	4.13368
2-Methylpentane	0.670512	7.71031E-06	0.665459	2.29575	1.39729E-07	0.646970	0.00294483	0	0.734654
3-Methylpentane	0.497758	1.41753E-05	0.494394	1.58163	6.75993E-07	0.482042	0.00204080	0	0.536623
n-Hexane	13.7090	8.99838E-05	13.6348	5.21676	1.30157E-06	13.3603	0.0486052	0	14.1036
Methylcyclopentane	0.234763	1.67292E-05	0.233536	0.628627	2.18621E-06	0.228997	0.000805019	0	0.247473
Benzene	0.0302617	0.000109287	0.0301016	0.0813024	9.64217E-05	0.0295124	0.000101432	0	0.0321830
2-Methylhexane	1.42078	4.40901E-06	1.41755	2.53043	6.77758E-08	1.40548	0.00258844	0	1.28425
3-Methylhexane	1.23501	3.81595E-06	1.23233	2.15409	6.12700E-08	1.22234	0.00216337	0	1.11847
Heptane	2.89352	7.41329E-06	2.88854	4.63088	1.19686E-07	2.86998	0.00416852	0	2.57117
Methylcyclohexane	1.57696	2.38351E-05	1.57420	2.51870	2.15666E-06	1.56387	0.00231314	0	1.44654
Toluene	0.398824	0.000315868	0.398251	0.593424	0.000271974	0.396109	0.000489906	0	0.367436
Octane	7.86195	3.84814E-06	7.85759	9.48305	4.12287E-08	7.84130	0.00406936	0	6.89568
Ethylbenzene	0.510832	0.000122127	0.510587	0.599291	0.000103638	0.509671	0.000229722	0	0.461777
m-Xylene	0.586487	0.000119866	0.586252	0.672212	0.000102247	0.585371	0.000222514	0	0.531835
o-Xylene	0.787138	0.000194288	0.786857	0.890136	0.000172323	0.785798	0.000268294	0	0.718052
Nonane	4.79607	1.19508E-06	4.79521	5.13714	2.02376E-08	4.79196	0.000841248	0	4.37808
C10+	8.08339	3.45431E-07	8.08312	8.20065	5.36016E-09	8.08211	0.000268091	0	7.76550
Mass Fraction	%	%	%	%	%	%	%	%	%
Water	0.00908128	99.9499	0.00366485	0	99.9946	0.000565099	0.0100778	100	0.0172373
H2S	0	0	0	0	0	0	0	0	0
Nitrogen	0.00368111	0.000139494	0.000198450	0.00503353	3.82280E-06	3.00698E-06	0.00161533	0	0.0246408
Carbon Dioxide	0.0210234	0.00321362	0.00800849	0.0137068	0.00173058	0.00113056	0.0441139	0	0.0794499
Methane	1.25996	0.0300932	0.197071	1.32329	0.00164701	0.00935791	1.47075	0	6.45168
Ethane	2.54095	0.0108542	1.41228	2.99752	0.000686156	0.349214	8.71761	0	8.12824
Propane	2.15198	0.00283429	1.80251	4.62769	0.000196675	1.00144	9.16761	0	4.84202
Isobutane	1.36390	0.000235053	1.29230	1.76287	5.94437E-06	1.00509	5.61908	0	2.34098
n-Butane	3.49496	0.000909831	3.39904	4.98854	4.91762E-05	2.86794	13.7637	0	5.46372
Isopentane	2.87917	0.000201244	2.90480	3.68261	7.58389E-06	2.77371	8.63864	0	3.38858
n-Pentane	3.70744	0.000189099	3.76379	4.92715	7.05867E-06	3.67331	9.86016	0	4.10636
2-Methylpentane	0.955688	9.29023E-06	0.980754	2.82742	1.68438E-07	0.995154	1.65464	0	0.871682
3-Methylpentane	0.709459	1.70800E-05	0.728638	1.94792	8.14885E-07	0.741466	1.14668	0	0.636714
n-Hexane	19.5397	0.000108422	20.0949	6.42493	1.56900E-06	20.5505	27.3104	0	16.7342
Methylcyclopentane	0.326783	1.96856E-05	0.336134	0.756101	2.57375E-06	0.343999	0.441744	0	0.286763
Benzene	0.0390964	0.000119359	0.0402126	0.0907620	0.000105357	0.0411477	0.0516600	0	0.0346127
2-Methylhexane	2.35466	6.17715E-06	2.42923	3.62372	9.49996E-08	2.51377	1.69112	0	1.77181
3-Methylhexane	2.04679	5.34626E-06	2.11184	3.08478	8.58806E-08	2.18621	1.41341	0	1.54310
Heptane	4.79544	1.03863E-05	4.95005	6.63168	1.67761E-07	5.13309	2.72345	0	3.54730
Methylcyclohexane	2.56093	3.27218E-05	2.64341	3.53435	2.96212E-06	2.74077	1.48086	0	1.95556
Toluene	0.607783	0.000406928	0.627558	0.781429	0.000350542	0.651447	0.294317	0	0.466138
Octane	14.8536	6.14606E-06	15.3504	15.4813	6.58787E-08	15.9877	3.03083	0	10.8454
Ethylbenzene	0.896986	0.000181287	0.927059	0.909291	0.000153912	0.965816	0.159018	0	0.675002
m-Xylene	1.02983	0.000177930	1.06444	1.01993	0.000151846	1.10927	0.154028	0	0.777411
o-Xylene	1.38216	0.000288402	1.42867	1.35058	0.000255915	1.48907	0.185718	0	1.04961
Nonane	10.1739	2.14310E-06	10.5181	9.41629	3.63082E-08	10.9701	0.703493	0	7.73125
C10+	20.2951	7.33170E-07	20.9849	17.7911	1.13820E-08	21.8988	0.265347	0	16.2305
Mass Flow	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Water	0.549061	7148.44	0.214289	0	7148.35	0.0316593	0.00154562	7353.16	1.25192
H2S	0	0	0	0	0	0	0	0	0
Nitrogen	0.222563	0.00997663	0.0116037	0.352199	0.000273282	0.000168464	0.000247742	0	1.78962
Carbon Dioxide	1.27109	0.229839	0.468268	0.959072	0.123714	0.0633391	0.00676573	0	5.77034
Methane	76.1782	2.15227	11.5231	92.5912	0.117740	0.524271	0.225568	0	468.577
Ethane	153.628	0.776296	82.5784	209.739	0.0490515	19.5645	1.33702	0	590.343
Propane	130.110	0.202709	105.396	323.803	0.0140598	56.1048	1.40603	0	351.670
Isobutane	82.4622	0.0168110	75.5628	123.349	0.000424947	56.3098	0.861796	0	170.022
n-Butane	211.308	0.0650713	198.747	349.052	0.00351547	160.675	2.11092	0	396.822
Isopentane	174.077	0.0143930	169.848	257.675	0.000542152	155.395	1.32490	0	246.108
n-Pentane	224.154	0.0135244	220.074	344.756	0.000504606	205.795	1.51225	0	298.240
2-Methylpentane	57.7816	0.000664439	57.3461	197.837	1.20412E-05	55.7528	0.253772	0	63.3091
3-Methylpentane	42.8944	0.00122156	42.6045	136.297	5.82539E-05	41.5402	0.175866	0	46.2436
n-Hexane	1181.38	0.00775439	1174.98	449.557	0.000112163	1151.33	4.18857	0	1215.38
Methylcyclopentane	19.7575	0.00140792	19.6543	52.9049	0.000183990	19.2723	0.0677499	0	20.8272
Benzene	2.36379	0.00853658	2.35129	6.35068	0.00753168	2.30527	0.00792307	0	2.51387
2-Methylhexane	142.365	0.000441791	142.041	253.554	6.79126E-06	140.832	0.259366	0	128.684
3-Methylhexane	123.750	0.000382365	123.482	215.844	6.13937E-06	122.481	0.216774	0	112.073
Heptane	289.936	0.000742827	289.437	464.024	1.19928E-05	287.578	0.417694	0	257.636
Methylcyclohexane	154.836	0.00234027	154.564	247.301	0.000211754	153.550	0.227118	0	142.030
Toluene	36.7470	0.0291036	36.6942	54.6771	0.0250593	36.4969	0.0451392	0	33.8550
Octane	898.059	0.000439567	897.561	1083.23	4.70949E-06	895.700	0.464837	0	787.683
Ethylbenzene	54.2324	0.0129656	54.2065	63.6237	0.0110028	54.1092	0.0243884	0	49.0245
m-Xylene	62.2644	0.0127256	62.2395	71.3653	0.0108550	62.1459	0.0236232	0	56.4623
o-Xylene	83.5665	0.0206266	83.5367	94.5012	0.0182947	83.4243	0.0284834	0	76.2320
Nonane	615.120	0.000153275	615.010	658.864	2.59557E-06	614.593	0.107894	0	561.511
C10+	1227.06	5.24364E-05	1227.02	1244.86	8.13672E-07	1226.86	0.0406962	0	1178.80

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Light Liquid**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F			70	70		70	85			75.94		75.94		70	85		84.3577
Pressure	psig			246	246		50	1000			0		0		246	1000		1000
Mole Fraction Vapor	%			0	0		0	0			0		0		0	0		0
Mole Fraction Light Liquid	%			100	100		100	100			100		100		100	100		100
Mole Fraction Heavy Liquid	%			0	0		0	0			0		0		0	0		0
Molecular Weight	lb/lbmol			87.9520	18.0164		95.5567	83.4812			18.0157		100.945		60.5606	18.0153		61.7738
Mass Density	lb/ft^3			42.4173	62.2575		43.1316	41.8210			62.2171		43.4306		37.0067	62.1797		37.4717
Molar Flow	lbmol/h			68.7429	396.972		61.1904	83.8161			396.806		55.5001		0.253249	408.162		117.572
Mass Flow	lb/h			6046.08	7152.02		5847.15	6997.07			7148.73		5602.43		15.3369	7353.16		7262.86
Vapor Volumetric Flow	ft^3/h			142.538	114.878		135.565	167.310			114.900		128.997		0.414437	118.257		193.823
Liquid Volumetric Flow	gpm			17.7709	14.3225		16.9017	20.8594			14.3252		16.0828		0.0516701	14.7437		24.1649
Std Vapor Volumetric Flow	MMSCFD			0.626085	3.61547		0.557299	0.763366			3.61397		0.505474		0.00230650	3.71739		1.07080
Std Liquid Volumetric Flow	sgpm			18.1089	14.3109		17.0570	21.2840			14.2917		16.0417		0.0531419	14.6995		24.7725
Compressibility				0.0950971	0.0132722		0.0252158	0.346523			0.000740330		0.00594254		0.0750542	0.0502957		0.286518
Specific Gravity				0.680103	0.998212		0.691555	0.670542			0.997564		0.696349		0.593350	0.996965		0.600806
API Gravity				74.9562	10.0540		71.6344	75.4800			10.0152		69.4540		104.391	9.89088		97.9450
Enthalpy	Btu/h			-5.62380E+06	-4.88151E+07		-5.31854E+06	-6.51150E+06			-4.87714E+07		-5.00444E+06		-16555.0	-5.00818E+07		-7.50589E+06
Mass Enthalpy	Btu/lb			-930.157	-6825.36		-909.596	-930.604			-6822.38		-893.262		-1079.42	-6810.92		-1033.46
Mass Cp	Btu/(lb*°F)			0.505741	0.983020		0.499236	0.514270			0.982732		0.498937		0.557163	0.980410		0.557498
Ideal Gas CpCv Ratio				1.06260	1.32581		1.05766	1.06469			1.32555		1.05404		1.09075	1.32512		1.08682
Dynamic Viscosity	cP			0.338354	0.995497		0.390109	0.311368			0.924429		0.416041		0.178523	0.840365		0.184293
Kinematic Viscosity	cSt			0.497975	0.998222		0.564637	0.464791			0.927562		0.598026		0.301157	0.843719		0.307033
Thermal Conductivity	Btu/(h*ft*°F)			0.0680893	0.346411		0.0688441	0.0657872			0.349782		0.0690620		0.0628146	0.353848		0.0635557
Surface Tension	lbf/ft			0.00118250?	0.00503935?		0.00133967?	0.000655230?			0.00499710?		0.00138256?		0.000794121?	0.00492858		0.000506037?
Net Ideal Gas Heating Value	Btu/ft^3			4462.27	0.465563		4838.18	4240.57			0.0345932		5103.34		3124.36	0		3170.25
Net Liquid Heating Value	Btu/lb			19080.1	-1049.45		19038.4	19095.0			-1058.98		19008.8		19409.8	-1059.76		19314.9
Gross Ideal Gas Heating Value	Btu/ft^3			4806.99	50.8016		5208.59	4569.95			50.3461		5491.58		3382.90	50.31		3427.01
Gross Liquid Heating Value	Btu/lb			20566.1	10.7881		20508.0	20590.2			0.789731		20466.9		21028.9	0		20891.2

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Heavy Liquid**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction															%			%
Water															99.9557			99.8748
H2S															0			0
Nitrogen															2.30822E-05			0.000332769
Carbon Dioxide															0.00209362			0.00334478
Methane															0.0235681			0.104911
Ethane															0.0140860			0.0141693
Propane															0.00330997			0.00176378
Isobutane															0.000202672			9.12390E-05
n-Butane															0.000751594			0.000347082
Isopentane															0.000106274			4.46456E-05
n-Pentane															9.05785E-05			4.41682E-05
2-Methylpentane															2.32408E-06			1.58893E-06
3-Methylpentane															4.01961E-06			2.80554E-06
n-Hexane															2.20505E-05			1.76104E-05
Methylcyclopentane															4.19421E-06			3.04823E-06
Benzene															3.00164E-05			2.21922E-05
2-Methylhexane															5.78498E-07			6.79035E-07
3-Methylhexane															4.84580E-07			5.99496E-07
Heptane															7.84564E-07			1.02961E-06
Methylcyclohexane															2.61866E-06			4.30862E-06
Toluene															3.10991E-05			6.07534E-05
Octane															1.51453E-07			7.06035E-07
Ethylbenzene															4.49263E-06			2.20470E-05
m-Xylene															3.73631E-06			2.25678E-05
o-Xylene															5.49958E-06			3.79839E-05
Nonane															1.48697E-08			2.23787E-07
C10+															8.88902E-10			7.39979E-08
Molar Flow															lbmol/h			lbmol/h
Water															0.00766136			402.400
H2S															0			0
Nitrogen															1.76919E-09			0.00134074
Carbon Dioxide															1.60471E-07			0.0134763
Methane															1.80644E-06			0.422692
Ethane															1.07966E-06			0.0570886
Propane															2.53701E-07			0.00710633
Isobutane															1.55343E-08			0.000367606
n-Butane															5.76078E-08			0.00139841
Isopentane															8.14567E-09			0.000178679
n-Pentane															6.94262E-09			0.000177956
2-Methylpentane															1.78135E-10			6.40186E-06
3-Methylpentane															3.08094E-10			1.13036E-05
n-Hexane															1.69012E-09			7.09531E-05
Methylcyclopentane															3.21476E-10			1.22814E-05
Benzene															2.30069E-09			8.94135E-05
2-Methylhexane															4.43404E-11			2.73586E-06
3-Methylhexane															3.71419E-11			2.41539E-06
Heptane															6.01349E-11			4.14836E-06
Methylcyclohexane															2.00714E-10			1.73596E-05
Toluene															2.38367E-09			0.000244778
Octane															1.16085E-11			2.84465E-06
Ethylbenzene															3.44349E-10			8.88284E-05
m-Xylene															2.86379E-10			9.09266E-05
o-Xylene															4.21529E-10			0.000153039
Nonane															1.13973E-12			9.01646E-07
C10+															6.81322E-14			2.98141E-07
Mass Fraction															%			%
Water															99.9378			99.8671
H2S															0			0
Nitrogen															3.58859E-05			0.000517410
Carbon Dioxide															0.00511360			0.00817034
Methane															0.0209835			0.0934155
Ethane															0.0235065			0.0236479
Propane															0.00810030			0.00431683
Isobutane															0.000653760			0.000294339
n-Butane															0.00242441			0.00111969
Isopentane															0.000425539			0.000178786
n-Pentane															0.000362690			0.000176874
2-Methylpentane															1.11152E-05			7.59999E-06
3-Methylpentane															1.92242E-05			1.34191E-05
n-Hexane															0.000105459			8.42322E-05
Methylcyclopentane															1.95900E-05			1.42389E-05
Benzene															0.000130124			9.62152E-05
2-Methylhexane															3.21706E-06			3.77654E-06
3-Methylhexane															2.69478E-06			3.33417E-06
Heptane															4.36301E-06			5.72633E-06
Methylcyclohexane															1.42696E-05			2.34808E-05
Toluene															0.000159027			0.000310697
Octane															9.60139E-07			4.47638E-06
Ethylbenzene															2.64706E-05			0.000129914
m-Xylene															2.20143E-05			0.000132983
o-Xylene															3.24035E-05			0.000223824
Nonane															1.05842E-07			1.59307E-06
C10+															7.48872E-09			6.23472E-07
Mass Flow															lb/h			lb/h
Water															0.138022			7249.34
H2S															0			0
Nitrogen															4.95611E-08			0.0375587
Carbon Dioxide															7.06226E-06			0.593084
Methane															2.89798E-05			6.78102
Ethane															3.24642E-05			1.71660
Propane															1.11871E-05			0.313358
Isobutane															9.02890E-07			0.0213661
n-Butane															3.34829E-06			0.0812785
Isopentane															5.87700E-07			0.0129781
n-Pentane															5.00902E-07			0.0128393
2-Methylpentane															1.53508E-08			0.000551682
3-Methylpentane															2.65501E-08			0.000974094
n-Hexane															1.45647E-07			0.00611441
Methylcyclopentane															2.70552E-08			0.00103360
Benzene															1.79711E-07			0.00698425
2-Methylhexane															4.44300E-09			0.000274139
3-Methylhexane															3.72169E-09			0.000242027
Heptane															6.02564E-09			0.000415674
Methylcyclohexane															1.97073E-08			0.00170447
Toluene															2.19628E-07			0.0225534
Octane															1.32602E-09			0.000324940
Ethylbenzene															3.65578E-08			0.00943047
m-Xylene															3.04034E-08			0.00965322
o-Xylene															4.47516E-08			0.0162473
Nonane															1.46176E-10			0.000115641
C10+															1.03425E-11			4.52578E-05

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Properties	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Heavy Liquid**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F														70			84.3577
Pressure	psig														246			1000
Mole Fraction Vapor	%														0			0
Mole Fraction Light Liquid	%														0			0
Mole Fraction Heavy Liquid	%														100			100
Molecular Weight	lb/lbmol														18.0185			18.0167
Mass Density	lb/ft^3														62.2588			62.0916
Molar Flow	lbmol/h														0.00766476			402.904
Mass Flow	lb/h														0.138107			7258.99
Vapor Volumetric Flow	ft^3/h														0.00221828			116.908
Liquid Volumetric Flow	gpm														0.000276564			14.5755
Std Vapor Volumetric Flow	MMSCFD														6.98078E-05			3.66950
Std Liquid Volumetric Flow	sgpm														0.000276372			14.5502
Compressibility															0.0132734			0.0504304
Specific Gravity															0.998233			0.995553
API Gravity															10.0510			10.1018
Enthalpy	Btu/h														-942.537			-4.93995E+07
Mass Enthalpy	Btu/lb														-6824.67			-6805.28
Mass Cp	Btu/(lb*°F)														0.983008			0.981413
Ideal Gas CpCv Ratio															1.32578			1.32508
Dynamic Viscosity	cP														0.995581			0.838206
Kinematic Viscosity	cSt														0.998286			0.842746
Thermal Conductivity	Btu/(h*ft*°F)														0.346318			0.351730
Surface Tension	lbf/ft														0.00503784?			0.00492258?
Net Ideal Gas Heating Value	Btu/ft^3														0.559751			1.24975
Net Liquid Heating Value	Btu/lb														-1047.37			-1032.08
Gross Ideal Gas Heating Value	Btu/ft^3														50.9023			51.6290
Gross Liquid Heating Value	Btu/lb														12.8850			29.0567

Process Streams		Gas	HP Separator Gas	HP Separator Oil	HP Separator Water	LP Separator Gas	LP Separator Oil	Oil	Oil W/B	OT Flash Gas	Produced Water	PWT Flash Gas	Sales Oil	Total gas to sale	Vapor recovery by VRU (to sale)	Water	Water W/B	Well Stream
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Mixed Liquid**	From Block:	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Mole Fraction															%			%
Water															2.96923			77.3271
H2S															0			0
Nitrogen															0.00339019			0.0125319
Carbon Dioxide															0.0589826			0.0277807
Methane															5.38969			5.69310
Ethane															17.0424			3.78308
Propane															12.2210			1.53365
Isobutane															5.68284			0.562104
n-Butane															13.9198			1.31203
Isopentane															7.03813			0.655418
n-Pentane															8.03334			0.794245
2-Methylpentane															1.12866			0.141152
3-Methylpentane															0.782172			0.103104
n-Hexane															18.6288			2.70977
Methylcyclopentane															0.308538			0.0475498
Benzene															0.0388766			0.00620055
2-Methylhexane															0.992065			0.246746
3-Methylhexane															0.829152			0.214894
Heptane															1.59766			0.494004
Methylcyclohexane															0.886554			0.277929
Toluene															0.187766			0.0706432
Octane															1.55965			1.32488
Ethylbenzene															0.0880452			0.0887390
m-Xylene															0.0852825			0.102200
o-Xylene															0.102829			0.137990
Nonane															0.322423			0.841168
C10+															0.102751			1.49200
Molar Flow															lbmol/h			lbmol/h
Water															0.00774715			402.469
H2S															0			0
Nitrogen															8.84548E-06			0.0652253
Carbon Dioxide															0.000153894			0.144592
Methane															0.0140625			29.6312
Ethane															0.0444659			19.6900
Propane															0.0318862			7.98227
Isobutane															0.0148273			2.92562
n-Butane															0.0363188			6.82878
Isopentane															0.0183635			3.41130
n-Pentane															0.0209601			4.13385
2-Methylpentane															0.00294483			0.734660
3-Methylpentane															0.00204080			0.536634
n-Hexane															0.0486052			14.1037
Methylcyclopentane															0.000805019			0.247485
Benzene															0.000101435			0.0322724
2-Methylhexane															0.00258844			1.28425
3-Methylhexane															0.00216337			1.11847
Heptane															0.00416852			2.57117
Methylcyclohexane															0.00231314			1.44655
Toluene															0.000489908			0.367681
Octane															0.00406936			6.89568
Ethylbenzene															0.000229722			0.461865
m-Xylene															0.000222514			0.531926
o-Xylene															0.000268294			0.718206
Nonane															0.00084248			4.37808
C10+															0.000268091			7.76550
Mass Fraction															%			%
Water															0.901885			49.9288
H2S															0			0
Nitrogen															0.00160124			0.0125823
Carbon Dioxide															0.0437659			0.0438197
Methane															1.45781			3.27340
Ethane															8.64002			4.07703
Propane															9.08586			2.42382
Isobutane															5.56894			1.17095
n-Butane															13.6408			2.73315
Isopentane															8.56154			1.69483
n-Pentane															9.77217			2.05382
2-Methylpentane															1.63988			0.435961
3-Methylpentane															1.13645			0.318448
n-Hexane															27.0666			8.36939
Methylcyclopentane															0.437801			0.143427
Benzene															0.0512001			0.0173591

2-Methylhexane		1.67603	0.886145
3-Methylhexane		1.40080	0.771756
Heptane		2.69915	1.77413
Methylcyclohexane		1.46764	0.978054
Toluene		0.291691	0.233287
Octane		3.00378	5.42413
Ethylbenzene		0.157599	0.337656
m-Xylene		0.152653	0.388876
o-Xylene		0.184061	0.525059
Nonane		0.697215	3.86666
C10+		0.262979	8.11744
Mass Flow		**lb/h**	**lb/h**
Water		0.139567	7250.59
H2S		0	0
Nitrogen		0.000247792	1.82718
Carbon Dioxide		0.00677279	6.36343
Methane		0.225597	475.358
Ethane		1.33705	592.060
Propane		1.40604	351.983
Isobutane		0.861797	170.043
n-Butane		2.11093	396.904
Isopentane		1.32490	246.121
n-Pentane		1.51225	298.252
2-Methylpentane		0.253772	63.3096
3-Methylpentane		0.175866	46.2446
n-Hexane		4.18857	1215.39
Methylcyclopentane		0.0677500	20.8282
Benzene		0.00792325	2.52086
2-Methylhexane		0.259366	128.685
3-Methylhexane		0.216774	112.073
Heptane		0.417694	257.636
Methylcyclohexane		0.227119	142.032
Toluene		0.0451394	33.8775
Octane		0.464837	787.684
Ethylbenzene		0.0243885	49.0339
m-Xylene		0.0236232	56.4720
o-Xylene		0.0284835	76.2483
Nonane		0.107894	561.511
C10+		0.0406962	1178.80

Process Streams		**Gas**	**HP Separator Gas**	**HP Separator Oil**	**HP Separator Water**	**LP Separator Gas**	**LP Separator Oil**	**Oil**	**Oil W/B**	**OT Flash Gas**	**Produced Water**	**PWT Flash Gas**	**Sales Oil**	**Total gas to sale**	**Vapor recovery by VRU (to sale)**	**Water**	**Water W/B**	**Well Stream**
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: **Mixed Liquid**	**From Block:**	--	3 Phase Separator	3 Phase Separator	3 Phase Separator	2 Phase Separator	2 Phase Separator	--	--	Condensate Tanks	PW Tanks	PW Tanks	Condensate Tanks	MIX-100	HP Compressor Engine	--	--	MIX-101
	To Block:	MIX-101	MIX-100	2 Phase Separator	PW Tanks	HP Compressor Engine	Condensate Tanks	MIX-101	--	--	--	--	--	--	MIX-100	MIX-101	--	3 Phase Separator
Property	**Units**																	
Temperature	°F														70			84.3577
Pressure	psig														246			1000
Mole Fraction Vapor	%														0			0
Mole Fraction Light Liquid	%														97.0623			22.5893
Mole Fraction Heavy Liquid	%														2.93766			77.4107
Molecular Weight	lb/lbmol														59.3109			27.9011
Mass Density	lb/ft^3														37.1411			46.7345
Molar Flow	lbmol/h														0.260914			520.476
Mass Flow	lb/h														15.4750			14521.9
Vapor Volumetric Flow	ft^3/h														0.416655			310.731
Liquid Volumetric Flow	gpm														0.0519466			38.7404
Std Vapor Volumetric Flow	MMSCFD														0.00237631			4.74030
Std Liquid Volumetric Flow	sgpm														0.0534183			39.3227
Compressibility															0.0732393			0.103761
Specific Gravity															0.595506			0.749323
API Gravity															103.557			54.5266
Enthalpy	Btu/h														-17497.6			-5.69054E+07
Mass Enthalpy	Btu/lb														-1130.69			-3918.60
Mass Cp	Btu/(lb*°F)														0.560963			0.769399
Ideal Gas CpCv Ratio															1.09271			1.20068
Dynamic Viscosity	cP														0.182873			0.430318
Kinematic Viscosity	cSt														0.304868			0.508587
Thermal Conductivity	Btu/(h*ft*°F)														0.0643239			0.171977
Surface Tension	lbf/ft														0.000816715			0.00215769
Net Ideal Gas Heating Value	Btu/ft^3														3032.59			717.105
Net Liquid Heating Value	Btu/lb														19227.2			9144.13
Gross Ideal Gas Heating Value	Btu/ft^3														3285.02			814.103
Gross Liquid Heating Value	Btu/lb														20841.3			10462.9

October 7, 2013

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

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

Sample: Central No. 2H (Jonathan Davis Well Pad)
Separator Hydrocarbon Liquid
Sampled @ 300 psig & 70 °F

Date Sampled: 09/20/13 Job Number: 35821.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.015	0.004	0.005
Carbon Dioxide	0.026	0.011	0.014
Methane	6.886	2.920	1.331
Ethane	8.322	5.569	3.014
Propane	8.761	6.040	4.653
Isobutane	2.532	2.073	1.772
n-Butane	7.165	5.652	5.015
2,2 Dimethylpropane	0.118	0.113	0.102
Isopentane	4.261	3.899	3.702
n-Pentane	5.583	5.064	4.851
2,2 Dimethylbutane	0.243	0.254	0.252
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.401	0.411	0.416
2 Methylpentane	2.739	2.845	2.843
3 Methylpentane	1.887	1.927	1.958
n-Hexane	4.725	4.862	4.904
Heptanes Plus	46.337	58.355	65.167
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity	0.7352	(Water=1)
°API Gravity	60.96	@ 60°F
Molecular Weight	116.8	
Vapor Volume	19.98	CF/Gal
Weight	6.13	Lbs/Gal

Characteristics of Total Sample:

Specific Gravity	0.6584	(Water=1)
°API Gravity	83.42	@ 60°F
Molecular Weight	83.0	
Vapor Volume	25.17	CF/Gal
Weight	5.49	Lbs/Gal

Base Conditions: 14.850 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
Processor: JCdjv
Cylinder ID: T-3044

David Dannhaus 361-661-7015

TANKS DATA INPUT REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Carbon Dioxide	0.026	0.011	0.014
Nitrogen	0.015	0.004	0.005
Methane	6.886	2.920	1.331
Ethane	8.322	5.569	3.014
Propane	8.761	6.040	4.653
Isobutane	2.532	2.073	1.772
n-Butane	7.282	5.765	5.118
Isopentane	4.261	3.899	3.702
n-Pentane	5.583	5.064	4.851
Other C-6's	5.270	5.438	5.470
Heptanes	12.718	14.211	15.025
Octanes	14.320	17.030	18.719
Nonanes	6.129	8.438	9.360
Decanes Plus	9.786	15.535	17.888
Benzene	0.097	0.068	0.091
Toluene	0.708	0.593	0.786
E-Benzene	0.715	0.690	0.914
Xylenes	1.865	1.790	2.384
n-Hexane	4.725	4.862	4.904
2,2,4 Trimethylpentane	0.000	0.000	0.000
Totals:	100.000	100.000	100.000

Characteristics of Total Sample:

Specific Gravity	0.6584	(Water=1)
°API Gravity	83.42	@ 60°F
Molecular Weight	83.0	
Vapor Volume	25.17	CF/Gal
Weight	5.49	Lbs/Gal

Characteristics of Decanes (C10) Plus:

Specific Gravity	0.7581	(Water=1)
Molecular Weight	151.8	

Characteristics of Atmospheric Sample:

°API Gravity	68.98	@ 60°F
Reid Vapor Pressure (ASTM D-5191)	4.41	psi

QUALITY CONTROL CHECK			
	Sampling Conditions	Test Samples	
Cylinder Number	------	T-3044*	T-1105
Pressure, PSIG	300	246	238
Temperature, °F	70	70	70

* Sample used for analysis

TOTAL EXTENDED REPORT

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.015	0.004	0.005
Carbon Dioxide	0.026	0.011	0.014
Methane	6.886	2.920	1.331
Ethane	8.322	5.569	3.014
Propane	8.761	6.040	4.653
Isobutane	2.532	2.073	1.772
n-Butane	7.165	5.652	5.015
2,2 Dimethylpropane	0.118	0.113	0.102
Isopentane	4.261	3.899	3.702
n-Pentane	5.583	5.064	4.851
2,2 Dimethylbutane	0.243	0.254	0.252
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.401	0.411	0.416
2 Methylpentane	2.739	2.845	2.843
3 Methylpentane	1.887	1.927	1.958
n-Hexane	4.725	4.862	4.904
Methylcyclopentane	0.750	0.664	0.760
Benzene	0.097	0.068	0.091
Cyclohexane	0.855	0.728	0.866
2-Methylhexane	3.019	3.512	3.643
3-Methylhexane	2.570	2.952	3.101
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.170	1.328	1.398
n-Heptane	4.355	5.028	5.256
Methylcyclohexane	3.005	3.023	3.554
Toluene	0.708	0.593	0.786
Other C-8's	8.306	10.150	11.026
n-Octane	3.008	3.857	4.139
E-Benzene	0.715	0.690	0.914
M & P Xylenes	0.802	0.779	1.026
O-Xylene	1.062	1.011	1.358
Other C-9's	4.456	6.081	6.775
n-Nonane	1.673	2.356	2.585
Other C-10's	3.766	5.649	6.408
n-decane	0.826	1.268	1.415
Undecanes(11)	2.552	3.927	4.518
Dodecanes(12)	1.336	2.221	2.591
Tridecanes(13)	0.741	1.321	1.563
Tetradecanes(14)	0.329	0.627	0.752
Pentadecanes(15)	0.124	0.253	0.307
Hexadecanes(16)	0.056	0.123	0.151
Heptadecanes(17)	0.026	0.061	0.075
Octadecanes(18)	0.012	0.028	0.035
Nonadecanes(19)	0.006	0.015	0.019
Eicosanes(20)	0.002	0.005	0.006
Heneicosanes(21)	0.001	0.003	0.004
Docosanes(22)	0.001	0.002	0.002
Tricosanes(23)	0.000	0.001	0.002
Tetracosanes(24)	0.000	0.001	0.001
Pentacosanes(25)	0.000	0.001	0.001
Hexacosanes(26)	0.000	0.001	0.001
Heptacosanes(27)	0.000	0.001	0.001
Octacosanes(28)	0.000	0.001	0.001
Nonacosanes(29)	0.000	0.001	0.002
Triacontanes(30)	0.001	0.002	0.003
Hentriacontanes Plus(31+)	0.005	0.022	0.031
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: 09/20/13

Date Analyzed: 10/02/13

Sample: Central No. 2H (Jonathan Davis Well Pad)

Job Number: J35821

FLASH LIBERATION OF HYDROCARBON LIQUID		
	Separator HC Liquid	**Stock Tank**
Pressure, psig	300	0
Temperature, °F	70	70
Gas Oil Ratio (1)	------	365
Gas Specific Gravity (2)	------	1.408
Separator Volume Factor (3)	1.2406	1.000

STOCK TANK FLUID PROPERTIES	
Shrinkage Recovery Factor (4)	0.8060
Oil API Gravity at 60 °F	68.98
Reid Vapor Pressure, psi (5)	4.41

Quality Control Check			
	Sampling Conditions	**Test Samples**	
Cylinder No.	------	T-3044*	T-1105
Pressure, psig	300	246	238
Temperature, °F	70	70	70

(1) - Scf of flashed vapor per barrel of stock tank oil
(2) - Air = 1.000
(3) - Separator volume / Stock tank volume
(4) - Fraction of first stage separator liquid
(5) - Absolute pressure at 100 deg F
Analyst: M. G.
* Sample used for flash study
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: Central No. 2H (Jonathan Davis Well Pad)
Gas Evolved from Hydrocarbon Liquid Flashed
From 300 psig & 70 °F to 0 psig & 70 °F

Date Sampled: 09/20/13 Job Number: 35821.001

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.053	
Carbon Dioxide	0.107	
Methane	23.624	
Ethane	26.392	7.114
Propane	22.728	6.311
Isobutane	4.750	1.567
n-Butane	10.798	3.431
2-2 Dimethylpropane	0.127	0.049
Isopentane	3.304	1.218
n-Pentane	3.382	1.236
Hexanes	2.805	1.165
Heptanes Plus	1.930	0.855
Totals	100.000	22.945

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity	3.556	(Air=1)
Molecular Weight	101.39	
Gross Heating Value	5420	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity	1.408	(Air=1)
Compressibility (Z)	0.9845	
Molecular Weight	40.14	
Gross Heating Value		
Dry Basis	2354	BTU/CF
Saturated Basis	2314	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: CYL-1

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.053		0.037
Carbon Dioxide	0.107		0.117
Methane	23.624		9.441
Ethane	26.392	7.114	19.772
Propane	22.728	6.311	24.970
Isobutane	4.750	1.567	6.879
n-Butane	10.798	3.431	15.637
2,2 Dimethylpropane	0.127	0.049	0.228
Isopentane	3.304	1.218	5.939
n-Pentane	3.382	1.236	6.080
2,2 Dimethylbutane	0.117	0.049	0.251
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.166	0.069	0.356
2 Methylpentane	0.881	0.369	1.892
3 Methylpentane	0.543	0.223	1.166
n-Hexane	1.098	0.455	2.358
Methylcyclopentane	0.079	0.027	0.166
Benzene	0.022	0.006	0.043
Cyclohexane	0.125	0.043	0.262
2-Methylhexane	0.233	0.109	0.582
3-Methylhexane	0.233	0.107	0.582
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.228	0.100	0.564
n-Heptane	0.296	0.138	0.739
Methylcyclohexane	0.195	0.079	0.477
Toluene	0.043	0.015	0.099
Other C8's	0.271	0.127	0.744
n-Octane	0.068	0.035	0.194
Ethylbenzene	0.002	0.001	0.005
M & P Xylenes	0.022	0.009	0.058
O-Xylene	0.003	0.001	0.008
Other C9's	0.076	0.039	0.239
n-Nonane	0.014	0.008	0.045
Other C10's	0.018	0.011	0.063
n-Decane	0.002	0.001	0.007
Undecanes (11)	0.000	0.000	0.000
Totals	100.000	22.945	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity	1.408	(Air=1)
Compressibility (Z)	0.9845	
Molecular Weight	40.14	

Gross Heating Value

Dry Basis	2354	BTU/CF
Saturated Basis	2314	BTU/CF

GAS ANALYTICAL SERVICES

C6+ Gas Analysis Report

Gas Analytical

Report Date: May 9, 2016 8:11a

Client:	Antero Resources	Date Sampled:	Apr 29, 2016
Site:	Hiley Unit 2H	Analysis Date:	May 5, 2016 3:20p
Field No:	9998	Collected By:	Doug Lipscomb
Meter:		Date Effective:	Apr 29, 2016 12:00a
Source Laboratory	Clarksburg (Bridgeport), WV	Sample Pressure (PSI):	223.0
Lab File No:	**X_CH1-11491.CHR**	Sample Temp (°F):	78
Sample Type:	Spot	Field H2O:	No Test
Reviewed By:		Field H2S:	No Test
Analysis Status:	good		

Component	Mol %	Gal/MSCF
Methane	80.3799	
Ethane	14.4783	3.8488
Propane	2.3850	0.6556
I-Butane	0.4736	0.1547
N-Butane	0.8388	0.2640
I-Pentane	0.2265	0.0827
N-Pentane	0.2114	0.0765
Nitrogen	0.4146	
Oxygen	<MDL	
Carbon Dioxide	0.1574	
Hexanes+	0.4345	0.1784
TOTAL	100.0000	5.2607

Analytical Results at Base Conditions (Real)	
BTU/SCF (Dry):	1,216.9949 BTU/ft³
BTU/SCF (Saturated):	1,196.6916 BTU/ft³
PSIA:	14.730 PSI
Temperature (°F):	60.00 °F
Z Factor (Dry):	0.99676
Z Factor (Saturated):	0.99636

Analytical Results at Contract Conditions (Real)	
BTU/SCF (Dry):	1,216.9949 BTU/ft³
BTU/SCF (Saturated):	1,196.6916 BTU/ft³
PSIA:	14.730 PSI
Temperature (°F):	60.00 °F
Z Factor (Dry):	0.99676
Z Factor (Saturated):	0.99636

Calculated Specific Gravities			
Ideal Gravity:	0.6895	Real Gravity:	0.6914
Molecular Wt:	19.9692 lb/lbmol		

Gross Heating Values are Based on:
GPA 2145-09, 2172
Compressibility is Calculated using AGA-8.

Source	Date	Notes

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

Attachment T
Facility-wide Emissions Summary Sheet(s)

ATTACHMENT T – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	NOx		CO		VOC		SO2		PM10		PM2.5		GHG (CO2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-HR001									0.6915	0.3256				
EP-PCV					0.0726	0.3180							9.3452	40.9320
F001					3.4116	14.9426							87.7795	384.4741
EP-ENG001	3.16E-01	1.38E+00	5.64E+00	2.47E+01	6.93E-03	3.04E-02	1.38E-04	6.03E-04	2.22E-03	9.74E-03	2.22E-03	9.74E-03	27.11	118.73
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009, EP-GPU010	1.2325	5.3985	1.0353	4.5348	0.0678	0.2969	0.0074	0.0324	0.0937	0.4103	0.0937	0.4103	1479.0530	6478.2523
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	1.6434	7.1981	1.3804	6.0464	0.0904	0.3959	0.0099	0.0432	0.1249	0.5471	0.1249	0.5471	1972.0707	8637.6697
EP-L001					10.0805	4.2160							4.2296	1.7689
EP-L002					7.29E-04	2.72E-04							0.8490	0.3163
EP-EC001, EP-EC002, EP-EC003	0.2510	1.0995	0.2109	0.9236	3.6471	15.9741	2.27E-05	9.93E-05	0.0191	0.0836	0.0143	0.0627	826.5296	3620.1995
TOTAL	3.4427	15.0792	8.2711	36.2275	3.8122	16.6973	0.0174	0.0763	0.2399	1.0506	0.2351	1.0298	4304.7602	18854.8496

Annual emissions shall be based on 8760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above

ATTACHMENT T – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

List all sources of emissions in this table. Use extra pages if necessary.

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
EP-HR001														
EP-PCV			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0109	0.0475	0.0109	0.0475
F001			0.0026	0.0113	0.0223	0.0976	0.0259	0.1136	0.0676	0.2962	0.2842	1.2447	0.4026	1.7635
EP-ENG001	4.80E-03	2.10E-02	3.70E-04	1.62E-03	1.31E-04	5.72E-04	5.81E-06	2.54E-05	4.57E-05	2.00E-04			5.38E-03	2.35E-02
EP-GPU001, EP-GPU002, EP-GPU003, EP-GPU004, EP-GPU005, EP-GPU006, EP-GPU007, EP-GPU008, EP-GPU009, EP-GPU010	0.0009	0.0040	2.59E-05	1.13E-04	4.19E-05	0.0002			0.00E+00	0.00E+00	0.0222	0.0972	0.0232	0.1016
EP-LH001, EP-LH002, EP-LH003, EP-LH004, EP-LH005, EP-LH006, EP-LH007, EP-LH008, EP-LH009, EP-LH010	0.0012	0.0054	3.45E-05	0.0002	5.59E-05	2.45E-04			0.00E+00	0.00E+00	0.0296	0.1296	0.0309	0.1355
EP-L001			1.60E-04	6.68E-05	1.47E-03	6.15E-04	1.36E-03	5.67E-04	3.42E-03	1.43E-03	9.85E-02	4.12E-02	1.05E-01	4.39E-02
EP-L002			3.79E-07	1.41E-07	7.33E-07	2.73E-07	2.00E-07	7.46E-08	4.90E-07	1.83E-07	6.96E-09	2.59E-09	1.81E-06	6.74E-07
EP-EC001, EP-EC002, EP-EC003	2.84E-06	1.24E-05	0.0009	0.0041	0.0041	0.0178	0.0020	0.0088	0.0043	0.0188	0.4756	2.0832	0.4869	2.1327
TOTAL	0.0070	0.0305	0.0014	0.0060	0.0043	0.0188	0.0020	0.0089	0.0043	0.0190	0.5274	2.3099	0.5464	2.3934

Annual emissions shall be based on 8760 hours per year of operation for all emission units except emergency generators.

According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, fugitive emissions shall not be included in the PTE above

Attachment U
Class I Legal Advertisement

Attachment U

Air Quality Permit Notice
Notice of Application
Rock Run Well Pad
Antero Resources Corporation
Doddridge County, 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-B General Permit Modification for an Oil and Natural Gas Production facility located at 794 Tunnel Hill Rd., near West Union in Doddridge County, West Virginia.

The latitude and longitude coordinates are: 39.304923 and -80.814648

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

Pollutants	TOTALS (tpy):
NO_X	15.0792
CO	36.2275
$PM_{2.5}$	1.0298
PM_{10}	1.0506
VOC	16.6973
SO_2	0.0763
Formaldehyde	0.0305
Benzene	0.0060
Toluene	0.0188
Ethylbenzene	0.0089
Xylenes	0.0190
Hexane	2.3099
Total HAPs	2.3934

Startup of operation is planned to begin on or about August 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 1250, during normal business hours.
Dated this the __ day of _____, 2016

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

www.ghd.com