



February 15, 2016

Mr. Roy Kees, P.E.  
WV Department of Environmental Protection  
Division of Air Quality  
601 57<sup>th</sup> Street, SE  
Charleston, WV 25304

**RE: Antero Midstream LLC – Underwood Compressor Station  
West Virginia Department of Environmental Protection, Division of Air Quality,  
45CSR13 Air Permit Modification, R13-3281**

Dear Mr. Kees,

On behalf of Antero Midstream LLC, please find attached the 45CSR13 Air Permit Modification for permit number R13-3281 for the Underwood Compressor Station (Facility ID 095-00065) located in Tyler County, West Virginia. A summary of the modifications in this application include:

1. Updating compressor engine emissions to reflect catalyst data based on a new catalyst design from the manufacturer,
2. The installation of two new compressor engines and associated blowdown events,
3. Eliminating the compressor fuel use limit and synthetic minor status,
4. Increasing the dehydrator throughput to 88 MMscfd per dehydrator, and
5. Modifying the dehydrator flash tank control efficiency based on new standardized guidance from WVDEP.

Enclosed are one hardcopy and two CDs containing the entire permit application including the application form and required attachments. Per 45CSR22, a \$4,500 application fee is also enclosed, which covers the base 45CSR13 \$1,000 application fee, an additional \$1,000 for NSPS requirements, and an additional \$2,500 for Hazardous Air Pollutant requirements.

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

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

Sincerely,  
**KLEINFELDER**

Michele Steyskal  
Air Quality Specialist

Enclosures: Underwood Compressor Station R13-3281 Air Permit Modification

# **Antero Midstream LLC**

## **Underwood Compressor Station**

**NSR Permit Application  
West Virginia Department of Environmental Protection  
Division of Air Quality  
45CSR13**

**Tyler County, West Virginia**

**February 2016**

**Prepared by:**



**1801 California Street, Suite 1100  
Denver, CO 80202  
(303) 237-6601  
Fax (303) 237-6602  
[www.kleinfelder.com](http://www.kleinfelder.com)**

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WEST VIRGINIA DEPARTMENT OF  
ENVIRONMENTAL PROTECTION  
**DIVISION OF AIR QUALITY**

601 57<sup>th</sup> Street, SE  
Charleston, WV 25304  
(304) 926-0475  
[www.dep.wv.gov/daq](http://www.dep.wv.gov/daq)

**APPLICATION FOR NSR PERMIT  
AND  
TITLE V PERMIT REVISION  
(OPTIONAL)**

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

- ☐ CONSTRUCTION ☒ MODIFICATION ☐ RELOCATION  
☐ CLASS I ADMINISTRATIVE UPDATE ☐ TEMPORARY  
☐ CLASS II ADMINISTRATIVE UPDATE ☐ AFTER-THE-FACT

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

- ☐ ADMINISTRATIVE AMENDMENT ☐ MINOR MODIFICATION  
☐ SIGNIFICANT MODIFICATION

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

**FOR TITLE V FACILITIES ONLY:** Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

**Section I. General**

1. Name of applicant (as registered with the WV Secretary of State's Office): Antero Midstream LLC		2. Federal Employer ID No. (FEIN): 46-5517375	
3. Name of facility (if different from above): Underwood Compressor Station		4. The applicant is the: <input type="checkbox"/> OWNER <input type="checkbox"/> OPERATOR <input checked="" type="checkbox"/> BOTH	
5A. Applicant's mailing address: 1615 Wynkoop Street Denver, CO 80202		5B. Facility's present physical address: Wheelers Run Road Centerville, WV 26320	
6. <b>West Virginia Business Registration.</b> Is the applicant a resident of the State of West Virginia? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO – If <b>YES</b> , provide a copy of the <b>Certificate of Incorporation/Organization/Limited Partnership</b> (one page) including any name change amendments or other Business Registration Certificate as <b>Attachment A</b> . – If <b>NO</b> , provide a copy of the <b>Certificate of Authority/Authority of L.L.C./Registration</b> (one page) including any name change amendments or other Business Certificate as <b>Attachment A</b> .			
7. If applicant is a subsidiary corporation, please provide the name of parent corporation:			
8. Does the applicant own, lease, have an option to buy or otherwise have control of the <i>proposed site</i> ? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO – If <b>YES</b> , please explain: Antero Midstream LLC owns the land for the proposed site – If <b>NO</b> , you are not eligible for a permit for this source.			
9. Type of plant or facility (stationary source) to be <b>constructed, modified, relocated, administratively updated</b> or <b>temporarily permitted</b> (e.g., coal preparation plant, primary crusher, etc.): Natural Gas Compressor Station		10. North American Industry Classification System (NAICS) code for the facility: 221210	
11A. DAQ Plant ID No. (for existing facilities only): 095 – 00065		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): R13-3281	

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

12A. – For <b>Modifications, Administrative Updates</b> or <b>Temporary permits</b> at an existing facility, please provide directions to the <i>present location</i> of the facility from the nearest state road; – For <b>Construction</b> or <b>Relocation permits</b> , please provide directions to the <i>proposed new site location</i> from the nearest state road. Include a <b>MAP</b> as <b>Attachment B</b> .  From Centerville, WV, head west on Wheelers Run Road for approximately 1.6 miles. Turn left into the facility driveway.		
12.B. New site address (if applicable): Wheelers Run Road Centerville, WV 26320	12C. Nearest city or town: Centerville	12D. County: Tyler
12.E. UTM Northing (KM): 4364.783	12F. UTM Easting (KM): 511.052	12G. UTM Zone: 17
13. Briefly describe the proposed change(s) at the facility: The reduction efficiencies for the engine catalysts have been updated based on new catalyst information. Two new compressor engines have been added. The dehydrator throughput has been increased to 88 MMscfd per dehydrator. Lastly, the fuel limit for the compressors has been removed so the facility is no longer a synthetic minor.		
14A. Provide the date of anticipated installation or change: June 2016 – If this is an <b>After-The-Fact</b> permit application, provide the date upon which the proposed change did happen:        /        /		14B. Date of anticipated Start-Up if a permit is granted: June 2016
14C. Provide a <b>Schedule</b> of the planned <b>Installation</b> of/ <b>Change</b> to and <b>Start-Up</b> of each of the units proposed in this permit application as <b>Attachment C</b> (if more than one unit is involved).		
15. Provide maximum projected <b>Operating Schedule</b> of activity/activities outlined in this application: Hours Per Day 24                   Days Per Week 7                   Weeks Per Year 52		
16. Is demolition or physical renovation at an existing facility involved? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
17. <b>Risk Management Plans.</b> If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see <a href="http://www.epa.gov/ceppo">www.epa.gov/ceppo</a> ), submit your <b>Risk Management Plan (RMP)</b> to U. S. EPA Region III.		
18. <b>Regulatory Discussion.</b> List all Federal and State air pollution control regulations that you believe are applicable to the proposed process ( <i>if known</i> ). A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance ( <i>if known</i> ). Provide this information as <b>Attachment D</b> .		
<b>Section II. Additional attachments and supporting documents.</b>		
19. Include a check payable to WVDEP – Division of Air Quality with the appropriate <b>application fee</b> (per 45CSR22 and 45CSR13).		
20. Include a <b>Table of Contents</b> as the first page of your application package.		
21. Provide a <b>Plot Plan</b> , e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as <b>Attachment E</b> (Refer to <b>Plot Plan Guidance</b> ) . – Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).		
22. Provide a <b>Detailed Process Flow Diagram(s)</b> showing each proposed or modified emissions unit, emission point and control device as <b>Attachment F</b> .		
23. Provide a <b>Process Description</b> as <b>Attachment G</b> . – Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).		
<b>All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.</b>		

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H**.  
– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I**.

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J**.

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K**.

28. Check all applicable **Emissions Unit Data Sheets** listed below:

<input type="checkbox"/> Bulk Liquid Transfer Operations	<input type="checkbox"/> Haul Road Emissions	<input type="checkbox"/> Quarry
<input checked="" type="checkbox"/> Chemical Processes	<input type="checkbox"/> Hot Mix Asphalt Plant	<input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities
<input type="checkbox"/> Concrete Batch Plant	<input type="checkbox"/> Incinerator	<input type="checkbox"/> Storage Tanks
<input type="checkbox"/> Grey Iron and Steel Foundry	<input type="checkbox"/> Indirect Heat Exchanger	
<input checked="" type="checkbox"/> General Emission Unit, specify: Engines, Dehydrator		

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L**.

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

<input type="checkbox"/> Absorption Systems	<input type="checkbox"/> Baghouse	<input type="checkbox"/> Flare
<input type="checkbox"/> Adsorption Systems	<input type="checkbox"/> Condenser	<input type="checkbox"/> Mechanical Collector
<input type="checkbox"/> Afterburner	<input type="checkbox"/> Electrostatic Precipitator	<input type="checkbox"/> Wet Collecting System
<input checked="" type="checkbox"/> Other Collectors, specify : Catalysts		

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M**.

30. Provide all **Supporting Emissions Calculations** as **Attachment N**, or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O**.  
➤ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and **Example Legal Advertisement** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?  
☐ YES    ☒ NO  
➤ If **YES**, identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's **"Precautionary Notice – Claims of Confidentiality"** guidance found in the **General Instructions** as **Attachment Q**.

### **Section III. Certification of Information**

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

<input type="checkbox"/> Authority of Corporation or Other Business Entity	<input type="checkbox"/> Authority of Partnership
<input type="checkbox"/> Authority of Governmental Agency	<input type="checkbox"/> Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R**.

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

**35A. Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

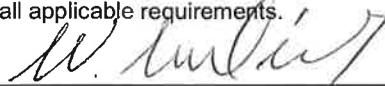
**Certification of Truth, Accuracy, and Completeness**

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative**, hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

**Compliance Certification**

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE



(Please use blue ink)

DATE:



(Please use blue ink)

35B. Printed name of signee: Ward McNeilly

35C. Title: Vice President, Reserves Planning and Midstream

35D. E-mail:

wmcneilly@anteroresources.com

36E. Phone: (303) 357-6822

36F. FAX: (303)357-7315

36A. Printed name of contact person (if different from above): Barry Schatz

36B. Title: Senior Environmental and Regulatory Manager

36C. E-mail:

bschatz@anteroresources.com

36D. Phone: (303) 357-7276

36E. FAX: (303)357-7315

**PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:**

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Attachment A: Business Certificate               | <input checked="" type="checkbox"/> Attachment K: Fugitive Emissions Data Summary Sheet            |
| <input checked="" type="checkbox"/> Attachment B: Map(s)                             | <input checked="" type="checkbox"/> Attachment L: Emissions Unit Data Sheet(s)                     |
| <input checked="" type="checkbox"/> Attachment C: Installation and Start Up Schedule | <input checked="" type="checkbox"/> Attachment M: Air Pollution Control Device Sheet(s)            |
| <input checked="" type="checkbox"/> Attachment D: Regulatory Discussion              | <input checked="" type="checkbox"/> Attachment N: Supporting Emissions Calculations                |
| <input checked="" type="checkbox"/> Attachment E: Plot Plan                          | <input checked="" type="checkbox"/> Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans |
| <input checked="" type="checkbox"/> Attachment F: Detailed Process Flow Diagram(s)   | <input checked="" type="checkbox"/> Attachment P: Public Notice                                    |
| <input checked="" type="checkbox"/> Attachment G: Process Description                | <input type="checkbox"/> Attachment Q: Business Confidential Claims                                |
| <input checked="" type="checkbox"/> Attachment H: Material Safety Data Sheets (MSDS) | <input checked="" type="checkbox"/> Attachment R: Authority Forms                                  |
| <input checked="" type="checkbox"/> Attachment I: Emission Units Table               | <input type="checkbox"/> Attachment S: Title V Permit Revision Information                         |
| <input checked="" type="checkbox"/> Attachment J: Emission Points Data Summary Sheet | <input checked="" type="checkbox"/> Application Fee  |

*Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.*

**FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:**

- ☐ Forward 1 copy of the application to the Title V Permitting Group and:
- ☐ For Title V Administrative Amendments:
- ☐ NSR permit writer should notify Title V permit writer of draft permit,
- ☐ For Title V Minor Modifications:
- ☐ Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,
- ☐ NSR permit writer should notify Title V permit writer of draft permit.
- ☐ For Title V Significant Modifications processed in parallel with NSR Permit revision:
- ☐ NSR permit writer should notify a Title V permit writer of draft permit,
- ☐ Public notice should reference both 45CSR13 and Title V permits,
- ☐ EPA has 45 day review period of a draft permit.

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

## **Discussion of Nearby Facilities**

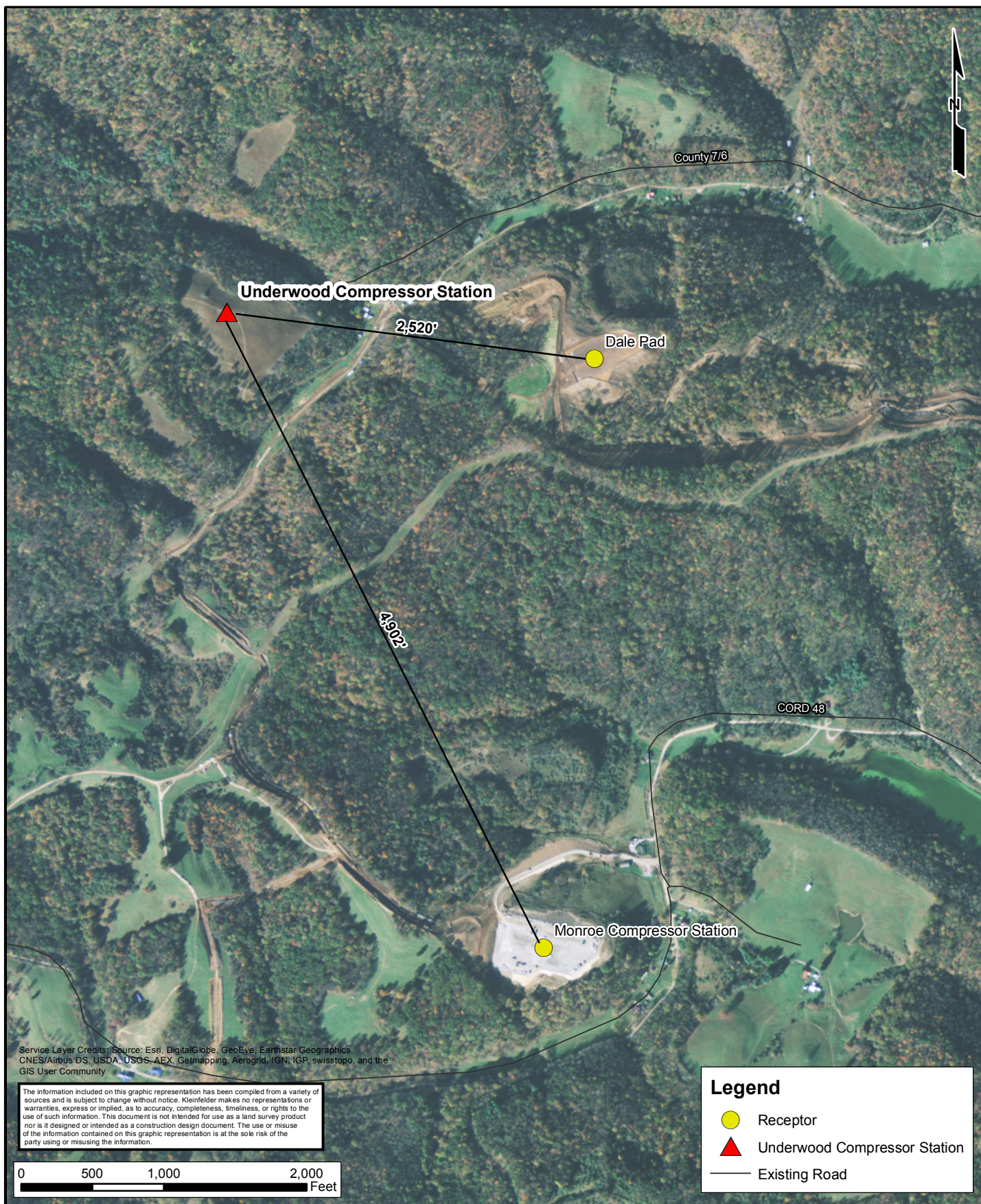



## **Underwood Compressor Station – Closest Antero Facilities**

1. Common Control: Only those facilities that are owned and managed by Antero were included in the aggregation discussion. This includes Antero Resources Corporation production facilities in addition to the Antero Midstream LLC midstream facilities.
2. SIC Code: The Underwood Compressor Station will operate under SIC code 4923 (natural gas distribution). The closest facility owned by Antero Midstream LLC with this SIC code is the Monroe Compressor station which is 4,902 feet southeast of the Facility. All Antero Resources Corporation production facilities operate under the SIC code of 1311 (crude petroleum and natural gas extraction). The closest facility operated by Antero Resources Corporation with the SIC code of 1311 is the Dale Pad 2,520 feet to the east.
3. Contiguous or Adjacent: The land between the Underwood Compressor Station and its nearest facility operating under SIC code 4923 is not owned or managed by Antero Midstream LLC or Antero Resources Corporation. Therefore, the two facilities are not contiguous or adjacent. Secondly, although most of the Underwood Compressor Station land parcel border is not adjacent to any parcels operated by Antero, a small portion of the Underwood Compressor Station land parcel is adjacent to the land parcel for the Dale Pad facility operating under 1311. The actual pad locations for the Underwood Compressor Station and the Dale Pad are 2,520 feet apart and thus not contiguous.

Based on this three-pronged evaluation, although the Underwood Compressor Station and Monroe Compressor Station do belong to the same major industrial group, they should not be aggregated because they are not contiguous or adjacent.

Although a small portion of their land parcel borders are adjacent, the Underwood Compressor Station and Dale Pad should not be aggregated because they do not belong to the same major industrial group and do not directly rely on each other nor are they contiguous.



 <p><b>KLEINFELDER</b> <i>Bright People. Right Solutions.</i></p> <p>www.kleinfelder.com</p>	PROJECT NO. 20161767.001A	<b>Antero Midstream LLC</b>	FIGURE
	DRAWN: 9/30/2015		
	DRAWN BY: B. McDavid	Underwood Compressor Station Tyler County, West Virginia	
	CHECKED BY: M. Steyskal		
	FILE NAME: Underwood_ClosestReceptor.mxd		

**Attachment A.**  
**Business Certificate**



# State of West Virginia



## Certificate

UB

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

**ANTERO MIDSTREAM LLC**

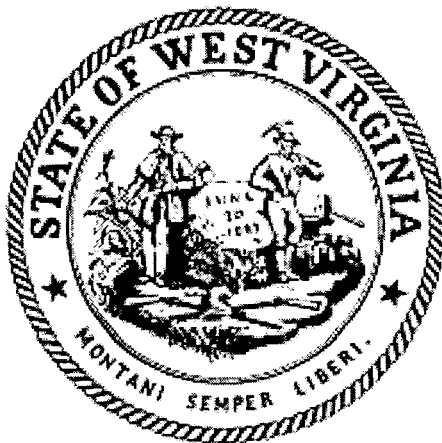
**Control Number: 9A5E1**

a limited liability company, organized under the laws of the State of Delaware  
has filed its "Application for Certificate of Authority" in my office according to the provisions  
of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a  
foreign limited liability company from its effective date of April 29, 2014, until a certificate of  
cancellation is filed with our office.

Therefore, I hereby issue this

### **CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY**

to the limited liability company authorizing it to transact business in West Virginia



*Given under my hand and the  
Great Seal of the State of  
West Virginia on this day of  
April 29, 2014*

*Natalie E. Tennant*

Secretary of State

FILED

APR 29 2014

IN THE OFFICE OF  
WV SECRETARY OF STATESubmitted by:  
CT Corporation Rep-Terry Stamper  
Terry.Stamper@wolterskluwer.com  
304-776-1152

1152

Natalie E. Tennant  
Secretary of State  
1900 Kanawha Blvd E  
Bldg 1, Suite 157-K  
Charleston, WV 25305Penney Barker, Manager  
Corporations Division  
Tel: (304)558-8000  
Fax: (304)558-8381  
Website: [www.wvsos.com](http://www.wvsos.com)  
E-mail: [business@wvsos.com](mailto:business@wvsos.com)FILE ONE ORIGINAL.  
(Two if you want a filed  
stamped copy returned to you)  
FEE: \$150WV APPLICATION FOR  
CERTIFICATE OF AUTHORITY OF  
LIMITED LIABILITY COMPANYOffice Hours: Monday – Friday  
8:30 a.m. – 5:00 p.m. ETControl # WABE11. The name of the company as registered in its home state is: Antero Midstream LLCand the state or country of organization is: Delaware☒ **CHECK HERE** to indicate you have obtained and submitted with this application a **CERTIFICATE OF EXISTENCE (GOOD STANDING)**, dated during the current tax year, from your home state of original incorporation as **required** to process your application. The certificate may be obtained by contacting the Secretary of State's Office in the home state of original incorporation.2. The name to be used in West Virginia will be: ☒ **Home State name as listed above, if available in WV**  
[The name must contain one of the required terms such as "limited liability company" or abbreviations such as "LLC" or "PLLC". See instructions for complete list of acceptable terms and requirements for use of trade name.]  
☐ **DBA name** \_\_\_\_\_  
(See special instructions in Section 2. Regarding the Letter of Resolution attached to this application.)3. The company will be a: [See instructions for limitations on professions which may form P.L.L.C. in WV. All members must have WV professional license. In most cases, a Letter of Authorization/Approval from the appropriate State Licensing Board is required to process the application.]  
☒ **regular L.L.C.**  
☐ **Professional L.L.C. for the profession of** \_\_\_\_\_4. The street address of the principal office is: No. & Street: 1625 17th Street, Suite 300  
City/State/Zip: Denver, Colorado 80202  
and the mailing address (if different) is: Street/Box: \_\_\_\_\_  
City/State/Zip: \_\_\_\_\_5. The address of the designated office of the company in WV, if any, will be: No. & Street: 5400 D Big Tyler Road  
City/State/Zip: Charleston, West Virginia 253136. **Agent of Process:** Properly designated person to whom notice of legal process may be sent, if any: Name: C T Corporation System  
Address: 5400 D Big Tyler Road  
City/State/Zip: Charleston, West Virginia 25313

RECEIVED

APR 29 2014

## APPLICATION FOR CERTIFICATE OF AUTHORITY OF LIMITED LIABILITY COMPANY

Page 2

7. E-mail address where business correspondence may be received: igiannaula@anteroresources.com8. Website address of the business, if any: N/A

9. The company is: ☒ an at-will company, for an indefinite period  
☐ a term company, for the term of \_\_\_\_\_ years,  
which will expire on \_\_\_\_\_.

10. The company is: ☒ member-managed. [List the names and addresses of all members.]  
☐ manager-managed. [List the names and addresses of all managers.]

List the Name(s) and Address(es) of the Member(s)/Manager(s) of the company (attach additional pages if necessary).

<u>Name</u>	<u>Street Address</u>	<u>City, State, Zip</u>
Antero Resources Corporation	1625 17th Street, Suite 300	Denver, Colorado 80202

11. All or specified members of a limited liability company are liable in their capacity as members for all or specified debts, obligations or liabilities of the company.
- ☒ No--All debts, obligations and liabilities are those of the company.  
☐ Yes--Those persons who are liable in their capacity as members for all debts, obligations or liability of the company have consented in writing to the adoption of the provision or to be bound by the provision.

12. The purpose for which this limited liability company is formed are as follows:  
(Describe the type(s) of business activity which will be conducted, for example, "real estate," "construction of residential and commercial buildings," "commercial printing," "professional practice of architecture.")

Midstream oil and gas operating company

13. Is the business a Scrap Metal Dealer?

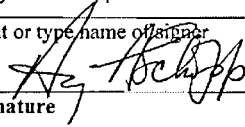
☐ Yes [If "Yes," you must complete the Scrap Metal Dealer Registration Form (Form SMD-1) and proceed to question 14.].

☒ No [Proceed to question 14.]

14. The number of pages attached and included in this application is: 3

15. The requested effective date is: ☒ the date & time of filing in the Secretary of State's Office  
 [Requested date may not be earlier than  
filing nor later than 90 days after filing  
in our office.] ☐ the following date \_\_\_\_\_ and time \_\_\_\_\_

16. Contact and Signature Information\* (See below Important Legal Notice Regarding Signature):

- |    |   |  |
|----|---|--|
| a. | Alvyn A. Schopp   | (313) 357-7310   |
|    | Contact Name  | Phone Number   |
| b. | Alvyn A. Schopp   | Chief Administrative Officer and Regional Vice President |
|    | Print or type name of signer  | Title / Capacity of Signer                               |
| c. |  | April 28, 2014   |
|    | Signature   | Date   |

**\*Important Legal Notice Regarding Signature:** Per West Virginia Code §31B-2-209. Liability for false statement in filed record. If a record authorized or required to be filed under this chapter contains a false statement, one who suffers loss by reliance on the statement may recover damages for the loss from a person who signed the record or caused another to sign it on the person's behalf and knew the statement to be false at the time the record was signed.

# Delaware

PAGE 1

*The First State*

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY "ANTERO MIDSTREAM LLC" IS DULY FORMED UNDER THE LAWS OF THE STATE OF DELAWARE AND IS IN GOOD STANDING AND HAS A LEGAL EXISTENCE SO FAR AS THE RECORDS OF THIS OFFICE SHOW, AS OF THE TWENTY-NINTH DAY OF APRIL, A.D. 2014.


AND I DO HEREBY FURTHER CERTIFY THAT THE ANNUAL TAXES HAVE NOT BEEN ASSESSED TO DATE.

5466900 8300

140532521

You may verify this certificate online  
at [corp.delaware.gov/authver.shtml](http://corp.delaware.gov/authver.shtml)




  
Jeffrey W. Bullock, Secretary of State  
AUTHENTICATION: 1328067

DATE: 04-29-14

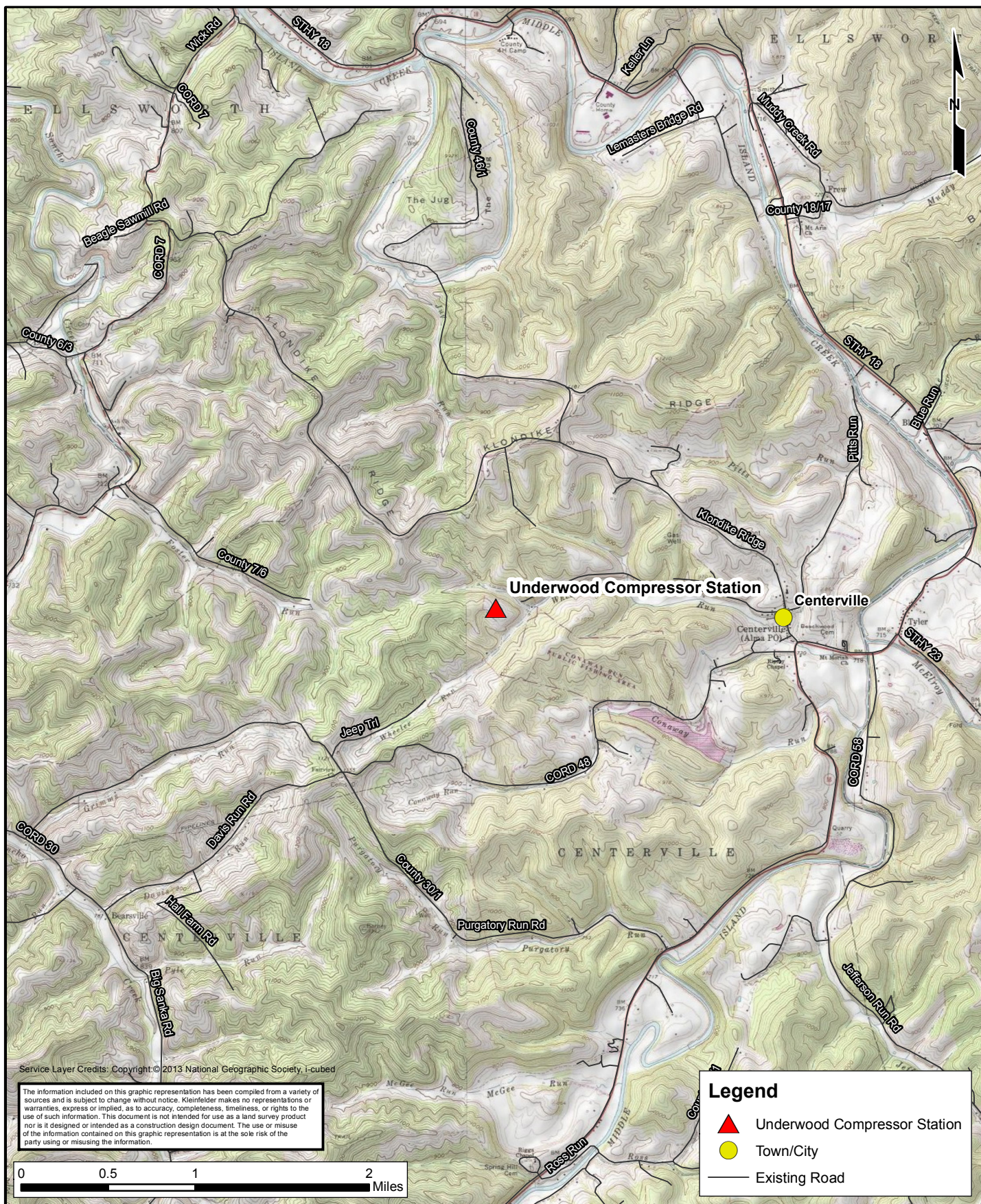



**Attachment B.**  
**Area Map**



	PROJECT NO. 20161767.001A	<b>Antero Midstream LLC</b>	FIGURE
	DRAWN: 9/30/2015		
	DRAWN BY: B. McDavid	Underwood Compressor Station Tyler County, West Virginia	
	CHECKED BY: M. Steyskal		
	FILE NAME: Underwood_Receptor_Aerial.mxd		





 <b>KLEINFELDER</b> <i>Bright People. Right Solutions.</i>  www.kleinfelder.com	PROJECT NO. 20161767.001A	<b>Antero Midstream LLC</b>	FIGURE
	DRAWN: 9/30/2015		
	DRAWN BY: B. McDavid	Underwood Compressor Station Tyler County, West Virginia	
	CHECKED BY: M. Steyskal		
	FILE NAME: UnderwoodCompressor_Topo.mxd		



**Attachment C.**  
**Installation and Startup Schedule**

## **Underwood Compressor Station – Installation and Startup Schedule**

The Underwood Compressor Station will be a new facility located in Tyler County, WV, approximately 1.7 miles west of Centerville, WV. Existing equipment will be installed and operated per permit R13-3281. The proposed equipment is scheduled to be installed and operational around June 1, 2016 with construction starting in April 2016.

**Attachment D.**  
**Regulatory Discussion**

## Underwood Compressor Station – Regulatory Discussion

### Federal Regulations

#### 40 CFR Part 60 – Standards of Performance for New Stationary Sources

- I. *Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.*

Applicability: Subpart Kb applies to volatile organic liquid storage tanks with a capacity greater than or equal to 75 m<sup>3</sup> (§60.110b(a)). Storage vessels with a design capacity less than 1,589.874 m<sup>3</sup> do not apply to this subpart if they are used store condensate prior to custody transfer. The condensate and produced water storage tanks at the Underwood Compressor Station are 64 m<sup>3</sup>. The settler tank is 79 m<sup>3</sup>, but stores condensate prior to custody transfer. Therefore, Subpart Kb does not apply to the Underwood Compressor Station.

- II. *Subpart GG - Standards of Performance for Stationary Gas Turbines*

Applicability: Subpart GG applies to all stationary gas turbines with a heat input at peak load equal to or greater than 10 million BTU per hour based on the lower heating value of the fuel (§60.330(a)). Since the microturbine generators at the Underwood Compressor Station have a heat input rating less than 10 million Btu per hour, Subpart GG does not apply.

- III. *Subpart KKK - Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.*

Applicability: Subpart KKK applies to facilities built or modified before August 23, 2011, so Subpart KKK will not apply as the Underwood Compressor Station was constructed after August 23, 2011.

- IV. *Subpart LLL - Standards of Performance for SO<sub>2</sub> Emissions from Onshore Natural Gas Processing for Which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011.*

Applicability: Subpart LLL applies to facilities built or modified before August 23, 2011, so Subpart LLL will not apply as the Underwood Compressor Station was constructed after August 23, 2011.

- V. *Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*

Applicability: Subpart JJJJ applies to rich burn engines that were ordered after June 12, 2006 and manufactured on or after July 1, 2007 for engines with maximum power

greater than or equal to 500 hp (§60.4230(a)(4)(i)). Thus, Subpart JJJJ applies to the Underwood Compressor Station as the compressor engines will be installed in 2016 and are new engines manufactured after July 1, 2007.

*VI. Subpart KKKK - Standards of Performance for Stationary Combustion Turbines*

Applicability: Subpart KKKK applies to all stationary combustion turbines with a heat input at peak load equal to or greater than 10 million BTU per hour based on the higher heating value of the fuel (§60.4305(a)). Since the microturbine generators at the Underwood Compressor Station have a heat input rating less than 10 million Btu per hour, Subpart KKKK does not apply.

*VII. Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution*

Applicability: Subpart OOOO applies to reciprocating compressor facilities that were constructed, modified, or reconstructed after August 23, 2011 (§60.5365(c)). Additionally, Subpart OOOO applies to storage vessel affected facilities with individual tank emissions greater than 6 tons per year (§60.5365(e)). Thus, Subpart OOOO applies to the Underwood Compressor Station as it was constructed after August 23, 2011 and has reciprocating compressors and a settler tank that has controlled VOC potential to emit greater than six (6) tons per year. The pneumatic controllers installed at Underwood Compressor Station are air-actuated and therefore exempt from the requirements of this subpart.

**40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants**

*I. Subpart V – National Emission Standard for Equipment Leaks (Fugitive Emission Sources)*

Applicability: Subpart V applies to components such as compressors, valves, and pumps that are intended to operate in volatile hazardous air pollutant (VHAP) service (§61.240(a)). VHAP service means that a component contains or contacts a fluid that is at least 10 percent by weight a VHAP. Subpart V does not apply to the Underwood Compressor Station because none of the components have fluid (natural gas, water, or condensate) that is over 10 percent by weight of any VHAP.

**40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories**

*I. Subpart HH – National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities*

Applicability: Subpart HH applies to oil and natural gas production facilities that are a major or area source of HAP emissions, and that process, upgrade, or store hydrocarbon liquids or natural gas prior to the transmission and storage source category



(§63.760(a)). Subpart HH does apply to the Underwood Compressor Station, and because it is an area source of HAP emissions, the two (2) TEG dehydrators are applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from the dehydrators at the Underwood Compressor Station are less than 1 ton per year, so both dehydrators are exempt from all requirements except recordkeeping (§63.764(e)(1)(ii)).

*II. Subpart HHH – National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities*

Applicability: Subpart HHH applies to natural gas transmission and storage facilities that are a major source of HAP emissions (§63.1270(a)). Subpart HHH does not apply to the Underwood Compressor Station as it is not a major source of HAP emissions. Further, the Underwood Compressor Station is prior to the gas transmission and storage phase.

*III. Subpart EEEE – National Emission Standards for Hazardous Air Pollutants: Organic Liquids Distribution (Non-Gasoline)*

Applicability: Subpart EEEE applies to organic liquids distribution operations that are located at major source of HAP emissions (§63.2334(a)). Subpart EEEE does not apply to the Underwood Compressor Station as it is not a major source of HAP emissions.

*IV. Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines*

Applicability: Subpart YYYY applies to stationary combustion turbines located at major sources of HAP emissions (§63.6085(a)). Since the Underwood Compressor Station is not a major source of HAP emissions, Subpart YYYY does not apply.

*V. Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*

Applicability: Subpart ZZZZ applies to stationary RICE at a major or area source of HAP emissions (§63.6585). Subpart ZZZZ applies to the Underwood Compressor Station as the compressor engines are new RICE. The engines will meet Subpart ZZZZ by meeting 40 CFR Part 60, Subpart JJJJ as the Underwood Compressor Station is an area source of HAP emissions (§63.6590(c)(1)).

*VI. Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters*

Applicability: Subpart DDDDD applies to process heaters at a major source of HAP emissions (§63.7485). Subpart DDDDD does not apply to the Underwood Compressor Station as it is not a major source of HAP emissions.

## **West Virginia State Regulations**

### ***Title 45 Legislative Rule – Division of Environmental Protection, Office of Air Quality***

The following Title 45 Legislative Rules will be applicable to the Underwood Compressor Station:

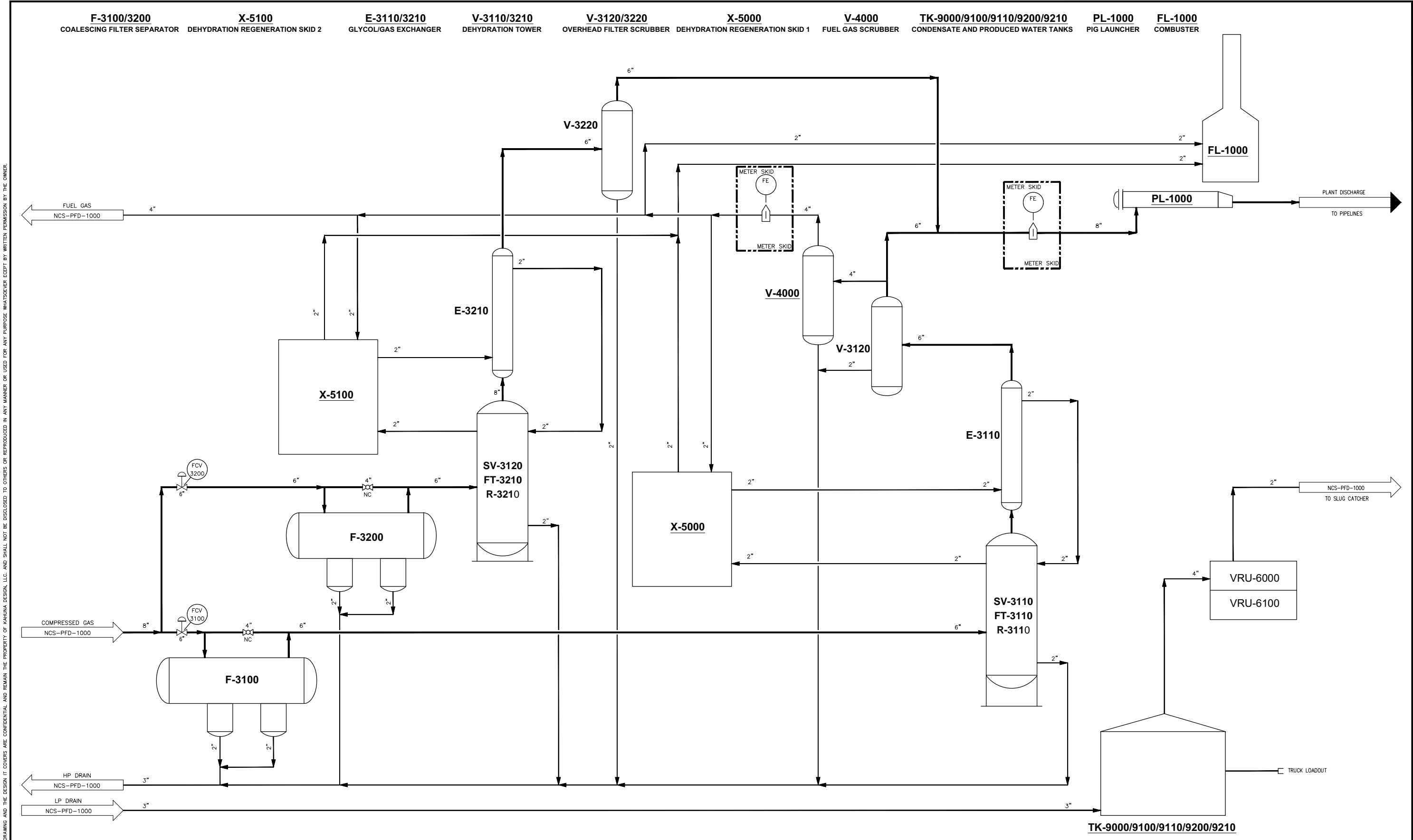
- I. 45CSR2 – To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers*
- II. 45CSR2A – Testing, Monitoring, Recordkeeping and Reporting Requirements Under 45CSR2*
- III. 45CSR4 – To Prevent and Control the Discharge of Air Pollutants into the Open Air Which Causes or Contributes to an Objectionable Odor or Odors*
- IV. 45CSR6 – Control of Air Pollution from Combustion of Refuse*
- V. 45CSR8 – Ambient Air Quality Standards*
- VI. 45CSR11 – Prevention of Air Pollution Emergency Episodes*
- VII. 45CSR13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation*
- VIII. 45CSR16 – Standards of Performance for New Stationary Sources Pursuant to 40 CFR, Part 60*
- IX. 45CSR20 – Good Engineering Practice as Applicable to Stack Heights*
- X. 45CSR22 – Air Quality Management Fee Program*
- XI. 45CSR27 – To Prevent and Control the Emissions of Toxic Air Pollutants*
- XII. 45CSR33 – Acid Rain Provisions and Permits*
- XIII. 45CSR34 – Emission Standards for Hazardous Air Pollutants for Source Categories Pursuant to 40 CFR, Part 63*
- XIV. 45CSR38 – Provisions for Determination of Compliance with Air Quality Management Rules*
- XV. 45CSR42 – Greenhouse Gas Emissions Inventory*

**Attachment E.**  
**Plot Plan**



**Attachment F.**  
**Process Flow Diagram**

[illegible]



NOTES:

REFERENCE DRAWINGS		REVISIONS							
		▲							
		▲							
		▲							
		▲	ISSUED FOR AIR PERMIT	AC	06/19/14	LW	06/19/14	PS	06/19/14
		▲	ISSUED FOR REVIEW	AC	06/06/14	JW	05/06/14	PS	05/06/14
DWG. NO.	TITLE	NO.	DESCRIPTION	BY	DATE	CHK	DATE	APPR.	DATE

BY: KAHUNA DESIGN LLC.

PROCESS FLOW DIAGRAM		
DRAWN BY: A. COOLEY	CHECKED: J. WARMAN	APPROVED: P. STOCKEBRAND
CREATION DATE: 05/05/14	CHECK DATE: 05/05/14	APPR. DATE: 05/06/14
Proj. No.: 4083.0164.00	DWG. No.: TCS-PFD-1001	SHEET No.: 2 OF 2
SCALE: NONE		

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**Attachment G.**  
**Process Description**



## **Underwood Compressor Station – Process Description**

The existing Underwood Compressor Station is located in Tyler County, West Virginia. Gas from surrounding pipelines enters the facility through one (1) receiver and associated slug catcher. From there, the gas is metered and routed through a filter separator. Any produced liquids from the scrubber or separator are sent to the 500 barrel settling tank (TK-9000). Gas from the filter separator is sent to one (1) of thirteen (13) 1680 hp compressor engines (C-2100 – C-2220). The thirteen (13) compressor engines are controlled with NSCR catalysts and air-fuel ratio controllers (1C – 11C, 15C & 16C). Produced fluids are routed to the settling tank and high pressure gas is sent to one of the two (2) TEG dehydrators.

Each TEG dehydrator contains a flash gas tank (FT-3110 & FT-3210) and 1.5 MMBtu/hr reboiler (R-3110 & R-3210). Each dehydrator has a design rate of 88 MMscf/day. Within the dehydrator unit, vent gas from the flash gas tank (FT-3110 & FT-3210) is routed to the reboiler (R-3110 & R-3210) and used as fuel. In the case where the flash tank gas cannot be used by the reboiler due to excess gas or the reboiler being offline, the gas will be sent to the VRUs (VRU-6000 and VRU-6100) via the storage tanks (TK-9000 – TK-9210) and thus controlled by 98%. Combustion emissions from each reboiler are routed to the atmosphere. The dehydrator still vents (SV-3110 & SV-3210) are controlled by a flare with at least 98% control efficiency (FL-1000). Produced fluids from the dehydrator are routed to the settling tank. The dry gas from the dehydration process is either routed to a fuel gas scrubber, metered, and routed to the compressors as fuel gas or metered and sent to the high pressure facility discharge pipeline.

All produced fluids enter one (1) 500 barrel settling tank (TK-9000) where the fluids settle out as either condensate or produced water. The produced water goes to two (2) 400 barrel produced water tanks (TK-9200 – TK-9210) and the condensate goes to two (2) 400 barrel condensate tanks (TK-9100 – TK-9110). Flashing only occurs at the settling tank as the fluids stabilize in the settling tank before going to the other storage tanks. All five (5) tanks are connected to a primary vapor recovery unit (VRU-6000) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. A second vapor recovery unit (VRU-6100) is used as back-up to the primary vapor recovery unit. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The loading emissions are uncontrolled. The anticipated production is 150 barrels per day of condensate and 45 barrels per day of produced water.

One (1) 600 kWe microturbine generator is used at the facility. The Capstone C600 unit is comprised of three (3) 200 kWe units that can be operated individually. Likely, all three units will not be operating 8,760 hours per year; however, emissions were calculated as such for maximum flexibility. The fuel line for the generators will be heated by a small catalytic heater (CATHT1) with a burner rating of 24 Btu/hr.

Fugitive emissions from component leaks and emissions from venting or blowdown events will also occur.

There will also be small storage tanks located at the facility. Their ID number, description, and exact size are listed in the table below.

Tag Number	Description	Gallons
TK-9300 & TK-9320	Compressor Skid Oily Water Tanks	1,000 each
TK-9310 & TK-9330	Used Oil Tank	500 each
TK-9410	TEG Make-Up Tank	1,000
TK-9420	Compressor Coolant Tank	2,000
TK-9430	Engine Lube Oil Tank	2,000
TK-9440	Compressor Lube Oil Tank	2,000
TK-9400	Compressor Waste Oil Tank	4,200

**Attachment H.**  
**Material Safety Data Sheets**

**Material Safety Data Sheet  
(TRIETHYLENE GLYCOL (TEG))**

**JMN Specialties, Inc.**

1100 Victory Drive  
Westwego, LA 70094  
(504) 341-3749  
ISO 9001 Registered

HMIS HEALTH:.....2  
HMIS FLAMMABILITY: .....1  
HMIS REACTIVITY:.....0  
PERSONAL PROTECTION: .....C

EMERGENCY NUMBER: .....800-255-3924

**SECTION 1 – IDENTIFICATION OF CHEMICAL PRODUCT**

PRODUCT NAME:..... TRIETHYLENE GLYCOL (TEG)  
EFFECTIVE DATE:..... October 1, 2007  
CHEMICAL FAMILY: ..... Glycol  
FORMULA: C<sub>6</sub>H<sub>14</sub>O<sub>4</sub>  
CAS NUMBER:..... 112-27-6

**SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS**

HAZARDOUS INGREDIENT	PERCENT	CAS NUMBER	PEL
TRIETHYLENE GLYCOL	> 99	112-27-6	None Established by ACGIH or OSHA.

The criteria for listing components in the composition section are as follows: Carcinogens are listed when present at 0.1% or greater; components which are otherwise hazardous according to OSHA are listed when present at 1.0% or greater. Non-hazardous components may be listed at 3.0% or greater if not proprietary in nature. This is not intended to be complete compositional disclosure. Refer to section 14 for applicable states right to know and other regulatory information.

**SECTION 3 – HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW**

APPEARANCE / ODOR: ..... Clear Liquid / Mild Odor

SHORT TERM EXPOSURE: **Inhalation:** No adverse health effects expected from inhalation.  
**Ingestion:** No adverse effects expected. **Skin Contact:** Prolonged exposure may cause skin irritation. **Eye Contact:** Splashing in eye causes irritation with transitory disturbances of corneal epithelium. However, these effects diminish and no permanent injury is expected. Vapors are non-irritating. **Chronic Exposure:** Possible skin irritation.  
**Aggravation of Pre-existing Conditions:** No information found.

OSHA REGULATED: ..... No

LISTED CARCINOGEN: ..... NTP: No IARC MONOGRAPHS: No

**POTENTIAL HEALTH EFFECTS**

INHALATION: ..... Unlikely

INGESTION: ..... Irritant

SKIN (DERMAL): ..... Slight Irritant After Prolonged Contact

# Material Safety Data Sheet

## (TRIETHYLENE GLYCOL (TEG))

**OVER EXPOSURE EFFECTS:** **Inhalation:** No adverse health effects expected from inhalation. **Ingestion:** No adverse effects expected. **Skin Contact:** Prolonged exposure may cause skin irritation. **Eye Contact:** Splashing in eye causes irritation with transitory disturbances of corneal epithelium. However, these effects diminish and no permanent injury is expected. Vapors are non-irritating. **Chronic Exposure:** Possible skin irritation. **Aggravation of Pre-existing Conditions:** No information found.

### SECTION 4 – FIRST AID MEASURES

**FIRST AID:** **SKIN CONTACT:** Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately. **EYE CONTACT:** Flush eyes immediately with large amounts of water or normal saline solution, occasionally lifting upper and lower lids until no evidence of chemical remains (at least 15-20 minutes). Get medical attention immediately. **INGESTION:** Give large amounts of fresh water or milk immediately. Do not give anything by mouth if person is unconscious or otherwise unable to swallow. If vomiting occurs, keep head below hips to prevent aspiration. Treat symptomatically and supportively. Seek medical attention immediately. **INHALATION:** Remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial resuscitation. Keep person warm and at rest. Treat symptomatically and supportively. Seek medical attention immediately. Qualified medical personnel should consider administering oxygen.

**NOTE TO PHYSICIAN:** ..... Ethylene Glycol (EG) and diethylene glycol (DEG) intoxication may initially produce behavioral changes, drowsiness, vomiting, diarrhea, thirst, and convulsions. EG and DEG are nephrotoxic. End stages of poisoning may include renal damage or failure with acidosis. Supportive measures, supplemented with hemodialysis if indicated, may limit the progression and severity of toxic effects. Primary toxic effects of EG when swallowed are kidney damage and metabolic acidosis. This product may contain trace amounts of Ethylene Glycol (EG) or Diethylene Glycol (DEG).

### SECTION 5 - FIRE FIGHTING MEASURES

**FLASHPOINT:**..... 350°F

**EXTINGUISHING MEDIA:** Water fog or spray, Foam, Dry Powder, Carbon Dioxide (CO<sub>2</sub>).

**DECOMPOSITION**

**PRODUCTS:**..... From fire; Smoke, Carbon dioxide, & Carbon Monoxide

**LOWER FLAME LIMIT:**..... < 0.9

**HIGHER FLAME LIMIT:**..... > 9

**UNUSUAL FIRE AND**

**EXPLOSION HAZARDS:**..... Toxic levels of carbon monoxide, carbon dioxide, irritation aldehydes and ketones may be formed on burning. Heating in air may produce irritating aldehydes, acids, and ketones.

#### FIRE FIGHTING

# Material Safety Data Sheet

## (TRIETHYLENE GLYCOL (TEG))

**EQUIPMENT:**..... Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

### SECTION 6 – ACCIDENTAL RELEASE MEASURES

#### CHEMTEL EMERGENCY

**NUMBER (24 Hour):**..... 1-800-255-3924

**SPILL:**..... Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

**RCRA STATUS:** ..... None

### SECTION 7 – HANDLING AND STORAGE

**HANDLE IN ACCORDANCE WITH GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES. THESE PRACTICES INCLUDE AVOIDING UNNECESSARY EXPOSURE AND PROMPT REMOVAL OF MATERIAL FROM EYES, SKIN, AND CLOTHING.**

**HANDLING AND STORAGE:** .. No special storage requirements. Do not store above 120°F.

#### PRECAUTIONARY

**MEASURES:** ..... Provide fresh air ventilation during and after application. Close container after each use. Avoid prolonged or repeated contact with skin. Avoid contact with skin, eyes, and clothing. After handling this product, wash hands before eating, drinking, or smoking. If needed, take first aid action shown in Section 4.

### SECTION 8 – EXPOSURE CONTROL / PERSONAL PROTECTION

#### GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment.

**EYE PROTECTION:**..... Chemical safety goggles meeting the specifications of OSHA 29CFR 1910.133 / ANSI Standard Z87.1 should be worn whenever there is the possibility of splashing or other contact with the eyes. Wear safety glasses meeting the specifications of OSHA 29CFR 1910.133 / ANSI Standard Z87.1 where no contact with the eye is anticipated.

#### RESPIRATORY

**PROTECTION:**..... Not normally needed. Use NIOSH approved vapor respirator if exposure is unknown or exceeds permissible limits. A respiratory protection program that meets OSHA's 29 CFR 1910.134 or ANSI Z88.2 requirements must be followed whenever workplace conditions warrant respirator use.

**Use NIOSH / MSHA approved respiratory protection equipment when airborne exposure limits are exceeded (see below). Consult the respirator manufacturer to determine appropriate type of**

## Material Safety Data Sheet (TRIETHYLENE GLYCOL (TEG))

equipment for a given application. Observe respirator use limitations specified by NIOSH / MSHA or the manufacturer. Respiratory protection programs must comply with 29 CFR 1910.134.

**WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

**PROTECTIVE GLOVES:**..... Wear impervious gloves

**VENTILATION:** A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

**MECHANICAL EXHAUST:** ..... Desired in closed places

**LOCAL EXHAUST:** ..... Recommended

**VENTILATION NOTES:** Provide natural or mechanical ventilation to control exposure levels below Airborne exposure limits (see below). The use of local mechanical exhaust ventilation is preferred at sources of air contamination such as open process equipment. Consult NFPA Standard 91 for design of exhaust systems.

**THRESHOLD LIMIT VALUE:** . None Established

**PROTECTIVE EQUIPMENT:**... HMIS PERSONAL PROTECTION: C: Safety Glasses, Gloves, Apron

The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

### SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE / ODOR:** ..... Clear Liquid / Mild Odor

**BOILING POINT:** ..... > 500°F

**FREEZING POINT:** ..... < 32°F

**VAPOR PRESSURE:**..... > 1

**VAPOR DENSITY (AIR=1):** ..... 5.1

**SPECIFIC GRAVITY:** ..... 1.1

**pH:** ..... 8.2

**SOLUBILITY IN WATER:** ..... Complete

### SECTION 10 – STABILITY AND REACTIVITY

**STABILITY:**..... Stable

**HAZARDOUS**

**POLYMERIZATION:** ..... Will Not Occur

**POLYMERIZATION AVOID:**... None

**INCOMPATIBILITY:** ..... Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. Therefore, avoid strong acids and strong bases at elevated temperatures. Avoid contamination with strong oxidizing agents and materials reactive with hydroxyl compounds. Avoid burning or heating in air. This may produce irritating aldehydes, acids, and ketones.

**CONDITIONS TO AVOID:**..... Excessive heat. Will ignite in air at 700°F

**Material Safety Data Sheet  
(TRIETHYLENE GLYCOL (TEG))**

**SECTION 11 – TOXICOLOGICAL INFORMATION**

**EYE EFFECTS:**

The eye irritation hazard is based on data from information supplied by raw material(s) supplier(s).

**SKIN EFFECTS:**

The skin irritation hazard is based on data from information supplied by raw material(s) supplier(s).

**ACUTE ORAL EFFECTS:**

The acute oral toxicity is based on data from information supplied by raw material(s) supplier(s).

**ACUTE INHALATION EFFECTS:**

The acute respiratory toxicity is based on data from information supplied by raw material(s) supplier(s).

**SECTION 12 – ECOLOGICAL INFORMATION**

Data from laboratory studies and from scientific literature is noted below if available.

**SECTION 13 DISPOSAL CONSIDERATIONS**

**WASTE DISPOSAL:** ..... Treatment, storage, transportation and disposal must be in accordance with Federal, State/Provincial and Local Regulations. Regulations may vary in different locations. Characterization and compliance with applicable laws are the responsibility solely of the generator. Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

**SECTION 14- TRANSPORTATION INFORMATION**

The data provided in this section is for information only. The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate regulations to properly classify your shipment for transportation.

**PROPER SHIPPING NAME:**..... DOT NON-REGULATED - TRIETHYLENE GLYCOL (TEG)

**REPORTABLE QUANTITY:**..... None

**HAZARD CLASS AND LABEL:** NON-REGULATED

**UN NUMBER:** ..... None

**NA NUMBER:** ..... None

**PACKAGING SIZE:**..... Pail, Drum & Bulk

**SECTION 15 - REGULATORY INFORMATION**

**SARA 311 CATEGORIES:**

**EPA ACUTE:**..... Yes (Eyes)



# Material Safety Data Sheet (TRIETHYLENE GLYCOL (TEG))

EPA CHRONIC: ..... No  
EPA IGNITABILITY: ..... No  
EPA REACTIVITY: ..... No  
EPA SUDDEN RELEASE  
OF PRESSURE: ..... No

CERCLA RQ VALUE: ..... None  
SARA TPQ: ..... None  
SARA RQ: ..... None  
EPA HAZARD WASTE #: ..... None  
CLEAN AIR: ..... NA  
CLEAN WATER: ..... NA  
SARA SECTION 313: ..... No  
NFPA HEALTH: ..... 2  
NFPA FLAMMABILITY: ..... 1  
NFPA REACTIVITY: ..... 0  
DEA Chemical Trafficking Act:.. No  
TSCA STATUS: ..... All ingredients in this product are on the TSCA Inventory List.

## SECTION 16 - ADDITIONAL INFORMATION

**FOOT NOTES:** NA - NOT APPLICABLE ND - NO DATA AVAILABLE > = GREATER THAN < = LESS THAN

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1) by the Company Health and Risk Assessment Unit, PO Box 1519, Gretna, LA 70054-1519.

**REVISION STATEMENT:** Changes have been made throughout this Material Safety Data Sheet. Please read the entire document.

### DISCLAIMER:

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\*\*\*\*\*  
**THIS IS THE LAST PAGE OF THIS MSDS**  
\*\*\*\*\*



## SAFETY DATA SHEET

**Material Name:** Produced Water

**US GHS**

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

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

**PRODUCT NAME:** Produced Water

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

**PRODUCT CODES:** Mixture

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

**PRODUCER:** Antero Resources

**ADDRESS:** 1615 Wynkoop Street  
Denver, Colorado 80202

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

### \*\*\* Section 2 – HAZARDS IDENTIFICATION \*\*\*

#### **GHS Classification:**

Eye Irritant – Category 2A.

#### **GHS LABEL ELEMENTS**

##### **Symbol(s)**



##### **Signal Word**

Warning

##### **Hazard Statements**

Causes serious eye irritation

##### **Precautionary Statements**

###### **Prevention**

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

###### **Response**

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

# SAFETY DATA SHEET

**Material Name:** Produced Water

**US GHS**

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

If EYE irritation persists, get medical advice / attention.

## **Storage**

Store in a secure area.

## **Disposal**

Dispose of contents/containers in accordance with regulations.

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

<b>CAS #</b>	<b>Component</b>	<b>Percent</b>
7732-18-5	Water	80
7647-14-5	Sodium Chloride	20

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

### **\* \* \* Section 4 – FIRST AID MEASURES \* \* \***

#### **First Aid: Eyes**

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

#### **First Aid: Skin**

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

#### **First Aid: Ingestion (Swallowing)**

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

#### **First Aid: Inhalation (Breathing)**

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

# SAFETY DATA SHEET

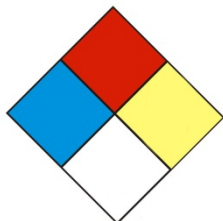
Material Name: Produced Water

US GHS

## Most important symptoms and effects

None known or anticipated.

### \*\*\* Section 5 – FIRE FIGHTING MEASURES \*\*\*



## NFPA 704 Hazard Class

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

## General Fire Hazards

No fire hazards are expected.

## General Fire Hazards

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

## Extinguishing Media

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

## Unsuitable Extinguishing Media

None

## Fire Fighting Equipment / Instructions

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

## Hazardous Combustion Products

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

# SAFETY DATA SHEET

Material Name: Produced Water

US GHS

<b>* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *</b>
--

## Recovery and Neutralization

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

## Materials and Methods for Clean-Up

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

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

## Emergency Measures

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

## Personal Precautions and Protective Equipment

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

## Environmental Precautions

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

## Prevention of Secondary Hazards

None

# SAFETY DATA SHEET

Material Name: Produced Water

US GHS

## \*\*\* Section 7 – HANDLING AND STORAGE \*\*\*

### Handling Procedures

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

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

### Storage Procedures

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

### Incompatibilities

Keep away from excessive heat to prevent rupture of container.

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

### Component Exposure Limits

#### Water (7732-18-5)

ACGIH: Not listed

#### Sodium Chloride (7647-14-5)

ACGIH: Not listed

### Engineering Measures

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

### Personal Protective Equipment: Respiratory

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

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

# SAFETY DATA SHEET

**Material Name:** Produced Water

**US GHS**

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

## **Personal Protective Equipment: Skin and Hands**

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

## **Personal Protective Equipment: Eyes**

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

## **Hygiene Measures**

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

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

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

# SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

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

### Conditions to Avoid

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

### Hazardous Decomposition Products

Not anticipated under normal conditions of use.

### Hazardous Polymerization

Not known to occur.

## \*\*\* Section 11 – TOXICOLOGICAL INFORMATION \*\*\*

### Acute Toxicity

#### A: General Product Information

Unlikely to be harmful.

#### B. Component Analysis – D50/LC50

##### Water (7732-18-5)

Oral LD50 Rat 90 g/kg

##### Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

### Potential Health Effects: Skin Corrosion Property / Stimulativeness

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

### Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.



# SAFETY DATA SHEET

**Material Name:** Produced Water

**US GHS**

**Potential Health Effects: Ingestion**

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

**Potential Health Effects: Inhalation**

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

**Generative Cell Mutagenicity**

Not expected to cause genetic effects.

**Carcinogenicity**

**General Product Information**

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

**Reproductive Toxicity**

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

**Specified Target Organ General Toxicity: Single Exposure**

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

**Specified Target Organ General Toxicity: Repeated Exposure**

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

**Aspiration Respiratory Organs Hazard**

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

<b>*** Section 12 – ECOLOGICAL INFORMATION ***</b>
--

**Ecotoxicity**

**A: General Product Information**

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

# SAFETY DATA SHEET

**Material Name:** Produced Water

**US GHS**

**Persistence / Degradability**

No information available

**Bioaccumulation**

No information available

**Mobility in Soil**

No information available

<b>*** Section 13 – DISPOSAL CONSIDERATIONS ***</b>
---

**Waste Disposal Instructions**

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

**Disposal of Contaminated Containers or Packaging**

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

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

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

<b>*** Section 14 – TRANSPORTATION INFORMATION ***</b>
--

**DOT Information**

**Shipping Description:** Not Regulated

**UN #:** Not Regulated

# SAFETY DATA SHEET

Material Name: Produced Water

US GHS

## \*\*\* Section 15 – REGULATORY INFORMATION \*\*\*

### **CERCLA/SARA – Section 302 Extremely Hazardous Substances and TPQs (in pounds):**

This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372,

### **CERCLA/SARA – Section 313 and 40 CFR 372):**

This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

### **EPA (CERCLA) Reportable Quantity (in pounds):**

This material does not contain any chemicals with CERCLA Reportable Quantities.

### **State Regulations**

#### **Component Analysis**

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

### **California Proposition 65:**

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

### **National Chemical Inventories:**

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

**U.S. Export control classification Number:** EAR99.

## \*\*\* Section 16 – OTHER INFORMATION \*\*\*

### **NFPA® Hazard Rating**

Health 1  
Fire 0  
Reactivity 0

### **HMIS® Hazard Rating**

Health 1 Slight  
Fire 0 Minimal  
Physical 0 Minimal

# **SAFETY DATA SHEET**

**Material Name: Produced Water**

**US GHS**

## **Key/Legend**

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

## **Literature References**

None

## **Other Information**

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

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

**Date of Preparation: January 28, 2014**

**Date of Last Revision: March 4, 2014**

End of Sheet

**Material Name:** Natural Gas Condensate

**US GHS**

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

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

**PRODUCT NAME:** Natural Gas Condensate

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

**PRODUCT CODES:** 64741-47-5

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

**PRODUCER:** Antero Resources

**ADDRESS:** 1615 Wynkoop Street  
Denver, Colorado 80202

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

**\*\*\* Section 2 – HAZARDS IDENTIFICATION \*\*\***

**GHS Classification:**

Flammable Liquids – Category 2.

Acute Toxicity Inhalation – Category 3

Germ Cell Mutagenicity – Category 1B

Carcinogenicity – Category 1A

Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 3

Specific Target Organ Systemic Toxicity (STOT) – Repeat Exposure Category 1

Aspiration Toxicity – Category 1

Toxic to the Aquatic Environment Acute – Category 3

**GHS LABEL ELEMENTS**

**Symbol(s)**



**Signal Word**

Danger

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

## **Hazard Statements**

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

## **Precautionary Statements**

### **Prevention**

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

### **Response**

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

### **Storage**

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

# SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

## Disposal

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

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

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

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

### \*\*\* Section 4 – FIRST AID MEASURES \*\*\*

#### First Aid: Eyes

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

#### First Aid: Skin

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

#### First Aid: Ingestion (swallowing)

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



# SAFETY DATA SHEET

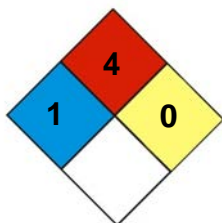
**Material Name:** Natural Gas Condensate

**US GHS**

## **First Aid: Inhalation (breathing)**

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

### **\*\*\* Section 5 – FIRE FIGHTING MEASURES \*\*\***



## **NFPA 704 Hazard Class**

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

## **General Fire Hazards**

See Section 9 for Flammability Properties.

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

## **Hazardous Combustion Products**

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

## **Extinguishing Media**

**SMALL FIRES:** Any extinguisher suitable for Class B fires, dry chemical, firefighting foam, water spray, carbon dioxide (CO<sub>2</sub>), or other gaseous extinguishing agents. Use caution when applying CO<sub>2</sub> in confined spaces.

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

## **Unsuitable Extinguishing Media**

None

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

## **Fire Fighting Equipment / Instructions**

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

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

<b>* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *</b>
--

## **Recovery and Neutralization**

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

## **Materials and Methods for Clean-Up**

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

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

## **Emergency Measures**

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

## **Personal Precautions and Protective Equipment**

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

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

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

## Environmental Precautions

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

## Prevention of Secondary Hazards

None

## \*\*\* Section 7 – HANDLING AND STORAGE \*\*\*

### Handling Procedures

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

### Storage Procedures

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

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

# SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

## Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

### Component Exposure Limits

#### Octanes (111-65-9)

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

#### Heptanes (142-82-5)

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

#### n-Hexane (110-54-3)

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

#### n-Pentane (109-66-0)

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

#### n-Butane (106-97-8)

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

#### Propane (74-98-6)

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

#### Ethane (74-84-0)

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

#### Benzene (71-43-2)

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

#### Toluene (108-88-3)

ACGIH: 20 ppm TWA (listed under Toluene)

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

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

## **Engineering Measures**

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

## **Personal Protective Equipment: Respiratory**

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

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

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

## **Personal Protective Equipment: Hands**

Gloves constructed of nitrile or neoprene are recommended.

## **Personal Protective Equipment: Eyes**

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

## **Personal Protective Equipment: Skin and Body**

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

## **Hygiene Measures**

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

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

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

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

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

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

### Conditions to Avoid

Keep away from ignition sources and high temperatures.

### Hazardous Decomposition Products

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

# SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

*** Section 11 – TOXICOLOGICAL INFORMATION ***
--

## Acute Toxicity

### A: General Product Information

Harmful if swallowed.

### B. Component Analysis – LD50/LC50

#### Octanes (111-65-9)

Inhalation LC50 rat = 118,000 mg/m<sup>3</sup> / 4H

#### Heptanes (142-82-5)

Inhalation LC50 rat = 103,000 mg/m<sup>3</sup> / 4H

#### Hexanes as n-Hexane (110-53-3)

Inhalation LC50 rat = 48,000 ppm / 4H

#### Pentanes as n-Pentane (109-66-0)

Inhalation LC50 rat = 364,000 mg/m<sup>3</sup> / 4H

#### Butanes as n-Butane (106-97-8)

Inhalation LC50 rat 658,000 mg/l / 4H

#### Propane (74-98-6)

Inhalation LC50 Rat > 800,000 ppm / 0.25H

#### Ethane (74-84-0)

Inhalation LC50 Rat 658,000 mg/l / 4H

#### Benzene (71-43-2)

Inhalation LC50 Rat 44,700 mg/m<sup>3</sup> /

#### Toluene (108-88-3)

Inhalation LD50 Rat 12/5 mg/l / 4H

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

Inhalation LC50 Rat 5000 ppm / 4H

### Potential Health Effects: Skin Corrosion Property / Stimulativeness

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



# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

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**Potential Health Effects: Eye Critical Damage / Stimulativeness**

Contact with eyes may cause moderate irritation.

**Potential Health Effects: Ingestion (swallowing)**

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

**Potential Health Effects: Inhalation (breathing)**

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

**Respiratory Organs Sensitization / Skin Sensitization**

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

**Generative Cell Mutagenicity**

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

**Carcinogenicity**

**A: General Product Information**

May cause cancer.

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

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

**B: Component Carcinogenicity**

**Benzene (71-43-2)**

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

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

## **Reproductive Toxicity**

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

## **Specified Target Organ General Toxicity: Single Exposure**

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

## **Specified Target Organ General Toxicity: Repeated Exposure**

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

## **Aspiration Respiratory Organs Hazard**

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

## **\*\*\* Section 12 – ECOLOGICAL INFORMATION \*\*\***

### **Ecotoxicity**

#### **A: General Product Information**

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

#### **B: Component Analysis – Ecotoxicity – Aquatic Toxicity**

##### **Benzene (71-43-2)**

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

## **Natural Gas condensates (68919-39-1)**

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

### **Persistence / Degradability**

No information available

### **Bioaccumulation**

No information available

### **Mobility in Soil**

No information available

<b>*** Section 13 – DISPOSAL CONSIDERATIONS ***</b>
---

### **Waste Disposal Instructions**

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

### **Disposal of Contaminated Containers or Packaging**

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

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

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

# SAFETY DATA SHEET

Material Name: Natural Gas Condensate

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## \*\*\* Section 14 – TRANSPORTATION INFORMATION \*\*\*

### DOT Information

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

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

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

Placard:



## \*\*\* Section 15 – REGULATORY INFORMATION \*\*\*

### Regulatory Information

#### Component Analysis

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

#### **Benzene (71-43-2)**

SARA 313: 0.1% de minimis concentration

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

#### **SARA Section 311/312 – Hazard Classes**

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

#### **SARA SECTION 313 – SUPPLIER NOTIFICATION**

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

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

## Canadian Regulatory Information

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

## European Union Regulatory Information

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

# SAFETY DATA SHEET

Material Name: Natural Gas Condensate

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## State Regulations

### Component Analysis – State

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

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

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

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

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

### Component Analysis – WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act

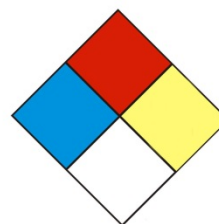
Ingredient Disclosure List:

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

## \*\*\* Section 16 – OTHER INFORMATION \*\*\*

### NFPA® Hazard Rating

Health 1  
Fire 4  
Reactivity 0



### HMIS® Hazard Rating

Health 1 Slight  
Fire 4 Severe  
Physical 0 Minimal  
\* Chronic

# **SAFETY DATA SHEET**

**Material Name: Natural Gas Condensate**

**US GHS**

## **Key/Legend**

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

## **Literature References**

None

## **Other Information**

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

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

**Date of Preparation: January 29, 2014**

**Date of Last Revision: March 4, 2014**

End of Sheet



**Material Name:** Wet Field Natural Gas

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

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

<b>PRODUCT NAME:</b>	<b>Wet Field Natural Gas</b>	<b>EMERGENCY PHONE:</b>	<b>(800) 878-1373</b>
<b>PRODUCT CODES:</b>	<b>CAS Reg. No. 68410-63-9</b>	<b>AFTER HOURS:</b>	<b>(800) 878-1373</b>
<b>PRODUCER:</b>	<b>Antero Resources</b>		
<b>ADDRESS:</b>	<b>1615 Wynkoop Street Denver, Colorado 80202</b>	<b>CHEMTREC PHONE:</b>	<b>(800) 424-9300</b>

**\*\*\* Section 2 – HAZARDS IDENTIFICATION \*\*\***

**GHS Classification:**

Flammable Gas – Category 1.

Gases Under Pressure – Gas.

Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

**GHS LABEL ELEMENTS**

**Symbol(s)**



**Signal Word**

Danger

**Hazard Statements**

Extremely flammable gas.

Contains gas under pressure, may explode if heated.

May cause damage to central nervous and respiratory systems.

**Precautionary Statements**

**Prevention**

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

Do not breathe fume/gas/mist/vapors/spray.

Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

## Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

## Storage

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

Store in a secure area.

## Disposal

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

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

CAS #	Component	Percent
74-82-8	Methane	72 - 97
78-84-0	Ethane	2.2 - 14
74-98-6	Propane	0.0 – 8.0
106-97-8	Butanes	0.0 – 3.5
109-66-0	Pentanes	0.0 – 1.4
110-54-3	Hexanes	0.0 – 0.5
7727-37-9	Nitrogen	< 0.4
124-38-9	Carbon Dioxide	< 0.2
7782-44-7	Oxygen	< 0.04

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

### \*\*\* Section 4 – FIRST AID MEASURES \*\*\*

#### First Aid: Eyes

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

#### First Aid: Skin

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

# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

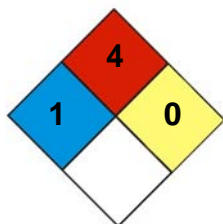
## **First Aid: Ingestion**

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

## **First Aid: Inhalation**

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

### **\* \* \* Section 5 – FIRE FIGHTING MEASURES \* \* \***



## **NFPA 704 Hazard Class**

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

## **General Fire Hazards**

See Section 9 for Flammability Properties.

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

## **Hazardous Combustion Products**

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

## **Extinguishing Media**

Any extinguisher suitable for Class B fires, dry chemical, firefighting foam, CO<sub>2</sub>, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

## **Unsuitable Extinguishing Media**

None.

## **Fire Fighting Equipment / Instructions**

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

# SAFETY DATA SHEET

**Material Name: Wet Field Natural Gas**

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

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

<b>*** Section 6 – ACCIDENTAL RELEASE MEASURES ***</b>
--

## **Recovery and Neutralization**

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

## **Materials and Methods for Clean-Up**

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

## **Emergency Measures**

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

## **Personal Precautions and Protective Equipment**

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

## **Environmental Precautions**

Do not flush gas vapors toward sewer or drainage systems.

## **Prevention of Secondary Hazards**

None.

# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

## \*\*\* Section 7 – HANDLING AND STORAGE \*\*\*

### Handling Procedures

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

### Storage Procedures

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

### Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

### Component Exposure Limits

#### Methane (74-82-8)

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

#### Ethane (74-84-0)

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

#### Propane (74-98-6)

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

#### Butane (106-97-8)

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

#### Pentanes (109-66-0)

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

#### Hexanes (110-54-3)

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

# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

**Nitrogen (7727-37-9)**

Simple Asphyxiant

**Carbon Dioxide (124-38-9)**

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

**Oxygen (7782-44-7)**

N/A – Necessary for life

**Engineering Measures**

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

**Personal Protective Equipment: Respiratory**

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

**Personal Protective Equipment: Hands**

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

**Personal Protective Equipment: Eyes**

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

**Personal Protective Equipment: Skin and Body**

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

<b>*** Section 9 – PHYSICAL AND CHEMICAL PROPERTIES ***</b>
---

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

# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

<b>Evaporation Rate:</b>	ND	<b>VOC:</b>	ND
<b>Octanol / H<sub>2</sub>O Coeff.:</b>	ND	<b>Flash Point:</b>	Flammable Gas
<b>Flash Point Method:</b>	N/A		
<b>Lower Flammability Limit:</b>	3.8 – 6.5	<b>Upper Flammability Limit:</b>	13-17
<b>(LFL):</b>		<b>(UFL):</b>	
<b>Auto Ignition:</b>	900-1170°F (482-632°C)	<b>Burning Rate:</b>	ND

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

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

### Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

### Hazardous Decomposition Products

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

## \*\*\* Section 11 – TOXICOLOGICAL INFORMATION \*\*\*

### Acute Toxicity

#### A: General Product Information

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

#### B. Component Analysis – LD50/LC50

##### Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m<sup>3</sup> 2h

##### Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

##### Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

# SAFETY DATA SHEET

**Material Name: Wet Field Natural Gas**

**Butanes (106-97-8)**

Inhalation LC50 Rat 658 g/m<sup>3</sup> 4h

**Pentanes (109-66-0)**

Inhalation LD50 Rat 364 g/m<sup>3</sup> 4h

**Hexanes (110-54-3)**

Inhalation LC50 Rat > 20 mg/l 4h

**Nitrogen (7727-37-9)**

Simple Asphyxiant

**Carbon Dioxide (124-38-9)**

Inhalation LC50 Human 100,000 ppm 1 minute

**Oxygen (7782-44-7)**

N/A – Necessary for life

**Potential Health Effects: Skin Corrosion Property / Stimulativeness**

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

**Generative Cell Mutagenicity**

This product is not reported to have any mutagenic effects.

**Carcinogenicity**

**A: General Product Information**

This product is not reported to have any carcinogenic effects.

**B: Component Carcinogenicity**

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

**Reproductive Toxicity**

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

**Specified Target Organ General Toxicity: Single Exposure**

This product may cause damage to the heart.

**Specified Target Organ General Toxicity: Repeated Exposure**

This product is not reported to have any specific target organ repeat effects.

**Aspiration Respiratory Organs Hazard**

This product is not reported to have any aspiration hazard effects.



# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

## \*\*\* Section 12 – ECOLOGICAL INFORMATION \*\*\*

### Ecotoxicity

#### A: General Product Information

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

#### B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

### Persistence / Degradability

No information available.

### Bioaccumulation

No information available.

### Mobility in Soil

No information available.

## \*\*\* Section 13 – DISPOSAL CONSIDERATIONS \*\*\*

### Waste Disposal Instructions

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

### Disposal of Contaminated Containers or Packaging

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

## \*\*\* Section 14 – TRANSPORTATION INFORMATION \*\*\*

### DOT Information

**Shipping Name:** Natural Gas, Compressed

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

Placard:



# SAFETY DATA SHEET

Material Name: Wet Field Natural Gas

## \*\*\* Section 15 – REGULATORY INFORMATION \*\*\*

### Regulatory Information

#### Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A.

n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

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

#### SARA Section 311/312 – Hazard Classes

Acute Health

---

Chronic Health

---

Fire

X

Sudden Release of Pressure

X

Reactive

---

#### SARA Section 313 – Supplier Notification

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

### State Regulations

#### Component Analysis – State

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

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

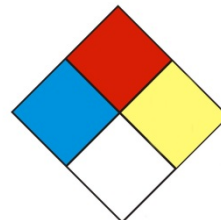
# SAFETY DATA SHEET

**Material Name:** Wet Field Natural Gas

## \*\*\* Section 16 – OTHER INFORMATION \*\*\*

### NFPA® Hazard Rating

Health 1  
Fire 4  
Reactivity 0



### HMIS® Hazard Rating

Health 1 Moderate  
Fire 4 Severe  
Physical 0 Minimal  
\* Chronic

### Key/Legend

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

### Literature References

None

### Other Information

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

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

**Date of Preparation:** February 7, 2014

**Date of Last Revision:** March 4,, 2014

End of Sheet

**Material Name:** Dry Field Natural Gas

**US GHS**

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

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

**PRODUCT NAME:** Dry Field Natural Gas **EMERGENCY PHONE:** (800) 878-1373

**PRODUCT CODES:** CAS Reg. No. 68410-63-9 **AFTER HOURS:** (800) 878-1373

**PRODUCER:** Antero Resources

**ADDRESS:** 1615 Wynkoop Street **CHEMTREC PHONE:** (800) 424-9300  
Denver, Colorado 80202

**\*\*\* Section 2 – HAZARDS IDENTIFICATION \*\*\***

**GHS Classification:**

Flammable Gas – Category 1.

Gases Under Pressure – Gas.

Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

**GHS LABEL ELEMENTS**

**Symbol(s)**



**Signal Word**

Danger

**Hazard Statements**

Extremely flammable gas.

Contains gas under pressure, may explode if heated.

May cause damage to central nervous and respiratory systems.

**Precautionary Statements**

**Prevention**

Keep away from heat/sparks/open flames/hot surfaces. No smoking.

Do not breathe fume/gas/mist/vapors/spray.

Wash thoroughly after handling.

Do not eat, drink or smoke when using this product.

# SAFETY DATA SHEET

**Material Name:** Dry Field Natural Gas

**US GHS**

## Response

Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

## Storage

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

Store in a secure area.

## Disposal

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

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

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

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

### \*\*\* Section 4 – FIRST AID MEASURES \*\*\*

#### First Aid: Eyes

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

#### First Aid: Skin

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

# SAFETY DATA SHEET

**Material Name:** Dry Field Natural Gas

**US GHS**

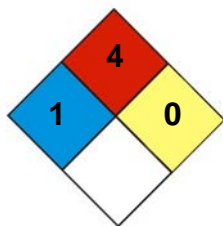
## **First Aid: Ingestion**

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

## **First Aid: Inhalation**

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

### **\* \* \* Section 5 – FIRE FIGHTING MEASURES \* \* \***



## **NFPA 704 Hazard Class**

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

## **General Fire Hazards**

See Section 9 for Flammability Properties.

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

## **Hazardous Combustion Products**

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

## **Extinguishing Media**

Any extinguisher suitable for Class B fires, dry chemical, fire fighting foam, CO<sub>2</sub>, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

## **Unsuitable Extinguishing Media**

None.

## **Fire Fighting Equipment / Instructions**

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

# SAFETY DATA SHEET

**Material Name:** Dry Field Natural Gas

**US GHS**

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

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

<b>*** Section 6 – ACCIDENTAL RELEASE MEASURES ***</b>
--

## **Recovery and Neutralization**

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

## **Materials and Methods for Clean-Up**

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

## **Emergency Measures**

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

## **Personal Precautions and Protective Equipment**

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

## **Environmental Precautions**

Do not flush gas vapors toward sewer or drainage systems.

## **Prevention of Secondary Hazards**

None.

# SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

## \*\*\* Section 7 – HANDLING AND STORAGE \*\*\*

### Handling Procedures

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

### Storage Procedures

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

### Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

### Component Exposure Limits

#### Methane (74-82-8)

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

#### Ethane (74-84-0)

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

#### Propane (74-98-6)

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

#### Butane (106-97-8)

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

#### Pentanes (109-66-0)

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

#### Hexanes (110-54-3)

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



# SAFETY DATA SHEET

**Material Name:** Dry Field Natural Gas

**US GHS**

**Nitrogen (7727-37-9)**

Simple Asphyxiant

**Carbon Dioxide (124-38-9)**

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

**Oxygen (7782-44-7)**

N/A – Necessary for life

**Engineering Measures**

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

**Personal Protective Equipment: Respiratory**

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

**Personal Protective Equipment: Hands**

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

**Personal Protective Equipment: Eyes**

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

**Personal Protective Equipment: Skin and Body**

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

<b>*** Section 9 – PHYSICAL AND CHEMICAL PROPERTIES ***</b>
---

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

# SAFETY DATA SHEET

**Material Name:** Dry Field Natural Gas

**US GHS**

<b>Evaporation Rate:</b>	ND	<b>VOC:</b>	ND
<b>Octanol / H<sub>2</sub>O Coeff.:</b>	ND	<b>Flash Point:</b>	Flammable Gas
<b>Flash Point Method:</b>	N/A		
<b>Lower Flammability Limit:</b>	3.8 – 6.5	<b>Upper Flammability Limit:</b>	13-17
<b>(LFL):</b>		<b>(UFL):</b>	
<b>Auto Ignition:</b>	900-1170°F (482-632°C)	<b>Burning Rate:</b>	ND

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

### Chemical Stability

This is a stable material.

### Hazardous Reaction Potential

Will not occur.

### Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

### Hazardous Decomposition Products

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

## \*\*\* Section 11 – TOXICOLOGICAL INFORMATION \*\*\*

### Acute Toxicity

#### A: General Product Information

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

#### B. Component Analysis – LD50/LC50

##### Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m<sup>3</sup> 2h

##### Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

##### Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

# SAFETY DATA SHEET

**Material Name:** Dry Field Natural Gas

US GHS

**Butanes (106-97-8)**

Inhalation LC50 Rat 658 g/m<sup>3</sup> 4h

**Pentanes (109-66-0)**

Inhalation LD50 Rat 364 g/m<sup>3</sup> 4h

**Hexanes (110-54-3)**

Inhalation LC50 Rat > 20 mg/l 4h

**Nitrogen (7727-37-9)**

Simple Asphyxiant

**Carbon Dioxide (124-38-9)**

Inhalation LC50 Human 100,000 ppm 1 minute

**Oxygen (7782-44-7)**

N/A – Necessary for life

**Potential Health Effects: Skin Corrosion Property / Stimulativeness**

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

**Generative Cell Mutagenicity**

This product is not reported to have any mutagenic effects.

**Carcinogenicity**

**A: General Product Information**

This product is not reported to have any carcinogenic effects.

**B: Component Carcinogenicity**

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

**Reproductive Toxicity**

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

**Specified Target Organ General Toxicity: Single Exposure**

This product may cause damage to the heart.

**Specified Target Organ General Toxicity: Repeated Exposure**

This product is not reported to have any specific target organ repeat effects.

**Aspiration Respiratory Organs Hazard**

This product is not reported to have any aspiration hazard effects.

# SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

## \*\*\* Section 12 – ECOLOGICAL INFORMATION \*\*\*

### Ecotoxicity

#### A: General Product Information

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

#### B: Component Analysis – Ecotoxicity – Aquatic Toxicity

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

### Persistence / Degradability

No information available.

### Bioaccumulation

No information available.

### Mobility in Soil

No information available.

## \*\*\* Section 13 – DISPOSAL CONSIDERATIONS \*\*\*

### Waste Disposal Instructions

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

### Disposal of Contaminated Containers or Packaging

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

## \*\*\* Section 14 – TRANSPORTATION INFORMATION \*\*\*

### DOT Information

**Shipping Name:** Natural Gas, Compressed

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

Placard:



# SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

US GHS

## \*\*\* Section 15 – REGULATORY INFORMATION \*\*\*

### Regulatory Information

#### Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A).

n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

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

#### SARA Section 311/312 – Hazard Classes

Acute Health

---

Chronic Health

---

Fire

X

Sudden Release of Pressure

X

Reactive

---

#### SARA Section 313 – Supplier Notification

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

### State Regulations

#### Component Analysis – State

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

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

# SAFETY DATA SHEET

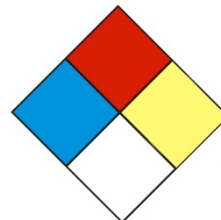
Material Name: Dry Field Natural Gas

US GHS

## \*\*\* Section 16 – OTHER INFORMATION \*\*\*

### NFPA® Hazard Rating

Health 1  
Fire 4  
Reactivity 0



### HMIS® Hazard Rating

Health 1 Moderate  
Fire 4 Severe  
Physical 0 Minimal  
\* Chronic

### Key/Legend

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

### Literature References

None

### Other Information

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

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

Date of Preparation: January 30, 2014

Date of Last Revision: March 4, 2014

End of Sheet

**Attachment I.**  
**Emission Units Table**

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

Emission Unit ID <sup>1</sup>	Emission Point ID <sup>2</sup>	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type <sup>3</sup> and Date of Change	Control Device <sup>4</sup>
C-2100	1E	Compressor Engine #1	2016	1,680 hp	Modified	NSCR (1C)
C-2110	2E	Compressor Engine #2	2016	1,680 hp	Modified	NSCR (2C)
C-2120	3E	Compressor Engine #3	2016	1,680 hp	Modified	NSCR (3C)
C-2130	4E	Compressor Engine #4	2016	1,680 hp	Modified	NSCR (4C)
C-2140	5E	Compressor Engine #5	2016	1,680 hp	Modified	NSCR (5C)
C-2150	6E	Compressor Engine #6	2016	1,680 hp	Modified	NSCR (6C)
C-2160	7E	Compressor Engine #7	2016	1,680 hp	Modified	NSCR (7C)
C-2170	8E	Compressor Engine #8	2016	1,680 hp	Modified	NSCR (8C)
C-2180	9E	Compressor Engine #9	2016	1,680 hp	Modified	NSCR (9C)
C-2190	10E	Compressor Engine #10	2016	1,680 hp	Modified	NSCR(10C)
C-2200	11E	Compressor Engine #11	2016	1,680 hp	Modified	NSCR(11C)
G-8000	12E	Microturbine Generator #1	2016	600 kWe	N/A	None
SV-3110	13E	Dehydrator Still Vent #1	2016	88 MMscfd	Modified	FL-1000 (12C)
FT-3110	14E	Dehydrator Flash Tank #1	2016	88 MMscfd	Modified	R-3110 (15E)
R-3110	15E	Dehydrator Reboiler #1	2016	1.5 mmbtu/hr	Modified	None
SV-3210	16E	Dehydrator Still Vent #2	2016	88 MMscfd	Modified	FL-1000 (12C)
FT-3210	17E	Dehydrator Flash Tank #2	2016	88 MMscfd	Modified	R-3210 (18E)
R-3210	18E	Dehydrator Reboiler #2	2016	1.5 mmbtu/hr	Modified	None
TK-9000	19E	Settling Tank 1	2016	500 barrel	N/A	VRU-6000 & VRU-6100 (13C & 14C)
TK-9200	20E	Condensate Tank 1	2016	400 barrel	N/A	VRU-6000 & VRU-6100 (13C & 14C)
TK-9210	21E	Condensate Tank 2	2016	400 barrel	N/A	VRU-6000 & VRU-6100 (13C & 14C)
TK-9100	22E	Produced Water Tank 1	2016	400 barrel	N/A	VRU-6000 & VRU-6100 (13C & 14C)
TK-9110	23E	Produced Water Tank 2	2016	400 barrel	N/A	VRU-6000 & VRU-6100 (13C & 14C)



CATHT1	24E	Catalytic Heater for Generator Fuel	2016	0.024 MMBtu/hr	N/A	None
----	----	NSCR Catalyst for Compressor #1	2016	----	Modified	1C
----	----	NSCR Catalyst for Compressor #2	2016	----	Modified	2C
----	----	NSCR Catalyst for Compressor #3	2016	----	Modified	3C
----	----	NSCR Catalyst for Compressor #4	2016	----	Modified	4C
----	----	NSCR Catalyst for Compressor #5	2016	----	Modified	5C
----	----	NSCR Catalyst for Compressor #6	2016	----	Modified	6C
----	----	NSCR Catalyst for Compressor #7	2016	----	Modified	7C
----	----	NSCR Catalyst for Compressor #8	2016	----	Modified	8C
----	----	NSCR Catalyst for Compressor #9	2016	----	Modified	9C
----	----	NSCR Catalyst for Compressor #10	2016	----	Modified	10C
----	----	NSCR Catalyst for Compressor #11	2016	----	Modified	11C
FL-1000	25E	Flare Combustion Device 1	2016	9.21 MMBtu/hr	N/A	12C
VRU-6000	----	Vapor Recovery Unit 1	2016	TBD	N/A	13C
VRU-6100	----	Vapor Recovery Unit 2	2016	TBD	N/A	14C
C-2210	26E	Compressor Engine #12	2016	1,680 hp	New	NSCR(15C)
C-2220	27E	Compressor Engine #13	2016	1,680 hp	New	NSCR(16C)
----	----	NSCR Catalyst for Compressor #12	2016	----	New	15C
----	----	NSCR Catalyst for Compressor #13	2016	----	New	16C
LDOUT1	28E	Tanker Truck Loading	2016	195 bbl/day	N/A	none

<sup>1</sup> For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S,... or other appropriate designation.

<sup>2</sup> For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

<sup>3</sup> New, modification, removal

<sup>4</sup> For Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

**Attachment J.**  
**Emission Point Data Summary Sheet**

**Attachment J**  
**EMISSION POINTS DATA SUMMARY SHEET**

Table 1: Emissions Data															
Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup>  (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Potential Controlled Emissions <sup>5</sup>		Emission Form or Phase  (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>	Emission Concentration <sup>7</sup> (ppmv or mg/m <sup>4</sup> )
		ID No.	Source	ID No.	Device Type	Short Term <sup>2</sup>	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
1E	Upward Vertical Stack	C-2100	Compressor engine 1	1C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
2E	Upward Vertical Stack	C-2110	Compressor engine 2	2C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
3E	Upward Vertical Stack	C-2120	Compressor engine 3	3C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	

4E	Upward Vertical Stack	C-2130	Com- pressor engine 4	4C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
5E	Upward Vertical Stack	C-2140	Com- pressor engine 5	5C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
6E	Upward Vertical Stack	C-2150	Com- pressor engine 6	6C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
7E	Upward Vertical Stack	C-2160	Com- pressor engine 7	7C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	

8E	Upward Vertical Stack	C-2170	Com- pressor engine 8	8C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
9E	Upward Vertical Stack	C-2180	Com- pressor engine 9	9C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
10E	Upward Vertical Stack	C-2190	Com- pressor engine 10	10C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	
11E	Upward Vertical Stack	C-2200	Com- pressor engine 11	11C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	

12E	Upward Vertical Stack	G8000	Microturbine Generator	----	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.24 0.66 0.06 0.04 0.02 0.006 0.004 799	1.05 2.89 0.26 0.18 0.09 0.03 0.02 3499	0.24 0.66 0.06 0.04 0.02 0.006 0.004 799	1.05 2.89 0.26 0.18 0.09 0.03 0.02 3499	Gas/Vapor	EE	
13E	Upward Vertical Stack	SV-3110	Dehydrator Still Vent 1	12C	Flare-98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	15.90 7.18 0.26 1.17 1.03 4.47 0.24 436	69.65 31.43 1.16 5.13 4.51 19.59 1.04 1910	See 25E emissions		Gas/Vapor	EE	
14E	Used for fuel in 15E	FT-3110	Dehydrator Flash Gas 1	Used for Fuel in 15E	95% Combustion	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	32.28 0.68 0.022 0.056 0.026 0.069 0.50 1367	141.39 2.96 0.095 0.24 0.11 0.30 2.21 5988	See 15E emissions		Gas/Vapor	EE	
15E	Upward Vertical Stack	R-3110	Dehydrator Reboiler 1	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.004 176.1	0.81 0.68 0.04 0.06 0.005 0.015 771	0.18 0.15 0.66 0.01 0.001 0.017 204.1	0.81 0.68 2.87 0.06 0.005 0.074 895	Gas/Vapor	EE	

16E	Upward Vertical Stack	SV-3210	Dehydrator Still Vent 2	12C	Flare-98% Control	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	15.90 7.18 0.26 1.17 1.03 4.47 0.24 436	69.65 31.43 1.16 5.13 4.51 19.59 1.04 1910	See 25E emissions		Gas/Vapor	EE	
17E	Used for fuel in 18E	FT-3210	Dehydrator Flash Gas 2	Used for Fuel in 18E	95% Combustion	C	8,760	VOC Total HAPs Benzene Toluene Ethylbenzene Xylenes n-Hexane CO2e	32.28 0.68 0.022 0.056 0.026 0.069 0.50 1367	141.39 2.96 0.095 0.24 0.11 0.30 2.21 5988	See 18E emissions		Gas/Vapor	EE	
18E	Upward Vertical Stack	R-3210	Dehydrator Reboiler 2	---	----	C	8,760	NOx CO VOC PM10 SO2 Total HAPs CO2e	0.18 0.15 0.01 0.01 0.001 0.004 176.1	0.81 0.68 0.04 0.06 0.005 0.015 771	0.18 0.15 0.66 0.01 0.001 0.017 204.1	0.81 0.68 2.87 0.06 0.005 0.074 895	Gas/Vapor	EE	
19E	Upward Vertical Stack	TK-9000	Settler Tank	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	128.9 3.94 325.8	564.6 17.25 1427	2.58 0.079 6.62	11.29 0.35 29	Gas/Vapor	EE	
20E	Upward Vertical Stack	TK-9200	Condensate Tank 1	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	1.56 0.004 0.046	6.82 0.017 2.01	0.032 7.8e-5 0.011	0.14 3.4e-4 0.047	Gas/Vapor	EE	
21E	Upward Vertical Stack	TK-9210	Condensate Tank 2	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	1.56 0.004 0.046	6.82 0.017 2.01	0.032 7.8e-5 0.011	0.14 3.4e-4 0.047	Gas/Vapor	EE	

22E	Upward Vertical Stack	TK-9100	Produced Water Tank 1	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	8.7e-5 3.4e-8 0.002	3.8e-4 1.5e-7 0.009	1.8e-6 6.9e-10 7.5e-5	7.7e-6 3.0e-9 3.3e-4	Gas/Vapor	EE	
23E	Upward Vertical Stack	TK-9110	Produced Water Tank 2	13C	VRU-98% capture	C	8,760	VOC Total HAPs CO2e	8.7e-5 3.4e-8 0.002	3.8e-4 1.5e-7 0.009	1.8e-6 6.9e-10 7.5e-5	7.7e-6 3.0e-9 3.3e-4	Gas/Vapor	EE	
24E	Upward Vertical Stack	CATHT 1	Catalytic Heater for Generator Fuel	---	---	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.0029 0.0025 1.6 E-4 2.2 E-4 1.8 E-5 6 E-5 2 E-6 2.82	0.013 0.011 7.1 E-4 0.001 7.7 E-5 2.4 E-4 1 E-5 12	0.0029 0.0025 1.6 E-4 2.2 E-4 1.8 E-5 6 E-5 2 E-6 2.82	0.013 0.011 7.1 E-4 0.001 7.7 E-5 2.4 E-4 1 E-5 12	Gas/Vapor	EE	
25E	Upward Vertical Stack	FL-1000	Flare combustion device 1	---	---	C	8,760	NOx CO VOC Benzene Toluene Ethylbenzene Xylene n-Hexane Total HAPs CO2e	--- --- --- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- --- --- ---	0.63 2.86 0.64 0.011 0.047 0.041 0.18 0.010 0.29 1101	2.75 12.51 2.79 0.046 0.21 0.18 0.78 0.042 1.26 4822	Gas/Vapor	EE	
26E	Upward Vertical Stack	C-2210	Compressor engine 12	15C	NSCR catalyst	C	8,760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.74 47.04 1.74 0.27 0.008 0.35 0.19 2081	222.24 206.02 7.62 1.18 0.036 1.54 0.81 9113	1.27 1.18 0.28 0.27 0.008 0.18 0.019 1996	5.56 5.15 1.22 1.18 0.036 0.81 0.081 8744	Gas/Vapor	EE	



27E	Upward Vertical Stack	C-2220	Com- pressor engine 13	16C	NSCR catalyst	C	8,760	NOx	50.74	222.24	1.27	5.56	Gas/Vapor	EE	
								CO	47.04	206.02	1.18	5.15			
								VOC	1.74	7.62	0.28	1.22			
								PM10	0.27	1.18	0.27	1.18			
								SO2	0.008	0.036	0.008	0.036			
								Total HAPs	0.35	1.54	0.18	0.81			
								Formaldehyde	0.19	0.81	0.019	0.081			
								CO2e	2081	9113	1996	8744			

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

<sup>1</sup> Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

<sup>2</sup> Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

<sup>3</sup> List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. **DO NOT LIST** H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.

<sup>4</sup> Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

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

<sup>6</sup> Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

<sup>7</sup> Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m<sup>3</sup>) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO<sub>2</sub>, use units of ppmv (See 45CSR10).

**Attachment J**  
**EMISSION POINTS DATA SUMMARY SHEET**

Table 2: Release Parameter Data								
Emission Point ID No.	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow <sup>1</sup> (acfm) <i>at operating conditions</i>	Velocity (fps)	Ground Level <i>(Height above mean sea level)</i>	Stack Height <sup>2</sup>	Northing	Easting
1E/1C	1.1	1223	8813	155	980	TBD	4,364.863	510.979
2E/2C	1.1	1223	8813	155	980	TBD	4,364.858	510.991
3E/3C	1.1	1223	8813	155	980	TBD	4,364.854	511.002
4E/4C	1.1	1223	8813	155	980	TBD	4,364.851	511.013
5E/5C	1.1	1223	8813	155	980	TBD	4,364.848	511.025
6E/6C	1.1	1223	8813	155	980	TBD	4,364.843	511.036
7E/7C	1.1	1223	8813	155	980	TBD	4,364.839	511.048
8E/8C	1.1	1223	8813	155	980	TBD	4,364.834	511.059
9E/9C	1.1	1223	8813	155	980	TBD	4,364.829	511.071
10E/10C	1.1	1223	8813	155	980	TBD	4,364.825	511.082
11E/11C	1.1	1223	8813	155	980	TBD	4,364.820	511.093
12E	0.5	535	4.0 kg/s mass flow	---	980	~11	4364.802	511.026
15E	0.75	350	530	20	980	~18	4364.801	510.984
18E	0.75	350	530	20	980	~18	4364.814	510.993
24E	0.5	225	47	4	980	~10	4364.802	511.026
25E	3	1030	2545	6	980	20	4364.819	510.975
26E/15C	1.1	1223	8813	155	980	TBD	4,364.816	511.104
27E/16C	1.1	1223	8813	155	980	TBD	4,364.812	511.115

Note: Points 13E and 16E are grouped into 25E. Points 14E and 17E are grouped into 15E and 18E respectively. Points 19E-23E are sent to the VRUs in a closed loop.

<sup>1</sup> Give at operating conditions. Include inerts. <sup>2</sup> Release height of emissions above ground level.

**Attachment K.**  
**Fugitive Emissions Data Summary Sheet**

## Attachment K

### FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS <sup>1</sup>	Maximum Potential Uncontrolled Emissions <sup>2</sup>		Maximum Potential Controlled Emissions <sup>3</sup>		Est. Method Used <sup>4</sup>
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Unpaved Haul Roads	PM-10 PM-2.5	0.15 0.015	0.67 0.067	0.15 0.015	0.67 0.067	EE
Storage Pile Emissions						
Loading/Unloading Operations	VOCs Total HAPs CO <sub>2</sub> e	52.65 0.13 30.7	7.94 0.02 3.03	52.65 0.13 30.7	7.94 0.02 3.03	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOCs Total HAPs CO <sub>2</sub> e	1.03 0.020 24.36	4.53 0.087 107	1.03 0.020 24.36	4.53 0.087 107	EE
General Clean-up VOC Emissions						
Other – Venting Episodes	VOCs Total HAPs CO <sub>2</sub> e	Does not apply	11.46 0.19 778	Does not apply	11.46 0.19 778	EE

<sup>1</sup> List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. DO NOT LIST H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.

<sup>2</sup> Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

<sup>3</sup> Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

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

**Attachment L.**  
**Emission Unit Data Sheets**

# **Compressor Engines**

## NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number <sup>1</sup>		1E		2E		3E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status <sup>2</sup>		MS		MS		MS	
Date Installed/Modified/Removed <sup>3</sup>		June 2016		June 2016		June 2016	
Engine Manufactured/Reconstruction Date <sup>4</sup>		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No		No		No	
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	RB4S		RB4S		RB4S	
	APCD Type <sup>7</sup>	NSCR		NSCR		NSCR	
	Fuel Type <sup>8</sup>	PQ		PQ		PQ	
	H <sub>2</sub> S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1674 bhp/1200 rpm		1674 bhp/1200 rpm		1674 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,267		8,267		8,267	
	Fuel throughput (ft <sup>3</sup> /hr)	11,820		11,820		11,820	
	Fuel throughput (MMft <sup>3</sup> /yr)	103.54		103.54		103.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO <sub>x</sub>	1.27	5.56	1.27	5.56	1.27	5.56
MD	CO	1.18	5.15	1.18	5.15	1.18	5.15
MD	VOC	0.28	1.22	0.28	1.22	0.28	1.22
AP	SO <sub>2</sub>	0.0082	0.036	0.0082	0.036	0.0082	0.036
AP	PM <sub>10</sub>	0.27	1.18	0.27	1.18	0.27	1.18
MD	Formaldehyde	0.019	0.081	0.019	0.081	0.019	0.081
MD	CO <sub>2e</sub>	1,996	8,744	1,996	8,744	1,996	8,744



Source Identification Number <sup>1</sup>		4E		5E		6E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status <sup>2</sup>		MS		MS		MS	
Date Installed/Modified/Removed <sup>3</sup>		June 2016		June 2016		June 2016	
Engine Manufactured/Reconstruction Date <sup>4</sup>		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No		No		No	
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	RB4S		RB4S		RB4S	
	APCD Type <sup>7</sup>	NSCR		NSCR		NSCR	
	Fuel Type <sup>8</sup>	PQ		PQ		PQ	
	H <sub>2</sub> S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1674 bhp/1200 rpm		1674 bhp/1200 rpm		1674 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,267		8,267		8,267	
	Fuel throughput (ft <sup>3</sup> /hr)	11,820		11,820		11,820	
	Fuel throughput (MMft <sup>3</sup> /yr)	103.54		103.54		103.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO <sub>x</sub>	1.27	5.56	1.27	5.56	1.27	5.56
MD	CO	1.18	5.15	1.18	5.15	1.18	5.15
MD	VOC	0.28	1.22	0.28	1.22	0.28	1.22
AP	SO <sub>2</sub>	0.0082	0.036	0.0082	0.036	0.0082	0.036
AP	PM <sub>10</sub>	0.27	1.18	0.27	1.18	0.27	1.18
MD	Formaldehyde	0.019	0.081	0.019	0.081	0.019	0.081
MD	CO <sub>2e</sub>	1,996	8,744	1,996	8,744	1,996	8,744

Source Identification Number <sup>1</sup>		7E		8E		9E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status <sup>2</sup>		MS		MS		MS	
Date Installed/Modified/Removed <sup>3</sup>		June 2016		June 2016		June 2016	
Engine Manufactured/Reconstruction Date <sup>4</sup>		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No		No		No	
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	RB4S		RB4S		RB4S	
	APCD Type <sup>7</sup>	NSCR		NSCR		NSCR	
	Fuel Type <sup>8</sup>	PQ		PQ		PQ	
	H <sub>2</sub> S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1674 bhp/1200 rpm		1674 bhp/1200 rpm		1674 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,267		8,267		8,267	
	Fuel throughput (ft <sup>3</sup> /hr)	11,820		11,820		11,820	
	Fuel throughput (MMft <sup>3</sup> /yr)	103.54		103.54		103.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO <sub>x</sub>	1.27	5.56	1.27	5.56	1.27	5.56
MD	CO	1.18	5.15	1.18	5.15	1.18	5.15
MD	VOC	0.28	1.22	0.28	1.22	0.28	1.22
AP	SO <sub>2</sub>	0.0082	0.036	0.0082	0.036	0.0082	0.036
AP	PM <sub>10</sub>	0.27	1.18	0.27	1.18	0.27	1.18
MD	Formaldehyde	0.019	0.081	0.019	0.081	0.019	0.081
MD	CO <sub>2e</sub>	1,996	8,744	1,996	8,744	1,996	8,744

Source Identification Number <sup>1</sup>		10E		11E		26E	
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI		Waukesha, 7044 GSI	
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
Source Status <sup>2</sup>		MS		MS		NS	
Date Installed/Modified/Removed <sup>3</sup>		June 2016		June 2016		June 2016	
Engine Manufactured/Reconstruction Date <sup>4</sup>		TBD		TBD		TBD	
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No		No		No	
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	RB4S		RB4S		RB4S	
	APCD Type <sup>7</sup>	NSCR		NSCR		NSCR	
	Fuel Type <sup>8</sup>	PQ		PQ		PQ	
	H <sub>2</sub> S (gr/100 scf)	0		0		0	
	Operating bhp/rpm	1674 bhp/1200 rpm		1674 bhp/1200 rpm		1674 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8,267		8,267		8,267	
	Fuel throughput (ft <sup>3</sup> /hr)	11,820		11,820		11,820	
	Fuel throughput (MMft <sup>3</sup> /yr)	103.54		103.54		103.54	
	Operation (hrs/yr)	8,760		8,760		8,760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO <sub>x</sub>	1.27	5.56	1.27	5.56	1.27	5.56
MD	CO	1.18	5.15	1.18	5.15	1.18	5.15
MD	VOC	0.28	1.22	0.28	1.22	0.28	1.22
AP	SO <sub>2</sub>	0.0082	0.036	0.0082	0.036	0.0082	0.036
AP	PM <sub>10</sub>	0.27	1.18	0.27	1.18	0.27	1.18
MD	Formaldehyde	0.019	0.081	0.019	0.081	0.019	0.081
MD	CO <sub>2</sub> e	1,996	8,744	1,996	8,744	1,996	8,744

Source Identification Number <sup>1</sup>		27E					
Engine Manufacturer and Model		Waukesha, 7044 GSI					
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm					
Source Status <sup>2</sup>		NS					
Date Installed/Modified/Removed <sup>3</sup>		June 2016					
Engine Manufactured/Reconstruction Date <sup>4</sup>		TBD					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No					
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	RB4S					
	APCD Type <sup>7</sup>	NSCR					
	Fuel Type <sup>8</sup>	PQ					
	H <sub>2</sub> S (gr/100 scf)	0					
	Operating bhp/rpm	1674 bhp/1200 rpm					
	BSFC (Btu/bhp-hr)	8,267					
	Fuel throughput (ft <sup>3</sup> /hr)	11,820					
	Fuel throughput (MMft <sup>3</sup> /yr)	103.54					
	Operation (hrs/yr)	8,760					
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO <sub>x</sub>	1.27	5.56				
MD	CO	1.18	5.15				
MD	VOC	0.28	1.22				
AP	SO <sub>2</sub>	0.0082	0.036				
AP	PM <sub>10</sub>	0.27	1.18				
MD	Formaldehyde	0.019	0.081				
MD	CO <sub>2e</sub>	1,996	8,744				

1. Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. If more than three (3) engines exist, please use additional sheets.

2. Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Removal of Source

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

4. Enter the date that the engine was manufactured, modified or reconstructed.
5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

**Provide a manufacturer's data sheet for all engines being registered.**

6. Enter the Engine Type designation(s) using the following codes:
- |      |                       |      |                       |
|------|-----------------------|------|-----------------------|
| LB2S | Lean Burn Two Stroke  | RB4S | Rich Burn Four Stroke |
| LB4S | Lean Burn Four Stroke |      |                       |
7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:
- |      |   |      |   |
|------|---|------|---|
| A/F  | Air/Fuel Ratio                                | IR   | Ignition Retard                           |
| HEIS | High Energy Ignition System                   | SIPC | Screw-in Precombustion Chambers           |
| PSC  | Prestratified Charge                          | LEC  | Low Emission Combustion                   |
| NSCR | Rich Burn & Non-Selective Catalytic Reduction | SCR  | Lean Burn & Selective Catalytic Reduction |
8. Enter the Fuel Type using the following codes:
- |    |                              |    |                 |
|----|------------------------------|----|-----------------|
| PQ | Pipeline Quality Natural Gas | RG | Raw Natural Gas |
|----|------------------------------|----|-----------------|
9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.
- |    |                     |    |             |               |
|----|---------------------|----|-------------|---------------|
| MD | Manufacturer's Data | AP | AP-42       |               |
| GR | GRI-HAPCalc™        | OT | Other _____ | (please list) |
10. Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.



## Underwood Compressor Station - Tyler County, West Virginia

## VHP - L7044GSI

Gas Compression

ENGINE SPEED (rpm):	1200	NOx SELECTION (g/bhp-hr):	Customer Catalyst
DISPLACEMENT (in3):	7040	COOLING SYSTEM:	JW, IC + OC
COMPRESSION RATIO:	8:1	INTERCOOLER WATER INLET (°F):	130
IGNITION SYSTEM:	ESM	JACKET WATER OUTLET (°F):	180
EXHAUST MANIFOLD:	Water Cooled	JACKET WATER CAPACITY (gal):	100
COMBUSTION:	Rich Burn, Turbocharged	AUXILIARY WATER CAPACITY (gal):	11
ENGINE DRY WEIGHT (lbs):	24250	LUBE OIL CAPACITY (gal):	190
AIR/FUEL RATIO SETTING:	0.38% CO	MAX. EXHAUST BACKPRESSURE (in. H <sub>2</sub> O):	18
ENGINE SOUND LEVEL (dBA)	104	MAX. AIR INLET RESTRICTION (in. H <sub>2</sub> O):	15
		EXHAUST SOUND LEVEL (dBA)	111

**SITE CONDITIONS:**

FUEL:	Commercial Quality Natural Gas	ALTITUDE (ft):	980
FUEL PRESSURE RANGE (psig):	30 - 60	MAXIMUM INLET AIR TEMPERATURE (°F):	100
FUEL HHV (BTU/ft <sup>3</sup> ):	1,295.7	FUEL WKI:	58.9
FUEL LHV (BTU/ft <sup>3</sup> ):	1,171.3		

**SITE SPECIFIC TECHNICAL DATA**

POWER RATING	UNITS	MAX RATING AT 100 °F AIR TEMP	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE OF 100 °F		
			100%	75%	50%
CONTINUOUS ENGINE POWER	BHP	1674	1674	1260	843
OVERLOAD	% 2/24 hr	0	0	-	-
MECHANICAL EFFICIENCY (LHV)	%	30.8	30.8	29.3	28.6
CONTINUOUS POWER AT FLYWHEEL	BHP	1674	1674	1260	843
<i>based on no auxiliary engine driven equipment</i>					

**FUEL CONSUMPTION**

FUEL CONSUMPTION (LHV)	BTU/BHP-hr	8267	8267	8686	8896
FUEL CONSUMPTION (HHV)	BTU/BHP-hr	9145	9145	9609	9841
FUEL FLOW	SCFM	197	197	156	107

*based on fuel analysis LHV***HEAT REJECTION**

JACKET WATER (JW)	BTU/hr x 1000	4131	4131	3428	2505
LUBE OIL (OC)	BTU/hr x 1000	570	570	521	430
INTERCOOLER (IC)	BTU/hr x 1000	266	266	185	92
EXHAUST	BTU/hr x 1000	4173	4173	3160	1928
RADIATION	BTU/hr x 1000	705	705	655	543

**EMISSIONS (ENGINE OUT):**

NOx (NO + NO <sub>2</sub> )	g/bhp-hr	13.7	13.7	14.9	16.5
CO	g/bhp-hr	12.7	12.7	12.7	11.4
THC	g/bhp-hr	2.3	2.3	2.3	2.3
NMHC	g/bhp-hr	0.98	0.98	0.94	0.76
NM, NEHC	g/bhp-hr	0.47	0.47	0.45	0.37
CO <sub>2</sub>	g/bhp-hr	529	529	556	569
CO <sub>2e</sub>	g/bhp-hr	561	561	587	594
CH <sub>2</sub> O	g/bhp-hr	0.05	0.05	0.05	0.05
CH <sub>4</sub>	g/bhp-hr	1.30	1.30	1.25	1.01

**AIR INTAKE / EXHAUST GAS**

INDUCTION AIR FLOW	SCFM	2534	2534	2004	1373
EXHAUST GAS MASS FLOW	lb/hr	11782	11782	9320	6384
EXHAUST GAS FLOW	ACFM	8813	8813	6797	4358
EXHAUST TEMPERATURE	°F	1223	1223	1181	1076

*at exhaust temp, 14.5 psia***HEAT EXCHANGER SIZING**

TOTAL JACKET WATER CIRCUIT (JW)	BTU/hr x 1000	4685
TOTAL AUXILIARY WATER CIRCUIT (IC + OC)	BTU/hr x 1000	947

**COOLING SYSTEM WITH ENGINE MOUNTED WATER PUMPS**

JACKET WATER PUMP MIN. DESIGN FLOW	GPM	450
JACKET WATER PUMP MAX. EXTERNAL RESTRICTION	psig	16
AUX WATER PUMP MIN. DESIGN FLOW	GPM	79
AUX WATER PUMP MAX. EXTERNAL RESTRICTION	psig	44



## Underwood Compressor Station - Tyler County, West Virginia

## VHP - L7044GSI

Gas Compression

## FUEL COMPOSITION

## HYDROCARBONS:

		Mole or Volume %
Methane	CH4	75.469
Ethane	C2H6	15.543
Propane	C3H8	5.177
Iso-Butane	I-C4H10	0.676
Normal Butane	N-C4H10	1.475
Iso-Pentane	I-C5H12	0.348
Normal Pentane	N-C5H12	0.358
Hexane	C6H14	0.415
Heptane	C7H16	0
Ethene	C2H4	0
Propene	C3H6	0

SUM HYDROCARBONS 99.461

## NON-HYDROCARBONS:

Nitrogen	N2	0.363
Oxygen	O2	0
Helium	He	0
Carbon Dioxide	CO2	0.162
Carbon Monoxide	CO	0
Hydrogen	H2	0
Water Vapor	H2O	0

TOTAL FUEL 99.986

FUEL: Commercial Quality Natural Gas

FUEL PRESSURE RANGE (psig): 30 - 60

FUEL WKI: 58.9

FUEL SLHV (BTU/ft3): 1150.92

FUEL SLHV (MJ/Nm3): 45.26

FUEL LHV (BTU/ft3): 1171.30

FUEL LHV (MJ/Nm3): 46.06

FUEL HHV (BTU/ft3): 1295.69

FUEL HHV (MJ/Nm3): 50.95

FUEL DENSITY (SG): 0.74

Standard Conditions per ASTM D3588-91 [60°F and 14.696psia] and ISO 6976:1996-02-01[25, V(0;101.325)].

Based on the fuel composition, supply pressure and temperature, liquid hydrocarbons may be present in the fuel. No liquid hydrocarbons are allowed in the fuel. The fuel must not contain any liquid water.

Waukesha recommends both of the following:

1) Dew point of the fuel gas to be at least 20°F (11°C) below the measured temperature of the gas at the inlet of the engine fuel regulator.

2) A fuel filter separator to be used on all fuels except commercial quality natural gas.

Refer to the 'Fuel and Lubrication' section of 'Technical Data' or contact the Waukesha Application Engineering Department for additional information on fuels, or LHV and WKI\* calculations.

\* Trademark of General Electric Company

## FUEL CONTAMINANTS

Total Sulfur Compounds	0	% volume
Total Halogen as Chloride	0	% volume
Total Ammonia	0	% volume

Total Sulfur Compounds 0 µg/BTU

Total Halogen as Chloride 0 µg/BTU

Total Ammonia 0 µg/BTU

## Siloxanes

Tetramethyl silane	0	% volume
Trimethyl silanol	0	% volume
Hexamethyldisiloxane (L2)	0	% volume
Hexamethylcyclotrisiloxane (D3)	0	% volume
Octamethyltrisiloxane (L3)	0	% volume
Octamethylcyclotetrasiloxane (D4)	0	% volume
Decamethyltetrasiloxane (L4)	0	% volume
Decamethylcyclopentasiloxane (D5)	0	% volume
Dodecamethylpentasiloxane (L5)	0	% volume
Dodecamethylcyclohexasiloxane (D6)	0	% volume
Others	0	% volume

Total Siloxanes (as Si) 0 µg/BTU

Calculated fuel contaminant analysis will depend on the entered fuel composition and selected engine model.

No water or hydrocarbon condensates are allowed in the engine. Requires liquids removal.



## Underwood Compressor Station - Tyler County, West Virginia

## VHP - L7044GSI

Gas Compression

**NOTES**

1. All data is based on engines with standard configurations unless noted otherwise.
2. Power rating is adjusted for fuel, site altitude, and site air inlet temperature, in accordance with ISO 3046/1 with tolerance of  $\pm 3\%$ .
3. Fuel consumption is presented in accordance with ISO 3046/1 with a tolerance of  $-0 / +5\%$  at maximum rating. Fuel flow calculation based on fuel LHV and fuel consumption with a tolerance of  $-0/+5\%$ . For sizing piping and fuel equipment, it is recommended to include the 5% tolerance.
4. Heat rejection tolerances are  $\pm 30\%$  for radiation, and  $\pm 8\%$  for jacket water, lube oil, intercooler, and exhaust energy.
5. Emission levels for engines with GE supplied 3-way catalyst are given at catalyst outlet flange. For all other engine models, emission levels are given at engine exhaust outlet flange prior to any after treatment. Values are based on a new engine operating at indicated site conditions, and adjusted to the specified timing and air/fuel ratio at rated load. Catalyst out emission levels represent emission levels the catalyst is sized to achieve. Manual adjustment may be necessary to achieve compliance as catalyst/engine age. Catalyst-out emission levels are valid for the duration of the engine warranty. Emissions are at an absolute humidity of 75 grains H<sub>2</sub>O/lb (10.71 g H<sub>2</sub>O/kg) of dry air. Emission levels may vary subject to instrumentation, measurement, ambient conditions, fuel quality, and engine variation. Engine may require adjustment on-site to meet emission values, which may affect engine performance and heat output. NO<sub>x</sub>, CO, THC, and NMHC emission levels are listed as a not to exceed limit, all other emission levels are estimated. CO<sub>2</sub> emissions based on EPA Federal Register/Vol. 74, No. 209/Friday, October 30, 2009 Rules and Regulations 56398, 56399 (3) Tier 3 Calculation Methodology, Equation C-5.
6. Air flow is based on undried air with a tolerance of  $\pm 7\%$ .
7. Exhaust temperature given at engine exhaust outlet flange with a tolerance of  $\pm 75^{\circ}\text{F}$  ( $42^{\circ}\text{C}$ ).
8. Exhaust gas mass flow value is based on a "wet basis" with a tolerance of  $\pm 7\%$ .
9. Inlet air restrictions based on full rated engine load. Exhaust backpressure based on 158 PSI BMEP and 1200 RPM. Refer to the engine specification section of Waukesha's standard technical data for more information.
10. Cooling circuit capacity, lube oil capacity, and engine dry weight values are typical.
11. Fuel must conform to Waukesha's "Gaseous Fuel Specification" S7884-7 or most current version. Fuel may require treatment to meet current fuel specification.
12. Heat exchanger sizing values given as the maximum heat rejection of the circuit, with applied tolerances and an additional 5% reserve factor.
13. Fuel volume flow calculation in english units is based on 100% relative humidity of the fuel gas at standard conditions of 60°F and 14.696 psia (29.92 inches of mercury; 101.325 kPa).
14. Fuel volume flow calculation in metric units is based on 100% relative humidity of the fuel gas at a combustion temperature of 25°C and metering conditions of 0°C and 101.325 kPa (14.696 psia; 29.92 inches of mercury). This is expressed as  $[25, V(0;101.325)]$ .
15. Engine sound data taken with the microphone at 1 m (3.3 ft) from the side of the engine at the approximate front-to-back centerline. Microphone height was at intake manifold level. Engine sound pressure data may be different at front, back and opposite side locations. Exhaust sound data taken with microphone 1 meter (3.3 ft) away and 1 meter (3.3 ft) to the side of the exhaust outlet.
16. Due to variation between test conditions and final site conditions, such as exhaust configuration and background sound level, sound pressure levels under site conditions may be different than those tabulated above.
17. Cooling system design flow is based on minimum allowable cooling system flow. Cooling system maximum external restriction is defined as the allowable restriction at the minimum cooling system flow.
18. Continuous Power Rating: The highest load and speed that can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance at indicated ambient reference conditions and fuel. No engine overload power rating is available.
19. emPact emission compliance available for entire range of operable fuels; however, fuel system and/or O<sub>2</sub> set point may need to be adjusted in order to maintain compliance.
20. In cold ambient temperatures, heating of the engine jacket water, lube oil and combustion air may be required. See Waukesha Technical Data.

**SPECIAL REQUIREMENTS**



## Dehydrators

**West Virginia Department of Environmental Protection**

DIVISION OF AIR QUALITY : (304) 926-0475

**Division of Air Quality**

WEB PAGE: <http://www.wvdep.org>

**40 CFR Part 63; Subpart HH & HHH Registration Form**

*Complete this form for any oil and natural gas production or natural gas transmission and storage facility that uses an affected unit under HH/HHH, whether subject or not.*

<b>Section A: Facility Description</b>			
Affected facility actual annual average natural gas throughput (scf/day):		176,000,000	
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):		195	
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.		<input checked="" type="radio"/> Yes	No
The affected facility processes, upgrades, or stores natural gas prior to the point at which natural gas (NG) enters the NG transmission and storage source category or is delivered to the end user.		<input checked="" type="radio"/> Yes	No
The affected facility is: <input checked="" type="checkbox"/> prior to a NG processing plant <input type="checkbox"/> a NG processing plant <input type="checkbox"/> prior to the point of custody transfer and there is no NG processing plant			
The affected facility transports or stores natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company).		<input checked="" type="radio"/> Yes	No
The affected facility exclusively processes, stores, or transfers black oil.		Yes	<input checked="" type="radio"/> No
Initial producing gas-to-oil ratio (GOR): _____ scf/bbl      API gravity: _____ degrees			
<b>Section B: Dehydration Unit (if applicable) <sup>1</sup></b>			
Description: Underwood Compressor Station Dehydrators (SV-3110 & SV-3210; FT-3110 & FT-3210; R-3110 & R-3210)			
Date of Installation:	June 2016	Annual Operating Hours:	8,760
Exhaust Stack Height (ft):	TBD	Stack Diameter (ft):	TBD
Glycol Type:	<input checked="" type="checkbox"/> TEG	<input type="checkbox"/> EG	<input type="checkbox"/> Other:
Glycol Pump Type:	<input type="checkbox"/> Electric	<input checked="" type="checkbox"/> Gas	If gas, what is the volume ratio? <u>0.032</u> ACFM/gpm
Condenser installed?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Exit Temp. <u>200</u> °F      Condenser Pressure <u>0</u> psig
Incinerator/flare installed?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	Destruction Eff. <u>98</u> %
Other controls installed?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	Describe:
Wet Gas <sup>2</sup> : (Upstream of Contact Tower)	Gas Temp.: <u>120</u> °F	Gas Pressure <u>1,100</u> psig	Saturated Gas? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No      If no, water content _____ lb/MMSCF
Dry Gas: (Downstream of Contact Tower)	Gas Flowrate(MMSCFD)	Actual _____	Design <u>88</u> each _____
Lean Glycol:	Circulation rate (gpm)	Actual <sup>3</sup> <u>TBD</u>	Maximum <sup>4</sup> <u>7.9</u>
Glycol Flash Tank (if applicable):	Temp.: <u>80</u> °F	Pressure <u>5</u> psig	Pump make/model: Kimray 45015PV
		Vented? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If no, describe vapor control: Vent gas used in reboiler as fuel and as a backup would go to the VRU system via the storage tanks
Stripping Gas (if applicable):	Source of gas: Dry gas, if used	Rate <u>9</u> scfm	

**Please attach the following required dehydration unit information:**

1. System map indicating the chain of custody information. See Page 43 of this document for an example of a gas flow schematic. It is not intended that the applicant provide this level of detail for all sources. The level of detail that is necessary is to establish where the custody transfer points are located. This can be accomplished by submitting a process flow diagram indicating custody transfer points and the natural gas flow. However, the DAQ reserves the right to request more detailed information in order to make the necessary decisions.
2. Extended gas analysis from the Wet Gas Stream including mole percents of C<sub>1</sub>-C<sub>8</sub>, benzene, ethylbenzene, toluene, xylene and n-Hexane, using Gas Processors Association (GPA) 2286 (or similar). A sample should be taken from the inlet gas line, downstream from any inlet separator, and using a manifold to remove entrained liquids from the sample and a probe to collect the sample from the center of the gas line. GPA standard 2166 reference method or a modified version of EPA Method TO-14, (or similar) should be used.
3. GRI-GLYCalc Ver. 3.0 aggregate report based on maximum Lean Glycol circulation rate and maximum throughput.
4. Detailed calculations of gas or hydrocarbon flow rate.

**Section C: Facility NESHAPS Subpart HH/HHH status**

Affected facility status: (choose only one)	<input checked="" type="checkbox"/>	Subject to Subpart HH - applies, but is exempt through < 1 tpy benzene exemption
	<input type="checkbox"/>	Subject to Subpart HHH
	<input checked="" type="checkbox"/>	Not Subject
	because:	<div><div><input checked="" type="checkbox"/> &lt; 10/25 TPY</div><div><input type="checkbox"/> Affected facility exclusively handles black oil</div><div><input type="checkbox"/> The facility wide actual annual average NG throughput is &lt; 650 thousand scf/day and facility wide actual annual average hydrocarbon liquid is &lt; 250 bpd</div><div><input type="checkbox"/> No affected source is present</div></div>

## NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		TBD	
		Max Dry Gas Flow Rate (MMscf/day)		88	
		Design Heat Input (MMBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status <sup>2</sup>		MS	
		Date Installed/Modified/Removed <sup>3</sup>		June 2016	
		Regenerator Still Vent APCD <sup>4</sup>		FL	
		Fuel HV (Btu/scf)		1,174	
		H <sub>2</sub> S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID # <sup>1</sup>	Vent	Reference <sup>5</sup>	Potential Emissions <sup>6</sup>	lbs/hr	tons/yr
15E	Reboiler Vent	AP	NO <sub>x</sub>	0.18	0.81
		AP	CO	0.15	0.68
		AP	VOC	0.010	0.044
		AP	SO <sub>2</sub>	0.0011	0.0048
		AP	PM <sub>10</sub>	0.014	0.061
13E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.32	1.39
		GRI-GLYCalc™	Benzene	0.0053	0.023
		GRI-GLYCalc™	Ethylbenzene	0.021	0.090
		GRI-GLYCalc™	Toluene	0.023	0.10
		GRI-GLYCalc™	Xylenes	0.089	0.39
		GRI-GLYCalc™	n-Hexane	0.0048	0.021
14E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	0.65	2.83
		GRI-GLYCalc™	Benzene	0.0004	0.0019
		GRI-GLYCalc™	Ethylbenzene	0.0005	0.0022
		GRI-GLYCalc™	Toluene	0.0011	0.0049
		GRI-GLYCalc™	Xylenes	0.0014	0.0061
		GRI-GLYCalc™	n-Hexane	0.010	0.044

General Glycol Dehydration Unit Data		Manufacturer and Model		TBD	
		Max Dry Gas Flow Rate (mmscf/day)		88	
		Design Heat Input (mmBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status <sup>2</sup>		MS	
		Date Installed/Modified/Removed <sup>3</sup>		June 2016	
		Regenerator Still Vent APCD <sup>4</sup>		FL	
		Fuel HV (Btu/scf)		1,174	
		H <sub>2</sub> S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8,760	
Source ID # <sup>1</sup>	Vent	Reference <sup>5</sup>	Potential Emissions <sup>6</sup>	lbs/hr	tons/yr
18E	Reboiler Vent	AP	NO <sub>x</sub>	0.18	0.81
		AP	CO	0.15	0.68
		AP	VOC	0.010	0.044
		AP	SO <sub>2</sub>	0.0011	0.0048
		AP	PM <sub>10</sub>	0.014	0.061
16E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.32	1.39
		GRI-GLYCalc™	Benzene	0.0053	0.023
		GRI-GLYCalc™	Ethylbenzene	0.021	0.090
		GRI-GLYCalc™	Toluene	0.023	0.10
		GRI-GLYCalc™	Xylenes	0.089	0.39
		GRI-GLYCalc™	n-Hexane	0.0048	0.021
17E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	0.65	2.83
		GRI-GLYCalc™	Benzene	0.0004	0.0019
		GRI-GLYCalc™	Ethylbenzene	0.0005	0.0022
		GRI-GLYCalc™	Toluene	0.0011	0.0049
		GRI-GLYCalc™	Xylenes	0.0014	0.0061
		GRI-GLYCalc™	n-Hexane	0.010	0.044

1. Enter the appropriate Source Identification Numbers for the glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent. The glycol dehydration unit Reboiler Vent and glycol Regenerator Still Vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a *Glycol Dehydration Unit Data Sheet* shall be completed for each, using Source Identification #s RBV-2 and RSV-2, RBV-3 and RSV-3, etc.
2. Enter the Source Status using the following codes:

NS Construction of New Source  
MS Modification of Existing Source

ES Existing Source  
RS Removal of Source

3. Enter the date (or anticipated date) of the glycol dehydration unit's installation (construction of source), modification or removal.
4. Enter the Air Pollution Control Device (APCD) type designation using the following codes:

NA	None	CD	Condenser
FL	Flare	CC	Condenser/Combustion Combination
TO	Thermal Oxidizer		
5. Enter the Potential Emissions Data Reference designation using the following codes:

MD	Manufacturer's Data	AP	AP-42
GR	GRI-GLYCalc™	OT	Other _____ (please list)
6. Enter the Reboiler Vent and glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalc™ (Radian International LLC & Gas Research Institute). Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc *Aggregate Calculations Report* to this *Glycol Dehydration Unit Data Sheet(s)*. This PTE data shall be incorporated in the *Emissions Summary Sheet*.

**Include a copy of the GRI-GLYCalc™ analysis. This includes a printout of the aggregate calculations report, which shall include emissions reports, equipment reports, and stream reports.**

**\*An explanation of input parameters and examples, when using GRI-GLYCalc™ is available on our website.**

## **Bulk Loading and Fugitives**

# Attachment L

## EMISSIONS UNIT DATA SHEET

### CHEMICAL PROCESS

For chemical processes please fill out this sheet and all supplementary forms (see below) that apply. Please check all supplementary forms that have been completed.

- ☐ *Emergency Vent Summary Sheet*  
☒ *Leak Sources Data Sheet*  
☐ *Toxicology Data Sheet*  
☐ *Reactor Data Sheet*  
☐ *Distillation Column Data Sheet*

1. Chemical process area name and equipment ID number (as shown in *Equipment List Form*)  
Piping for Entire Facility. Piping not contained in equipment form.

2. Standard Industrial Classification Codes (SICs) for process(es)  
4923

3. List raw materials and ☐ attach MSDSs  
Wet Natural Gas

4. List Products and Maximum Production and ☐ attach MSDSs

Description and CAS Number	Maximum Hourly (lb/hr)	Maximum Annual (ton/year)
Dry Natural Gas	7.33 MMscf/hour	64,240 MMscf/year
Condensate	6.25 barrels/hour	54,750 barrels/year
Produced Water	1.875 barrels/hour	16,425 barrels/year

5. Complete the *Emergency Vent Summary Sheet* for all emergency relief devices.

6. Complete the *Leak Source Data Sheet* and describe below or attach to application the leak detection or maintenance program to minimize fugitive emissions. Include detection instruments, calibration gases or methods, planned inspection frequency, and record-keeping, and similar pertinent information. If subject to a rule requirement (e.g. 40CFR60, Subpart VV), please list those here.

Leak Detection Plan yet to be determined. Not subject to any federal regulations.

7. Clearly describe below or attach to application Accident Procedures to be followed in the event of an accidental spill or release.

TBD – Will reference Spill Prevention, Control and Countermeasure (SPCC) plan once developed and approved.



<p>8A. Complete the <i>Toxicology Data Sheet</i> or attach to application a toxicology report (an up-to-date material safety data sheets (MSDS) may be used) outlining the currently known acute and chronic health effects of each compound or chemical entity emitted to the air. If these compounds have already been listed in Item 3, then a duplicate MSDS sheet is not required. Include data such as the OSHA time weighted average (TWA) or mutagenicity, teratogenicity, irritation, and other known or suspected effects should be addressed. Indicate where these are unknown, and provide references.</p> <p>8B. Describe any health effects testing or epidemiological studies on these compounds that are being or may be conducted by the company or required under TSCA, RCRA or other federal regulations. Discuss the persistence in the environment of any emission (e.g. pesticides, etc.).</p>							
<p>9. <b>Waste Products</b> - Waste products status: (If source is subject to RCRA or 45CSR25, please contact the Hazardous Waste Section of WVDEP, OAQ at (304) 926-3647.)</p>							
<p>9A. Types and amounts of wastes to be disposed:</p>							
<p>9B. Method of disposal and location of waste disposal facilities:  Carrier: _____ Phone: _____</p>							
<p>9C. Check here if approved USEPA/State Hazardous Waste Landfill will be used <input type="checkbox"/></p>							
<p>10. Maximum and Projected Typical Operating Schedule for process or project as a whole (circle appropriate units).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 5px;">circle units:</td> <td style="width: 25%; padding: 5px;">(hrs/day) (hr/batch)</td> <td style="width: 25%; padding: 5px;">(days), (batches/day), (batches/week)</td> <td style="width: 35%; padding: 5px;">(days/yr), (weeks/year)</td> </tr> </table>				circle units:	(hrs/day) (hr/batch)	(days), (batches/day), (batches/week)	(days/yr), (weeks/year)
circle units:	(hrs/day) (hr/batch)	(days), (batches/day), (batches/week)	(days/yr), (weeks/year)				
10A. Maximum	24	7	52				
10B. Typical	24	7	52				
<p>11. Complete a <i>Reactor Data Sheet</i> for each reactor in this chemical process.</p>							
<p>12. Complete a <i>Distillation Column Data Sheet</i> for each distillation column in this chemical process.</p>							
<p><b>13. Proposed Monitoring, Recordkeeping, Reporting, and Testing</b>  Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px; vertical-align: top;"> <p>MONITORING</p> <p>see Attachment O</p> </td> <td style="width: 50%; padding: 5px; vertical-align: top;"> <p>RECORDKEEPING</p> <p>see Attachment O</p> </td> </tr> <tr> <td style="padding: 5px; vertical-align: top;"> <p>REPORTING</p> <p>see Attachment O</p> </td> <td style="padding: 5px; vertical-align: top;"> <p>TESTING</p> <p>see Attachment O</p> </td> </tr> </table> <p><b>MONITORING.</b> Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation or air pollution control device.</p> <p><b>RECORDKEEPING.</b> Please describe the proposed recordkeeping that will accompany the monitoring.</p> <p><b>REPORTING.</b> Please describe the proposed frequency of reporting of the recordkeeping.</p> <p><b>TESTING.</b> Please describe any proposed emissions testing for this process equipment or air pollution control device.</p>				<p>MONITORING</p> <p>see Attachment O</p>	<p>RECORDKEEPING</p> <p>see Attachment O</p>	<p>REPORTING</p> <p>see Attachment O</p>	<p>TESTING</p> <p>see Attachment O</p>
<p>MONITORING</p> <p>see Attachment O</p>	<p>RECORDKEEPING</p> <p>see Attachment O</p>						
<p>REPORTING</p> <p>see Attachment O</p>	<p>TESTING</p> <p>see Attachment O</p>						
<p>14. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty</p>							

## LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components <sup>1</sup>	Number of Components Monitored by Frequency <sup>2</sup>	Average Time to Repair (days) <sup>3</sup>	Estimated Annual Emission Rate (lb/yr) <sup>4</sup>
Pumps <sup>5</sup>	light liquid VOC <sup>6,7</sup>				
	heavy liquid VOC <sup>8</sup>				
	Non-VOC <sup>9</sup>				
Valves <sup>10</sup>	Gas VOC	250	TBD	1	4,576 – EE
	Light Liquid VOC	42	TBD	1	1,486 – EE
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves <sup>11</sup>	Gas VOC				
	Non VOC				
Open-ended Lines <sup>12</sup>	VOC				
	Non-VOC				
Sampling Connections <sup>13</sup>	VOC				
	Non-VOC				
Compressors	VOC	39	TBD	1	1,396 – EE
	Non-VOC				
Flanges	Gas VOC	836	TBD	1	1,326 – EE
	Light Liquid VOC	175	TBD	1	272 – EE
	Non-VOC				
Other	VOC				
	Non-VOC				

<sup>1</sup> - <sup>13</sup> See notes on the following page.

**Attachment L**  
**EMISSIONS UNIT DATA SHEET**  
**GENERAL**

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): Fugitive so no number assigned

1. Name or type and model of proposed affected source:

Fugitive emissions from venting episodes such as plant shutdowns and compressor start ups/shut downs.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

4. Name(s) and maximum amount of proposed material(s) produced per hour:

- compressor blowdown - 0.059 tons VOC per event, 3.99 tons CO<sub>2</sub>e per event
- compressor startup - 0.006 tons VOC per event, 0.42 tons CO<sub>2</sub>e per event
- plant shutdown - 0.59 tons VOC per event, 39.88 tons CO<sub>2</sub>e per event
- pigging venting - 0.006 tons VOC per event, 0.40 tons CO<sub>2</sub>e per event

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

none

\* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable): (a) Type and amount in appropriate units of fuel(s) to be burned:					
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:					
(c) Theoretical combustion air requirement (ACF/unit of fuel):					
@		°F and		psia.	
(d) Percent excess air:					
(e) Type and BTU/hr of burners and all other firing equipment planned to be used:					
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:					
(g) Proposed maximum design heat input:					$\times 10^6$ BTU/hr.
7. Projected operating schedule:					
Hours/Day	not a regular schedule	Days/Week	not a regular schedule	Weeks/Year	not a regular schedule

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:		
@	venting events are uncontrolled	°F and psia
a. NO <sub>x</sub>	lb/hr	grains/ACF
b. SO <sub>2</sub>	lb/hr	grains/ACF
c. CO	lb/hr	grains/ACF
d. PM <sub>10</sub>	lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	variable based on event lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing  
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

**MONITORING**  
see Attachment O

**RECORDKEEPING**  
see Attachment O

**REPORTING**  
see Attachment O

**TESTING**  
see Attachment O

**MONITORING.** PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

**RECORDKEEPING.** PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

**REPORTING.** PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

**TESTING.** PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty  
N/A

**Attachment M.**  
**Air Pollution Control Device Sheets**

## **NSCR Catalysts**



**Attachment M**  
**Air Pollution Control Device Sheet**  
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): 1C – 11C, 15C, & 16C

**Equipment Information**

1. Manufacturer: EMIT Technologies Model No. RT-3615-T	2. Control Device Name: 1C – 11C, 15C & 16C – Catalysts for C-2100 through C-2220 Type: NSCR Catalyst
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected: N/A – no capture of pollutants	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume:                      8,813                      ACFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. N/A	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse or disposal. Replace Catalyst elements when necessary	

**Gas Stream Characteristics**

14. Are halogenated organics present? Are particulates present? Are metals present?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Yes <input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> No <input checked="" type="checkbox"/> No
15. Inlet Emission stream parameters:	<b>Maximum</b>	<b>Typical</b>
Pressure (mmHg):	Not specified	
Heat Content (BTU/scf):	1,400	1,175
Oxygen Content (%):	Not specified	
Moisture Content (%):	Not specified	
Relative Humidity (%):	Not specified	

16. Type of pollutant(s) controlled:		<input type="checkbox"/> SO <sub>x</sub>	<input type="checkbox"/> Odor			
<input type="checkbox"/> Particulate (type):		<input checked="" type="checkbox"/> Other NO <sub>x</sub> , CO, VOC, HCHO, CH <sub>4</sub>				
17. Inlet gas velocity:		155	ft/sec			
19. Gas flow into the collector:		20. Gas stream temperature:				
8,813 ACF @ 1,223°F and PSIA		Inlet: 1,223 °F				
		Outlet: 1,223 °F				
21. Gas flow rate:		22. Particulate Grain Loading in grains/scf: N/A				
Design Maximum: 8,813 ACFM		Inlet:				
Average Expected: TBD ACFM		Outlet:				
23. Emission rate of each pollutant (specify) into and out of collector:						
Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A NO <sub>x</sub>	50.74		--	1.27		97.5
B CO	47.04		--	1.18		97.5
C VOC	1.74		--	0.28		84
D HCHO	0.19		--	0.019		90
E CH <sub>4</sub>	4.81		--	1.44		70
24. Dimensions of stack:		Height TBD	ft.	Diameter	1.10	ft.
25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.						

## Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	Weight % for Size Range	Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification): None

28. Describe the collection material disposal system: Catalyst elements can be cleaned and/or replaced; materials are not disposed on site.

29. Have you included **Other Collectores Control Device** in the Emissions Points Data Summary Sheet? yes

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

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

MONITORING: **see Attachment O**

RECORDKEEPING: **see Attachment O**

REPORTING: **see Attachment O**

TESTING: **see Attachment O**

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

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

REPORTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.

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

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

NOx: 97.5%, CO: 97.5%, VOC: 84%, HCHO: 90%, CH4: 70%.

Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies listed above are typical based on expected operating conditions. The emission factors shown on the catalyst specification sheet are not site specific, so those will vary; however the percent control efficiencies will be the same.

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. Inlet temperature range is 750 F – 1250 F. Engine must be operated between 50 – 100 % load. A/F ratio controller must be set properly with fuel heating value of around 1400 Btu/scf. Engine lube oil shall contain less than 0.5 wt% sulfated ash. Catalyst must not be exposed to the following: antimony, arsenic, chromium, copper, iron, lead, lithium, magnesium, mercury, nickel, phosphorous, potassium, silicon, sodium, sulfur, tin, zinc.



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riames@emittechnologies.com

**Prepared For:**  
Clayton Brown  
ANTERO RESOURCES

**QUOTE:** QUO-17302-L3Z6

## INFORMATION PROVIDED BY WAUKESHA

Engine: L7044GSI  
Horsepower: 1680  
RPM: 1200  
Compression Ratio: 8.0  
Exhaust Flow Rate: 8820 CFM  
Exhaust Temperature: 1226 °F  
Reference: N/A  
Fuel: Natural Gas  
Annual Operating Hours: 8760

### Uncontrolled Emissions

	<u>g/bhp-hr</u>	<u>Lb/Hr</u>	<u>Tons/Year</u>
NOx:	13.50	50.00	219.00
CO:	12.50	46.30	202.78
THC:	2.30	8.52	37.31
NMHC	0.90	3.33	14.60
NMNEHC:	0.48	1.78	7.79
HCHO:	0.05	0.19	0.81
O2:	0.30 %		

## POST CATALYST EMISSIONS

	<u>% Reduction</u>
NOx:	>97.5%
CO:	>97.5%
VOC:	>84.0%
HCHO:	>90.0%
CH4:	>70.0%

## CONTROL EQUIPMENT

### Catalyst Element

Model: RT-3615-T  
Catalyst Type: NSCR, Standard Precious Group Metals  
Substrate Type: BRAZED  
Manufacturer: EMIT Technologies, Inc  
Element Quantity: 6  
Element Size: Rectangle 36" x 15" x 3.5"



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## WARRANTY

EMIT Technologies, Inc. warrants that the goods supplied will be free from defects in workmanship by EMIT Technologies, Inc. for a period of two (2) years from date of shipment. EMIT Technologies, Inc. will not be responsible for any defects which result from improper use, neglect, failure to properly maintain or which are attributable to defects, errors or omissions in any drawings, specifications, plans or descriptions, whether written or oral, supplied to EMIT Technologies, Inc. by Buyer.

Catalyst performance using an EMIT Air/Fuel ratio controller is dependent upon properly defined set-points, variable with engine and fuel gas composition. Air/fuel ratio controller performance is guaranteed, but not limited, to fuel gas with a HHV content of 1400 BTU/SCF.

Catalyst performance will be guaranteed for a period of 1 year from installation, or 8760 operating hours, whichever comes first. The catalyst shall be operated with an automatic air/fuel ratio controller. The performance guarantee shall not cover the effects of excessive ash masking due to operation at low load, improper engine maintenance, or inappropriate lubrication oil. The performance guarantee shall not cover the effects of continuous engine misfires (cylinder or ignition) exposing the catalyst to excessive exothermic reaction temperatures. In most cases, excluding thermal deactivation, catalyst performance is redeemable by means of proper washing (refer to EMIT Catalyst/Silencer Housing Manual for element wash information, or contact a local EMIT Sales representative).

The exhaust temperature operating range at the converter inlet is a minimum of 600°F for oxidation catalyst and 750 °F for NSCR catalyst, and a maximum of 1250°F.

If a properly functioning, high temperature shut down switch is not installed, thermal deactivation of catalyst at sustained temperatures above 1250°F is not covered. If excessive exposure to over oxygenation of NSCR catalyst occurs due to improperly functioning or non-existent Air/Fuel ratio control, then deactivation of catalyst is not warranted.

The catalyst conversion efficiencies (% reduction) will be guaranteed for engine loads of 50 to 100 percent. Standard Oxidation Catalyst conversion efficiencies (% reduction) will be guaranteed for fuel gas containing less than 1.5% mole fraction of non-methane, non-ethane hydrocarbons. Applications where fuel gas exceeds this level will require a Premium Oxidation Catalyst to maintain guaranteed VOC conversion efficiencies.

Engine lubrication oil shall contain less than 0.5 wt% Sulfated Ash with a maximum allowable specific oil consumption of 0.7 g/bhp-hr. The catalyst shall be limited to a maximum ash loading of 0.022 lb/ft<sup>3</sup>. Phosphorous and zinc additives are limited to 0.03 wt%. New or Reconstructed engines must operate for a minimum of 50 hours prior to catalyst installation, otherwise the warranty is void.

The catalyst must not be exposed to the following know poisoning agents, including: antimony, arsenic, chromium, copper, iron, lead, lithium, magnesium, mercury, nickel, phosphorous, potassium, silicon, sodium, sulfur, tin, and zinc. Total poison concentrations in the fuel gas must be limited to 0.25 ppm or less for catalyst to function properly.

Shipment - Promised shipping dates are approximate lead times from the point of manufacture and are not guaranteed. EMIT Technologies, Inc. will not be liable for any loss, damage or delay in manufacture or delivery resulting from any cause beyond its control including, but not limited to a period equal to the time lost by reason of that delay. All products will be crated as per best practice to prevent any damage during shipment. Unless otherwise specified, Buyer will pay for any special packing and shipping requirements. Acceptance of goods by common carrier constitutes delivery to Buyer. EMIT Technologies, Inc. shall not be responsible for goods damaged or lost in transit.

Terms: Credit is extended to purchaser for net 30 time period. If payment is not received in the net 30 timeframe, interest on the unpaid balance will accrue at a rate of 1.5% per month from the invoice date.

Order Cancellation Terms: Upon cancellation of an order once submittal of a Purchase Order has occurred, the customer will pay a 25% restocking fee for Catalyst Housings, Catalyst Elements, and Air/Fuel Ratio Controllers; 50% restocking fee for Cooler Top Solutions Exhaust System Accessories, and other Custom Built Products; 100% of all associated shipping costs incurred by EMIT; 100% of all project expenses incurred by EMIT for Field Services.

**Attachment N.**  
**Supporting Emissions Calculations**

## Emission Calculations

## Emissions Summary Total

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia

### UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO <sub>2</sub>		PM-10		HAPs		Formaldehyde		CO <sub>2</sub> e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
<u>Engines</u>															
Compressor Engine 1	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 2	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 3	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 4	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 5	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 6	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 7	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 8	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 9	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 10	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 11	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 12	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
Compressor Engine 13	50.74	222.24	47.04	206.02	1.74	7.62	0.008	0.04	0.27	1.18	0.35	1.54	0.19	0.81	9,113
<u>Turbines</u>															
Microturbine Generator 1	0.24	1.05	0.66	2.89	0.06	0.26	0.02	0.09	0.04	0.18	0.006	0.03	0.004	0.02	3,499
Catalytic Heater for Generator Fuel	0.003	0.01	0.002	0.01	0.0002	0.0007	0.00002	0.00008	0.0002	0.001	0.00006	0.0002	0.000002	0.00001	12
<u>Dehydrators</u>															
TEG Dehydrator Still Vent 1	---	---	---	---	15.90	69.65	---	---	---	---	7.18	31.43	---	---	1,910
TEG Dehydrator Still Vent 2	---	---	---	---	15.90	69.65	---	---	---	---	7.18	31.43	---	---	1,910
TEG Dehydrator Flash Tank 1	---	---	---	---	32.28	141.39	---	---	---	---	0.68	2.96	---	---	5,988
TEG Dehydrator Flash Tank 2	---	---	---	---	32.28	141.39	---	---	---	---	0.68	2.96	---	---	5,988
Reboiler 1	0.18	0.81	0.15	0.68	0.01	0.04	0.001	0.005	0.01	0.06	0.003	0.02	0.0001	0.0006	771
Reboiler 2	0.18	0.81	0.15	0.68	0.01	0.04	0.001	0.005	0.01	0.06	0.003	0.02	0.0001	0.0006	771
<u>Combustors</u>															
Flare and Pilot	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
<u>Hydrocarbon Loading</u>															
Truck Loadout	---	---	---	---	52.65	7.94	---	---	---	---	0.13	0.020	---	---	3
<u>Fugitive Emissions</u>															
Component Leak Emissions	---	---	---	---	1.03	4.53	---	---	---	---	0.02	0.09	---	---	107
Venting Emissions	---	---	---	---	---	11.46	---	---	---	---	---	0.19	---	---	778
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.15	0.67	---	---	---	---	---
<u>Storage Tanks</u>															
Produced Water Tanks	---	---	---	---	0.0002	0.0008	---	---	---	---	6.77E-08	2.97E-07	---	---	0.02
Settler Tank	---	---	---	---	128.90	564.59	---	---	---	---	3.94	17.25	---	---	1,427
Condensate Tanks	---	---	---	---	3.11	13.64	---	---	---	---	0.008	0.03	---	---	4
Total Facility PTE =	660.24	2,891.85	612.45	2,682.54	304.77	1,123.70	0.13	0.57	3.73	16.32	24.36	106.44	2.41	10.56	141,636



# Emissions Summary Total

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia

## CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO <sub>2</sub>		PM-10		HAPs		Formaldehyde		CO <sub>2</sub> e
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	tpy
<u>Engines</u>															
Compressor Engine 1	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 2	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 3	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 4	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 5	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 6	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 7	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 8	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 9	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 10	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 11	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 12	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
Compressor Engine 13	1.27	5.56	1.18	5.15	0.28	1.22	0.008	0.04	0.27	1.18	0.18	0.81	0.02	0.08	8,744
<u>Turbines</u>															
Microturbine Generator 1	0.24	1.05	0.66	2.89	0.06	0.26	0.02	0.09	0.04	0.18	0.006	0.03	0.004	0.02	3,499
Catalytic Heater for Generator Fuel	0.003	0.01	0.002	0.01	0.0002	0.0007	0.00002	0.00008	0.0002	0.001	0.00006	0.0002	0.000002	0.00001	12
<u>Dehydrators</u>															
TEG Dehydrator Still Vent 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Still Vent 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Reboiler 1	0.18	0.81	0.15	0.68	0.66	2.87	0.001	0.005	0.01	0.06	0.02	0.07	0.0001	0.0006	895
Reboiler 2	0.18	0.81	0.15	0.68	0.66	2.87	0.001	0.005	0.01	0.06	0.02	0.07	0.0001	0.0006	895
<u>Combustion</u>															
Flare and Pilot	0.63	2.75	2.86	12.51	0.64	2.79	0.00001	0.00004	0.0001	0.0005	0.29	1.26	---	---	4,822
<u>Hydrocarbon Loading</u>															
Truck Loadout	---	---	---	---	52.65	7.94	---	---	---	---	0.13	0.020	---	---	3
<u>Fugitive Emissions</u>															
Component Leak Emissions	---	---	---	---	1.03	4.53	---	---	---	---	0.02	0.09	---	---	107
Venting Emissions	---	---	---	---	---	11.46	---	---	---	---	---	0.19	---	---	778
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	0.15	0.67	---	---	---	---	---
<u>Storage Tanks</u>															
Produced Water Tanks	---	---	---	---	0.000003	0.00002	---	---	---	---	1.35E-09	5.93E-09	---	---	0.0007
Settler Tank	---	---	---	---	2.58	11.29	---	---	---	---	0.079	0.35	---	---	29
Condensate Tanks	---	---	---	---	0.06	0.27	---	---	---	---	0.0002	0.0007	---	---	0.09
Total Facility PTE =	17.73	77.65	19.11	83.72	61.95	60.15	0.13	0.57	3.73	16.32	2.90	12.60	0.25	1.07	124,711

1. Controlled dehydrator still vent emissions are in the flare and pilot category.
2. Controlled dehydrator flash tank emissions are in the reboiler category.

## HAP Emissions Summary Total

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia

### CONTROLLED POTENTIAL EMISSION SUMMARY

Source	Benzene		Toluene		Ethylbenzene		Xylenes		n-Hexane	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
<b><u>Engines</u></b>										
Compressor Engine 1	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 2	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 3	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 4	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 5	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 6	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 7	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 8	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 9	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 10	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 11	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 12	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
Compressor Engine 13	0.022	0.096	0.0077	0.034	0.00034	0.0015	0.0027	0.012	---	---
<b><u>Turbines</u></b>										
Microturbine Generator 1	7.42E-05	3.25E-04	8.03E-04	3.52E-03	1.98E-04	8.66E-04	3.96E-04	1.73E-03	---	---
Catalytic Heater for Generator Fuel	---	---	---	---	---	---	---	---	---	---
<b><u>Dehydrators</u></b>										
TEG Dehydrator Still Vent 1	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Still Vent 2	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 1	---	---	---	---	---	---	---	---	---	---
TEG Dehydrator Flash Tank 2	---	---	---	---	---	---	---	---	---	---
Reboiler 1	0.0004	0.0019	0.0011	0.005	0.0005	0.0022	0.0014	0.006	0.010	0.04
Reboiler 2	0.0004	0.0019	0.0011	0.005	0.0005	0.0022	0.0014	0.006	0.010	0.04
<b><u>Combustion</u></b>										
Flare and Pilot	0.011	0.046	0.047	0.21	0.041	0.18	0.18	0.78	0.010	0.042
<b><u>Hydrocarbon Loading</u></b>										
Truck Loadout	0.0015	0.00023	0.0067	0.0010	0.0046	0.00070	0.012	0.0018	0.10	0.016
<b><u>Fugitive Emissions</u></b>										
Component Leak Emissions	0.00027	0.0012	0.00082	0.0036	0.00055	0.0024	0.0016	0.0071	0.017	0.073
Venting Emissions	---	0.0024	---	0.0085	---	0.0066	---	0.020	---	0.15
Haul Road Dust Emissions	---	---	---	---	---	---	---	---	---	---
<b><u>Storage Tanks</u></b>										
Produced Water Tanks	5.02E-10	2.20E-09	4.89E-10	2.14E-09	1.04E-10	4.55E-10	2.22E-10	9.73E-10	3.82E-11	1.67E-10
Settler Tank	1.22E-03	5.35E-03	2.49E-03	1.09E-02	8.91E-04	3.90E-03	2.15E-03	9.40E-03	7.20E-02	3.15E-01
Condensate Tanks	1.74E-06	7.64E-06	7.92E-06	3.47E-05	5.50E-06	2.41E-05	1.43E-05	6.27E-05	1.25E-04	5.48E-04
<b>Total Facility PTE =</b>	<b>0.30</b>	<b>1.31</b>	<b>0.16</b>	<b>0.68</b>	<b>0.05</b>	<b>0.22</b>	<b>0.23</b>	<b>0.99</b>	<b>0.22</b>	<b>0.68</b>

1. Controlled dehydrator still vent emissions are in the flare and pilot category.
2. Controlled dehydrator flash tank emissions are in the reboiler category.

# Compressor Engine Emission Calculations

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Compressor Engines

## Source Information-Per Engine

Emission Unit ID:	C-2100 to C-2220
Engine Make/Model	Waukesha L7044 GSI
Service	Compression
Controls - Y or N / Type	Y NSCR/AFRC
Site Horsepower Rating <sup>1</sup>	1,680 hp
Fuel Consumption (BSFC) <sup>1</sup>	8.267 Btu/(hp-hr)
Heat Rating <sup>2</sup>	13.89 MMBtu/hr
Fuel Consumption <sup>2,3</sup>	103.54 MMscf/yr
Fuel Consumption <sup>1</sup>	11,820 scf/hr
Fuel Heating Value	1,171 Btu/scf
Operating Hours	8,760 hrs/yr

### Notes:

1. Values from Waukesha specification sheet. Due to typical methane content in the fuel, the site horsepower is shown as 1674 hp; however, emissions are calculated at the max rating of 1680 hp.
2. Calculated values
3. Annual fuel consumption is 100% of maximum fuel consumption at 100% load.

## Potential Emissions per Engine

Pollutant	Uncontrolled					Controlled					Source of Emissions Factors
	Emission Factor (lb/MMBtu)	(g/bhp-hr)	Estimated Emissions <sup>2</sup> (lb/hr)	(lb/yr)	(tpy)	Emission Factor (lb/MMBtu)	(g/bhp-hr)	Estimated Emissions <sup>2</sup> (lb/hr)	(lb/yr)	(tpy)	
NOx <sup>1,4</sup>	---	13.7	50.74	---	222.24	---	0.34	1.27	---	5.56	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
CO <sup>1,4</sup>	---	12.7	47.04	---	206.02	---	0.32	1.18	---	5.15	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
VOC <sup>1,4</sup>	---	0.47	1.74	---	7.62	---	0.075	0.28	---	1.22	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
SO <sub>2</sub>	5.88E-04	---	0.0082	---	0.036	5.88E-04	---	0.0082	---	0.036	AP-42, Chapter 3.2, Table 3.2-3
PM <sub>2.5</sub> /PM <sub>10</sub>	1.94E-02	---	0.27	---	1.18	1.94E-02	---	0.27	---	1.18	AP-42, Chapter 3.2, Table 3.2-3
Total PM	1.94E-02	---	0.27	---	1.18	1.94E-02	---	0.27	---	1.18	AP-42, Chapter 3.2, Table 3.2-3
1,1,2,2-Tetrachloroethane	2.53E-05	---	0.00035	3.08	0.0015	2.53E-05	---	0.00035	3.08	0.0015	AP-42, Chapter 3.2, Table 3.2-3
1,3-Butadiene	6.63E-04	---	0.0092	80.66	0.040	6.63E-04	---	0.0092	80.66	0.040	AP-42, Chapter 3.2, Table 3.2-3
Acetaldehyde	2.79E-03	---	0.039	339.44	0.17	2.79E-03	---	0.039	339.44	0.17	AP-42, Chapter 3.2, Table 3.2-3
Acrolein	2.63E-03	---	0.037	319.98	0.16	2.63E-03	---	0.037	319.98	0.16	AP-42, Chapter 3.2, Table 3.2-3
Benzene	1.58E-03	---	0.022	192.23	0.10	1.58E-03	---	0.022	192.23	0.10	AP-42, Chapter 3.2, Table 3.2-3
Ethylbenzene	2.48E-05	---	0.00034	3.02	0.0015	2.48E-05	---	0.00034	3.02	0.0015	AP-42, Chapter 3.2, Table 3.2-3
Formaldehyde <sup>1,4</sup>	---	0.05	0.19	1,622	0.81	---	0.01	0.019	162	0.081	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
Methanol	3.06E-03	---	0.042	372.29	0.19	3.06E-03	---	0.042	372.29	0.19	AP-42, Chapter 3.2, Table 3.2-3
Methylene Chloride	4.12E-05	---	0.00057	5.01	0.0025	4.12E-05	---	0.00057	5.01	0.0025	AP-42, Chapter 3.2, Table 3.2-3
PAH	1.41E-04	---	0.0020	17.15	0.0086	1.41E-04	---	0.0020	17.15	0.0086	AP-42, Chapter 3.2, Table 3.2-3
Toluene	5.58E-04	---	0.0077	67.89	0.034	5.58E-04	---	0.0077	67.89	0.034	AP-42, Chapter 3.2, Table 3.2-3
Xylenes	1.95E-04	---	0.0027	23.72	0.012	1.95E-04	---	0.0027	23.72	0.012	AP-42, Chapter 3.2, Table 3.2-3
Other HAPs <sup>2</sup>	2.10E-04	---	0.0029	25.52	0.013	2.10E-04	---	0.0029	25.52	0.013	AP-42, Chapter 3.2, Table 3.2-3
<b>Total HAPS</b>			0.35	3,072	1.54			0.18	1,612	0.81	
Pollutant	Emission Factor (kg/MMBtu)	(g/bhp-hr)	Estimated Emissions <sup>2</sup> (lb/hr)	(lb/yr) <sup>4</sup>	(tpy) <sup>4</sup>	Emission Factor (kg/MMBtu)	(g/bhp-hr)	Estimated Emissions <sup>2</sup> (lb/hr)	(lb/yr) <sup>4</sup>	(tpy) <sup>4</sup>	Source of Emissions Factors
CO <sub>2</sub> <sup>1</sup>	---	529	1,959	---	8582	---	529	1,959	---	8,582	Manufacturer's Specs
CH <sub>4</sub> <sup>1,4</sup>	---	1.30	4.81	---	21.09	---	0.39	1.44	---	6.33	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
N <sub>2</sub> O	0.0001	---	0.003	---	0.013	0.0001	---	0.0031	---	0.013	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e <sup>2</sup>	---	---	2,081	---	9,113	---	---	1,996	---	8,744	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

### Notes:

4. Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies used in the emissions are typical based on expected operating conditions. The catalyst specification sheet shows typical destruction efficiencies that were used in the calculations.
- The emission factors shown on the catalyst specification sheet are not site specific, so those will vary; however the efficiencies will be the same.

### Example Calculations

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

tpy = (MMscf/yr) \* (Btu/scf) \* (10<sup>6</sup> Btu/MMBtu) \* (g/hp-hr) / (Btu/hp-hr) \* (1 lb/453.59 g) \* (1 ton/2000 lb) or (MMscf/yr) \* (Btu/scf) \* (lb/MMBtu) \* (1 ton/2000 lb)

# Microturbine Generator Emission Calculations

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Microturbine Generators

## Source Information

Emission Unit ID:	G-8000	
Make/Model	Capstone C600 Standard	
Microturbine Rating <sup>2</sup>	600	kWe
Number of Microturbines <sup>2</sup>	1	unit
Net Heat Rate	10,300	Btu/kWhe
Heat Input <sup>1</sup>	6.18	MMBtu/hr
Operating Hours <sup>2</sup>	8,760	hrs/yr

### Notes:

1) Calculated

2) The Capstone C600 package is made up of three (3) 200 kWe units that can operate individually. While all three units may not be operating all at once, potential emissions are calculated as though all three are operating at 8,760 hours per year.

## Potential Emissions per Generator

	Uncontrolled					Controlled					
Pollutant	Emission Factor		Estimated Emissions <sup>1</sup>			Emission Factor		Estimated Emissions <sup>1</sup>			Source of Emissions Factors
	(lb/MMBtu)	(lb/MWhe)	(lb/hr)	(lb/yr)	(tpy)	(lb/MMBtu)	(lb/MWhe)	(lb/hr)	(lb/yr)	(tpy)	
NOx	---	0.40	0.24	---	1.05	---	0.40	0.24	---	1.05	Manufacturer Specifications
CO	---	1.10	0.66	---	2.89	---	1.10	0.66	---	2.89	Manufacturer Specifications
VOC	---	0.10	0.06	---	0.26	---	0.10	0.06	---	0.26	Manufacturer Specifications
SO <sub>2</sub>	3.40E-03	---	0.02	---	0.09	3.40E-03	---	0.02	---	0.09	AP-42, Chapter 3.1, Table 3.1-2a
PM <sub>2.5</sub> /PM <sub>10</sub>	6.60E-03	---	0.04	---	0.18	6.60E-03	---	0.04	---	0.18	AP-42, Chapter 3.1, Table 3.1-2a
1,3-Butadiene	4.30E-07	---	2.66E-06	0.02	1.16E-05	4.30E-07	---	2.66E-06	0.023	1.16E-05	AP-42, Chapter 3.1, Table 3.1-3
Acetaldehyde	4.00E-05	---	2.47E-04	2.17	1.08E-03	4.00E-05	---	2.47E-04	2.17	1.08E-03	AP-42, Chapter 3.1, Table 3.1-3
Acrolein	6.40E-06	---	3.96E-05	0.35	1.73E-04	6.40E-06	---	3.96E-05	0.35	1.73E-04	AP-42, Chapter 3.1, Table 3.1-3
Benzene	1.20E-05	---	7.42E-05	0.65	3.25E-04	1.20E-05	---	7.42E-05	0.65	3.25E-04	AP-42, Chapter 3.1, Table 3.1-3
Ethylbenzene	3.20E-05	---	1.98E-04	1.73	8.66E-04	3.20E-05	---	1.98E-04	1.73	8.66E-04	AP-42, Chapter 3.1, Table 3.1-3
Formaldehyde	7.10E-04	---	4.39E-03	38.44	1.92E-02	7.10E-04	---	4.39E-03	38.44	1.92E-02	AP-42, Chapter 3.1, Table 3.1-3
Naphthalene	1.30E-06	---	8.03E-06	0.07	3.52E-05	1.30E-06	---	8.03E-06	0.07	3.52E-05	AP-42, Chapter 3.1, Table 3.1-3
PAH	2.20E-06	---	1.36E-05	0.12	5.96E-05	2.20E-06	---	1.36E-05	0.12	5.96E-05	AP-42, Chapter 3.1, Table 3.1-3
Propylene Oxide	2.90E-05	---	1.79E-04	1.57	7.85E-04	2.90E-05	---	1.79E-04	1.57	7.85E-04	AP-42, Chapter 3.1, Table 3.1-3
Toluene	1.30E-04	---	8.03E-04	7.04	3.52E-03	1.30E-04	---	8.03E-04	7.04	3.52E-03	AP-42, Chapter 3.1, Table 3.1-3
Xylenes	6.40E-05	---	3.96E-04	3.46	1.73E-03	6.40E-05	---	3.96E-04	3.46	1.73E-03	AP-42, Chapter 3.1, Table 3.1-3
Total HAPS			0.006	55.62	0.03			0.006	55.62	0.03	
Pollutant	Emission Factor		Estimated Emissions <sup>1</sup>			Emission Factor		Estimated Emissions <sup>1</sup>			Source of Emissions Factors
	(kg/MMBtu)	(lb/MWhe)	(lb/hr)		(tpy)	(kg/MMBtu)	(lb/MWhe)	(lb/hr)		(tpy)	
CO <sub>2</sub>	---	1,330	798	---	3,495	---	1,330	798	---	3,495	Manufacturer Specifications
CH <sub>4</sub>	0.001	---	0.01	---	0.06	0.001	---	0.01	---	0.06	40 CFR Part 98, Subpart C, Table C-2
N <sub>2</sub> O	0.0001	---	0.001	---	0.006	0.0001	---	0.001	---	0.006	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	---	---	799	---	3,499	---	---	799	---	3,499	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

## Example Calculations

lb/hr = (lb/Mwhe) \* kWe \* (1 MWe/1000 kWe) or (lb/MMBtu) \* (MMBtu/hr) or (kg/MMBtu) \* (MMBtu/hr) \* (2.21 lb/kg)

tpy = (lb/hr) \* (hr/yr) \* (ton/2000 lb)

# Natural Gas Fueled Catalytic Heater Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Location:	Tyler County, West Virginia
Source Description:	Catalytic Heater for Generator Fuel

## Source Information

Emission Unit ID:	CATHT1	
Source Description:	Generator Fuel Heater	
Hours of Operation	8,760	hr/yr
Design Heat Rate	0.024	MMBtu/hr
Heater Efficiency	80%	
Fuel Heat Value	1,020	Btu/scf
Fuel Use	0.26	MMscf/yr

## Emission Calculations per Heater

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO <sub>x</sub>	100	0.0029	0.013	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.0025	0.011	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.00016	0.00071	AP-42 Ch. 1.4 Table 1.4-2
PM <sub>10</sub>	7.6	0.00022	0.0010	AP-42 Ch. 1.4 Table 1.4-2
SO <sub>2</sub>	0.6	0.000018	0.000077	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.000002	0.000010	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO) <sup>1</sup>	1.9	0.00006	0.00024	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	2.81	12	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.0001	0.00023	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00001	0.000023	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	----	2.82	12	40 CFR Part 98, Subpart A, Table A-1

1. Only those HAP pollutants above detection thresholds were included.

## Sample Calculations:

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

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

# Dehydrator Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Dehydrator Units

## Potential Emissions per Dehydrator

Pollutant	Emission Unit ID: SV-3110/SV-3210		Emission Unit ID: FT-3110/FT-3210	
	Dehydrator Still Vent (lb/hr)	(tpy)	Flash Tank Gas (lb/hr)	(tpy)
<b>Uncontrolled Emissions</b> <sup>1</sup>				
VOC	15.90	69.65	32.28	141.39
Total HAPs	7.18	31.43	0.68	2.96
Benzene	0.26	1.16	0.022	0.095
Toluene	1.17	5.13	0.056	0.24
Ethylbenzene	1.03	4.51	0.026	0.11
Xylenes	4.47	19.59	0.069	0.30
n-Hexane	0.24	1.04	0.50	2.21
Methane	17.43	76.36	54.65	239.36
Carbon Dioxide	0.17	0.74	0.98	4.29
CO <sub>2</sub> e	436	1,910	1,367	5,988
<b>Controlled Emissions</b> <sup>2,3</sup>	<b>FL-1000</b>		<b>R-3110/R-3210</b>	
VOC	0.32	1.39	0.65	2.83
Total HAPs	0.14	0.63	0.014	0.059
Benzene	0.0053	0.023	0.0004	0.0019
Toluene	0.023	0.10	0.0011	0.0049
Ethylbenzene	0.021	0.090	0.0005	0.0022
Xylenes	0.089	0.39	0.0014	0.0061
n-Hexane	0.0048	0.021	0.010	0.044
Methane	0.35	1.53	1.09	4.79
Carbon Dioxide	0.17	0.74	0.98	4.29
CO <sub>2</sub> e	9	39	28	124

<sup>1</sup>Output from GRI-GLYCalc 4.0 for both the still vent and flash tank gas emissions

<sup>2</sup>Controlled emissions assume that the glycol still vent is equipped with a condenser and is controlled by a combustor with at least 98% control efficiency. Controlled emissions are shown with FL-1000 in summary tables.

<sup>3</sup>Flash tank gas is used in the reboiler as the primary fuel source. However, in the case that gas cannot be used in the reboiler, the gas is sent to the primary/backup VRU system via the storage tanks for 98% control. Controlled emissions are shown with R-3110 and R-3210 in the summary tables.

# Natural Gas Fueled Dehydrator Reboiler Combustion Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Location:	Tyler County, West Virginia
Source Description:	Dehydrator Reboilers

## Source Information

Emission Unit ID:	R-3110 & R-3210	
Source Description:	Dehydrator Reboiler	
Hours of Operation	8,760	hr/yr
Design Heat Rate	1.5	MMBtu/hr
Heater Efficiency	0.8	
Fuel Heat Value	1,020	Btu/scf
Fuel Use	16.1	MMscf/yr

## Emission Calculations per Reboiler

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO <sub>x</sub>	100	0.18	0.81	AP-42 Ch. 1.4 Table 1.4-1
CO	84	0.15	0.68	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.010	0.044	AP-42 Ch. 1.4 Table 1.4-2
PM <sub>10</sub>	7.6	0.014	0.061	AP-42 Ch. 1.4 Table 1.4-2
SO <sub>2</sub>	0.6	0.0011	0.0048	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00014	0.00060	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)	1.9	0.0035	0.015	AP-42 Ch. 1.4 Table 1.4-3
Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	175.89	770	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.003	0.01	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.0003	0.001	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	----	176.08	771	40 CFR Part 98, Subpart A, Table A-1

## Sample Calculations:

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

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

# Flare Combustion Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Flare for Dehydrator Still Vent Gas
Emission Unit ID:	FL-1000

## Combusted Gas Emissions

Flare Heat Input :	9.21	MMBtu/hr
Hours of Operation:	8,760	hr/yr

Pollutant	Emission Factor <sup>1</sup> (lb/MMBtu)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter (PM/PM <sub>10</sub> /PM <sub>2.5</sub> )	N/A - Smokeless Design		
Nitrogen Oxides (NO <sub>x</sub> )	0.068	0.63	2.74
Carbon Monoxide (CO)	0.31	2.86	12.51

<sup>1</sup> Emission Factors from Table 13.5-1 and 13.5-2 of AP-42 Section 13.5 (April 2015)

## Pilot Emissions

Pilot Heating Value:	1,020	Btu/scf
Hours of Operation:	8,760	hr/yr
Total Pilot Natural Gas Usage:	1.64E-05	MMscf/hr

Pollutant	Emission Factor (lb/MMscf)	Emissions (lbs/hr)	Emissions (tons/yr)
Particulate Matter (PM/PM <sub>10</sub> /PM <sub>2.5</sub> ) <sup>2</sup>	7.6	1.25E-04	5.46E-04
Nitrogen Oxides (NO <sub>x</sub> )	100	1.64E-03	7.18E-03
Sulfur Dioxide (SO <sub>2</sub> ) <sup>2</sup>	0.6	9.84E-06	4.31E-05
Carbon Monoxide (CO) <sup>2</sup>	84	1.38E-03	6.03E-03
Volatile Organic Compounds (VOC) <sup>2</sup>	5.5	9.02E-05	3.95E-04
Total HAPs <sup>2,3</sup>	1.88	3.08E-05	1.35E-04

<sup>2</sup> Emission Factors from AP-42 Tables 1.4-1, 1.4-2, 1.4-3, and 1.4-4 (7/98).

<sup>3</sup> Sum of Emissions Factors published for pollutants classified as "HAPS" under AP-42 Table 1.4-3.

## Total Flare Emissions

Pollutant	Emission Rate (lbs/hr)	Emission Rate (tons/year)
Particulate Matter (PM/PM <sub>10</sub> /PM <sub>2.5</sub> )	1.25E-04	5.46E-04
Nitrogen Oxides (NO <sub>x</sub> )	0.63	2.75
Sulfur Dioxide (SO <sub>2</sub> )	9.84E-06	4.31E-05
Carbon Monoxide (CO)	2.86	12.51
Volatile Organic Compounds (VOC)	9.02E-05	3.95E-04
Total HAPs	3.08E-05	1.35E-04

## Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	1,082	4,739	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.020	0.089	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.0020	0.0089	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	----	1,083	4,744	40 CFR Part 98, Subpart A, Table A-1



# Settling Tank Flashing Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Settling Tank
Emission Unit ID:	TK-9000

## Settling Tank Flashing Emissions

Component	Uncontrolled Flashing Emissions <sup>1</sup> (lb/hr)	Uncontrolled Flashing Emissions (tons/yr)	Controlled Flashing Emissions <sup>2,3</sup> (lb/hr)	Controlled Flashing Emissions <sup>2,3</sup> (tons/yr)
Methane	13.00	56.95	0.26	1.14
Ethane	31.90	139.70	0.64	2.79
Propane	45.56	199.56	0.91	3.99
i-Butane	12.01	52.60	0.24	1.05
n-Butane	30.60	134.02	0.61	2.68
i-Pentane	11.42	50.01	0.23	1.00
n-Pentane	13.12	57.48	0.26	1.15
i-Hexanes	5.62	24.62	0.11	0.49
Heptanes	3.28	14.36	0.066	0.29
Octanes	1.11	4.85	0.022	0.10
Nonanes	0.19	0.81	0.0037	0.016
Decanes+	0.02	0.07	0.00032	0.0014
n-Hexane	3.60	15.76	0.072	0.32
Benzene	0.06	0.27	0.0012	0.0053
Toluene	0.12	0.54	0.0025	0.011
Ethylbenzene	0.04	0.19	0.00089	0.0039
Xylenes	0.11	0.47	0.0021	0.0094
Nitrogen	0.06	0.27	0.063	0.27
Carbon Dioxide	0.17	0.74	0.17	0.74
Water	1.59	6.95	1.59	6.95
<b>VOC Subtotal</b>	126.85	555.61	2.54	11.11
<b>HAP Subtotal</b>	3.93	17.23	0.079	0.34
<b>CO<sub>2</sub>e Subtotal</b>	325.23	1424.49	6.67	29.22
<b>Total</b>	173.57	760.22	5.25	23.01

### Notes:

1. Flashing emissions calculated by ProMax 3.2. Flashing only occurs in the settling tank as all pressurized fluids flow into the settling tank and then separate out at atmospheric conditions to the condensate and produced water tanks.
2. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system
3. VRU-6000 is the primary VRU to collect storage tank vapors and VRU-6100 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown.

## Storage Tank Working and Breathing Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Condensate, Settling, and Produced Water Tanks
Emission Unit ID:	TK-9000, TK-9100, TK-9110, TK-9200, TK-9210

TANK DESCRIPTION	Uncontrolled VOC Emissions <sup>1</sup> (tons/yr)	Uncontrolled Benzene Emissions <sup>1</sup> (tons/yr)	Uncontrolled Toluene Emissions <sup>1</sup> (tons/yr)	Uncontrolled Ethylbenzene Emissions <sup>1</sup> (tons/yr)	Uncontrolled Xylene Emissions <sup>1</sup> (tons/yr)	Uncontrolled n-Hexane Emissions <sup>1</sup> (tons/yr)	Uncontrolled CH <sub>4</sub> Emissions <sup>1</sup> (tons/yr)	Uncontrolled CO <sub>2</sub> e Emissions (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-9200)	6.82	1.91E-04	8.67E-04	6.03E-04	1.57E-03	1.37E-02	0.080	2.01
400 bbl Hydrocarbon Storage Tank (TK-9210)	6.82	1.91E-04	8.67E-04	6.03E-04	1.57E-03	1.37E-02	0.080	2.01
500 bbl Settling Tank (TK-9000)	8.98	2.51E-04	1.14E-03	7.94E-04	2.07E-03	1.81E-02	0.11	2.65
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-9100)	0.00038	5.49E-08	5.35E-08	1.14E-08	2.43E-08	4.19E-09	0.00037	0.0093
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-9110)	0.00038	5.49E-08	5.35E-08	1.14E-08	2.43E-08	4.19E-09	0.00037	0.0093
<b>TOTAL</b>	<b>22.62</b>	<b>0.00063</b>	<b>0.0029</b>	<b>0.0020</b>	<b>0.0052</b>	<b>0.045</b>	<b>0.27</b>	<b>6.69</b>

TANK DESCRIPTION	Controlled VOC Emissions <sup>1,3</sup> (tons/yr)	Controlled Benzene Emissions <sup>1,3</sup> (tons/yr)	Controlled Toluene Emissions <sup>1,3</sup> (tons/yr)	Controlled Ethylbenzene Emissions <sup>1,3</sup> (tons/yr)	Controlled Xylene Emissions <sup>1,3</sup> (tons/yr)	Controlled n-Hexane Emissions <sup>1,3</sup> (tons/yr)	Controlled CH <sub>4</sub> Emissions <sup>1,3</sup> (tons/yr)	Controlled CO <sub>2</sub> e Emissions (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-9200)	0.14	3.82E-06	1.73E-05	1.21E-05	3.14E-05	2.74E-04	0.0016	0.047
400 bbl Hydrocarbon Storage Tank (TK-9210)	0.14	3.82E-06	1.73E-05	1.21E-05	3.14E-05	2.74E-04	0.0016	0.047
500 bbl Settling Tank (TK-9000)	0.18	5.03E-06	2.28E-05	1.59E-05	4.13E-05	3.61E-04	0.0021	0.062
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-9100)	0.0000077	1.10E-09	1.07E-09	2.27E-10	4.87E-10	8.37E-11	7.36E-06	0.00033
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-9110)	0.0000077	1.10E-09	1.07E-09	2.27E-10	4.87E-10	8.37E-11	7.36E-06	0.00033
<b>TOTAL</b>	<b>0.45</b>	<b>1.27E-05</b>	<b>5.75E-05</b>	<b>4.00E-05</b>	<b>1.04E-04</b>	<b>9.10E-04</b>	<b>0.0053</b>	<b>0.16</b>

Notes:

1. ProMax 3.2 used to calculate standing, working, and breathing (S,W,B) emissions
2. Produced water assumed to have no more than 10% hydrocarbon liquid
3. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.
4. VRU-6000 is the primary VRU to collect storage tank vapors and VRU-6100 is the backup VRU in times when the primary VRU is undergoing maintenance or shutdown.

# Truck Loading Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Production Liquids Truck Loadout
Emission Unit ID:	LDOUT1

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

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

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

Source	S <sup>1</sup>	P (psia) <sup>2</sup>	M <sup>3</sup>	T (°F) <sup>4</sup>	T (°R)	L <sub>L</sub> (lb/1000 gal)	Production (bbl/day)	VOC (tpy)	Benzene (tpy)	Toluene (tpy)	E-Benzene (tpy)	Xylene (tpy)	n-Hexane (tpy)	CH <sub>4</sub> (tpy)	CO <sub>2</sub> e (tpy)
Condensate	0.6	11.8	41.1	65	524.75	6.88	150	7.91	0.00022	0.0010	0.00070	0.0018	0.016	0.093	2.33
Produced Water	0.6	0.31	18.6	65	524.75	0.08	45	0.03	4.12E-06	4.01E-06	8.52E-07	1.82E-06	3.14E-07	0.028	0.70

- Notes:
1. Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
  2. True vapor pressure and molecular weight are estimated from tank-specific ProMax 3.2 simulations for both liquids.
  3. Temperature based on the annual average temperature of Charleston, WV retrieved from ProMax working and breathing report.
  4. HAP and CO<sub>2</sub>e emissions calculated with weight percentages of the working and breathing vent gas from the ProMax 3.2 simulation

Assume 1 truck loaded per hour, 180 bbl truck, for short term emissions

Source	S <sup>1</sup>	P (psia) <sup>2</sup>	M <sup>3</sup>	T (°F) <sup>4</sup>	T (°R)	L <sub>L</sub> (lb/1000 gal)	Loading bbl/hr	VOC (lb/hr)	Benzene (lb/hr)	Toluene (lb/hr)	E-Benzene (lb/hr)	Xylene (lb/hr)	n-Hexane (lb/hr)	CH <sub>4</sub> (lb/hr)	CO <sub>2</sub> e (lb/hr)
Condensate	0.6	11.8	41.1	65	524.75	6.88	180	52.02	0.0015	0.0066	0.0046	0.012	0.10	0.61	15.3
Produced Water	0.6	0.31	18.6	65	524.75	0.08	180	0.63	9.02E-05	8.79E-05	1.87E-05	4.00E-05	6.88E-06	0.60	15.3

## Component Fugitive Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Fugitive Emissions - Component Leaks

VOC Fugitive Emissions						
Equipment Type and Service	Number of Units <sup>1</sup>	Hours of Operation (hours/yr)	THC Emission Factor <sup>2</sup> (kg/hr-unit)	VOC Weight Fraction <sup>3</sup>	THC Emissions (tpy)	VOC Emissions (tpy)
Flanges - Gas Service	836	8,760	3.90E-04	0.21	3.16	0.66
Valves - Gas Service	250	8,760	4.50E-03	0.21	10.89	2.29
Compressor Seals Gas Service	39	8,760	8.80E-03	0.21	3.32	0.70
Flanges - Liquid Service	175	8,760	1.10E-04	0.73	0.19	0.14
Valves - Liquid Service	42	8,760	2.50E-03	0.73	1.02	0.74
<b>Total Emissions (tons/yr)</b>					<b>18.57</b>	<b>4.53</b>

HAPs Fugitive Emissions										
Equipment Type and Service	Benzene Weight Fraction <sup>3</sup>	Benzene Emissions (tpy)	Toluene Weight Fraction <sup>3</sup>	Toluene Emissions (tpy)	Ethylbenzene Weight Fraction <sup>3</sup>	Ethylbenzene Emissions (tpy)	Xylene Weight Fraction <sup>3</sup>	Xylene Emissions (tpy)	n-Hexane Weight Fraction <sup>3</sup>	n-Hexane Emissions (tpy)
Flanges - Gas Service	4.42E-05	0.00014	1.56E-04	0.00049	1.20E-04	0.00038	3.65E-04	0.0012	2.75E-03	0.0087
Valves - Gas Service	4.42E-05	0.00048	1.56E-04	0.0017	1.20E-04	0.0013	3.65E-04	0.0040	2.75E-03	0.030
Compressor Seals Gas Service	4.42E-05	0.00015	1.56E-04	0.00052	1.20E-04	0.00040	3.65E-04	0.0012	2.75E-03	0.0091
Flanges - Liquid Service	3.55E-04	0.000066	7.24E-04	0.00013	2.58E-04	0.000048	6.22E-04	0.00012	2.09E-02	0.0039
Valves - Liquid Service	3.55E-04	0.00036	7.24E-04	0.00074	2.58E-04	0.00026	6.22E-04	0.00063	2.09E-02	0.021
<b>Total Emissions (tons/yr)</b>		<b>0.0012</b>		<b>0.0036</b>		<b>0.0024</b>		<b>0.0071</b>		<b>0.073</b>

1) Component counts from similar facilities.

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

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

GHG Fugitive Emissions								
Equipment Type and Service	Number of Units <sup>1</sup>	Hours of Operation (hours/yr)	Emission Factor <sup>2</sup> (scf/hr-unit)	CH <sub>4</sub> Concentration <sup>3</sup>	CO <sub>2</sub> Concentration <sup>3</sup>	CH <sub>4</sub> Emissions (tpy)	CO <sub>2</sub> Emissions (tpy)	CO <sub>2</sub> e Emissions (tpy)
Flanges	1,011	8,760	0.003	0.98	0.011	0.55	0.017	13.72
Valves - Gas Service	250	8,760	0.027	0.98	0.011	1.22	0.038	30.54
Valves - Liquid Service	42	8,760	0.050	0.98	0.011	0.38	0.012	9.50
Compressor Seals	39	8,760	0.300	0.98	0.011	2.11	0.065	52.94
<b>Total Emissions (tons/yr)</b>						<b>4.26</b>	<b>0.13</b>	<b>106.71</b>

1) Component counts from similar facilities.

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

3) CH<sub>4</sub> and CO<sub>2</sub> concentrations as defined in 40 CFR Part 98.233(r)

## Fugitive Emissions From Venting Episodes

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Fugitive Emissions-Venting Episodes

VOC Venting Emissions						
Type of Event <sup>1</sup>	Number Of Events (event/yr)	Amount Vented per Event (scf/event)	Molecular Weight of Vented Gas (lb/lb-mol)	Total Emissions (ton/yr)	VOC Weight Fraction <sup>4</sup>	VOC Emissions (ton/yr)
Compressor Blowdown <sup>2</sup>	156	10,000	21.41	44.02	0.21	9.17
Compressor Startup <sup>3</sup>	156	1,050	21.41	4.62	0.21	0.96
Plant Shutdown	2	100,000	21.41	5.64	0.21	1.18
Pigging Venting	26	1,000	21.41	0.73	0.21	0.15
<b>Total Emissions (tons/yr)</b>						<b>11.46</b>

HAPs Venting Emissions										
Type of Event <sup>1</sup>	Benzene Weight Fraction <sup>4</sup>	Benzene Emissions (tpy)	Toluene Weight Fraction <sup>4</sup>	Toluene Emissions (tpy)	Ethylbenzene Weight Fraction <sup>4</sup>	Ethylbenzene Emissions (tpy)	Xylene Weight Fraction <sup>4</sup>	Xylene Emissions (tpy)	n-Hexane Weight Fraction <sup>4</sup>	n-Hexane Emissions (tpy)
Compressor Blowdown <sup>2</sup>	4.39E-05	0.0019	1.55E-04	0.0068	1.19E-04	0.0052	3.62E-04	0.016	2.72E-03	0.12
Compressor Startup <sup>3</sup>	4.39E-05	0.00020	1.55E-04	0.00072	1.19E-04	0.00055	3.62E-04	0.0017	2.72E-03	0.013
Plant Shutdown	4.39E-05	0.00025	1.55E-04	0.00088	1.19E-04	0.00067	3.62E-04	0.0020	2.72E-03	0.015
Pigging Venting	4.39E-05	0.000032	1.55E-04	0.00011	1.19E-04	0.000087	3.62E-04	0.00027	2.72E-03	0.0020
<b>Total Emissions (tons/yr)</b>		<b>0.0024</b>		<b>0.0085</b>		<b>0.0066</b>		<b>0.020</b>		<b>0.15</b>

GHG Venting Emissions								
Type of Event <sup>1</sup>	Number Of Events (event/yr)	Amount Vented per Event (scf/event)	Molecular Weight of Vented Gas (lb/lb-mol)	CH <sub>4</sub> Weight Fraction <sup>4</sup>	CO <sub>2</sub> Weight Fraction <sup>4</sup>	CH <sub>4</sub> Emissions (ton/yr)	CO <sub>2</sub> Emissions (ton/yr)	CO <sub>2</sub> e Emissions (tpy)
Compressor Blowdown <sup>2</sup>	156	10,000	21.41	0.57	0.0033	24.88	0.15	622.17
Compressor Startup <sup>3</sup>	156	1,050	21.41	0.57	0.0033	2.61	0.015	65.33
Plant Shutdown	2	100,000	21.41	0.57	0.0033	3.19	0.019	79.77
Pigging Venting	26	1,000	21.41	0.57	0.0033	0.41	0.0024	10.37
<b>Total Emissions (tons/yr)</b>						<b>31.10</b>	<b>0.18</b>	<b>777.63</b>

1) Estimated number of events and venting per event from engineering based on other facilities

2) Total number of compressor blowdowns based on 12 blowdowns per compressor.

3) Total number of compressor startups based on 12 starts per compressor.

4) Weight Fraction is from a gas analysis that will be typical for the facility

# Fugitive Dust Emissions

Company:	Antero Midstream LLC
Facility Name:	Underwood Compressor Station
Facility Location:	Tyler County, West Virginia
Source Description:	Fugitive Dust Emissions

Gravel Access Road	Loaded Truck Weight <sup>1</sup>	Trips per year <sup>2</sup>	Trips per day <sup>2</sup>	Distance per round trip (truck in and out) <sup>3</sup>		VMT per year <sup>4</sup>
	tons			feet	miles	
Condensate Tank Truck	40.00	365	1.0	4,700	0.89	325
Produced Water Tank Truck	40.00	365	1.0	4,700	0.89	325
Passenger Vehicles	3.00	1,095	3.0	4,700	0.89	975

Equation Parameter	PM-10/PM2.5	PM-Total
<b>E</b> , annual size-specific emission factor for PM <sub>10</sub> & PM <sub>2.5</sub> (upaved industrial roads) extrapolated for natural mitigation <sup>6</sup>	see table below	see table below
<b>k</b> , Particle size multiplier for particle size range (PM <sub>10</sub> ), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	1.5	4.9
<b>k</b> , Particle size multiplier for particle size range (PM <sub>2.5</sub> ), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	0.15	
<b>s</b> , surface material silt content, (%) (Source: AP-42 Table 13.2.2-1)	4.8	4.8
<b>W</b> , mean weight (tons) of the vehicles traveling the road	17.8	17.8
<b>a</b> , constant for PM <sub>10</sub> and PM <sub>2.5</sub> on industrial roads (Source: AP-42 Table 13.2.2-2)	0.9	0.7
<b>b</b> , constant for PM <sub>10</sub> and PM <sub>2.5</sub> on industrial roads (Source: AP-42 Table 13.2.2-2)	0.45	0.45
<b>P</b> , number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.2-1.	160	160

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

Source of Equation: AP-42 Section 13.2.2

## PM<sub>10</sub> Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)	Annual Uncontrolled PM <sub>10</sub> Emissions (tpy)
0.82	1,625	0.67

## PM<sub>2.5</sub> Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)	Annual Uncontrolled PM <sub>2.5</sub> Emissions (tpy)
0.082	1,625	0.067

## PM- Total Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr)	Annual Uncontrolled PM-Total Emissions (tpy)
3.23	1,625	2.62

Table Notes:

1. Loaded truck weight is based on typical weight limit for highway vehicles.
2. Based on production, it's assumed a maximum of one condensate truck (180 bbl truck) and one produced water truck (180 bbl truck) will be onsite per day.
3. Distance per round trip is based on the proposed site layout. The one way distance is measured as 2,200 feet for the gravel access road and 150 feet on the dirt pad one way.

# Facility Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	75.469	16.04	12.11	0.57
Ethane	15.543	30.07	4.67	0.22
Propane	5.177	44.10	2.28	0.11
i-Butane	0.676	58.12	0.39	0.018
n-Butane	1.475	58.12	0.86	0.040
i-Pentane	0.348	72.15	0.25	0.012
n-Pentane	0.358	72.15	0.26	0.012
Hexanes+	0.347	100.00	0.35	0.016
n-Hexane	0.068	86.18	0.058	0.0027
Benzene	0.0012	78.11	0.0009	0.000044
Toluene	0.0036	92.14	0.0033	0.00016
Ethylbenzene	0.0024	106.17	0.0026	0.00012
Xylenes	0.0073	106.16	0.008	0.00036
Nitrogen	0.363	28.01	0.10	0.0047
Carbon Dioxide	0.162	44.01	0.071	0.0033
Totals	100.0		21.41	1.00

Molecular weight 21.41

VOC weight fraction 0.21  
Methane weight fraction 0.57  
THC weight fraction 0.99  
VOC of THC wt fraction 0.21  
CH4 of THC wt fraction 0.57  
Benzene of THC wt fraction 0.000044  
Toluene of THC wt fraction 0.00016  
E-benzene of THC wt fraction 0.00012  
Xylene of THC wt fraction 0.00036  
n-Hexane of THC wt fraction 0.0027

Weigle Unit 1H analysis with BTEX relative fractions from similar wells

# Facility Tank Vent Gas Analysis

	MOL %	MW	Component Weight lb/lb-mol	Wt. Fraction
Methane	19.177	16.04	3.08	0.075
Ethane	25.098	30.07	7.55	0.18
Propane	24.448	44.10	10.78	0.26
i-Butane	4.889	58.12	2.84	0.069
n-Butane	12.456	58.12	7.24	0.18
i-Pentane	3.744	72.15	2.70	0.066
n-Pentane	4.304	72.15	3.11	0.076
Other Hexanes	1.543	86.18	1.33	0.032
Heptanes	0.774	100.20	0.78	0.019
Octanes	0.229	114.23	0.26	0.0064
Nonanes	0.034	128.26	0.044	0.0011
Decanes+	0.002	142.28	0.0031	0.000076
n-Hexane	0.988	86.18	0.85	0.021
Benzene	0.018	78.11	0.014	0.00035
Toluene	0.032	92.14	0.029	0.00072
Ethylbenzene	0.010	106.17	0.010	0.00026
Xylenes	0.024	106.16	0.025	0.00062
Nitrogen	0.053	28.01	0.015	0.00036
Carbon Dioxide	0.091	44.01	0.040	0.0010
Water	2.084	18.02	0.38	0.0091
Totals	100.00		41.07	1.00

Molecular weight 41.07

VOC weight fraction 0.73

Methane weight fraction 0.075

THC weight fraction 0.99

VOC of THC wt fraction 0.74

CH4 of THC wt fraction 0.076

Benzene of THC wt fraction 0.00036

Toluene of THC wt fraction 0.00072

E-benzene of THC wt fraction 0.00026

Xylene of THC wt fraction 0.00062

n-Hexane of THC wt fraction 0.021

Tank vent gas is the Settling Tank flash gas stream from the ProMax 3.2 simulation



# Facility Pressurized Liquid Analysis

	MOL % Blanche 1H	MOL % Hendershot 2H	MOL % Average	MOL % Water
Methane	3.925	4.898	4.412	0.4412
Ethane	4.741	7.946	6.344	0.6344
Propane	5.587	10.441	8.014	0.8014
i-Butane	1.733	3.134	2.434	0.2434
n-Butane	5.368	10.164	7.766	0.7766
i-Pentane	3.552	6.035	4.794	0.4794
n-Pentane	5.339	8.955	7.147	0.7147
Other Hexanes	4.649	7.234	5.942	0.5942
Heptanes	13.536	12.272	12.904	1.2904
Octanes	16.656	8.304	12.480	1.2480
Nonanes	7.581	4.253	5.917	0.5917
Decanes+	18.768	8.249	13.509	1.3509
n-Hexane	4.753	5.789	5.271	0.5271
Benzene	0.100	0.100	0.100	0.0100
Toluene	0.755	0.524	0.640	0.0640
Ethylbenzene	0.788	0.443	0.616	0.0616
Xylenes	2.143	1.221	1.682	0.1682
Nitrogen	0.013	0.011	0.012	0.0012
Carbon Dioxide	0.013	0.030	0.022	0.0022

C10+ specific gravity	0.7837	0.7832	0.7835
C10+ MW	179.40	166.30	172.850
API	63.35	69.12	66.24

Liquid analysis is the average of two representative analyses from the field. The pressurized water analysis assumes 10% hydrocarbons.

**GlyCalc**

## GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Underwood Compressor Station

File Name: W:\20163815 Antero WV 2016 Comp Air Mods\2.0 Technical Information\Underwood CS\Attachment N\Dehy Runs\Underwood Dehy.ddf

Date: February 08, 2016

## DESCRIPTION:

Description: One (1) 88 MMscf/day TEG dehydration unit  
Kimray 45015 PV glycol pump

Annual Hours of Operation: 8760.0 hours/yr

## WET GAS:

Temperature: 120.00 deg. F  
Pressure: 1100.00 psig  
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1620
Nitrogen	0.3630
Methane	75.4690
Ethane	15.5430
Propane	5.1770
Isobutane	0.6760
n-Butane	1.4750
Isopentane	0.3480
n-Pentane	0.3580
n-Hexane	0.0680
Other Hexanes	0.3470
Benzene	0.0012
Toluene	0.0036
Ethylbenzene	0.0024
Xylenes	0.0073

## DRY GAS:

Flow Rate: 88.0 MMSCF/day  
Water Content: 5.0 lbs. H2O/MMSCF

## LEAN GLYCOL:

Glycol Type: TEG  
Water Content: 1.5 wt% H2O  
Flow Rate: 7.9 gpm

## PUMP:

Glycol Pump Type: Gas Injection  
Gas Injection Pump Volume Ratio: 0.032 acfm gas/gpm glycol

FLASH TANK:

---

Flash Control: Combustion device  
Flash Control Efficiency: 98.00 %  
Temperature: 80.0 deg. F  
Pressure: 5.0 psig

STRIPPING GAS:

---

Source of Gas: Dry Gas  
Gas Flow Rate: 9.000 scfm

REGENERATOR OVERHEADS CONTROL DEVICE:

---

Control Device: Condenser  
Temperature: 200.0 deg. F  
Pressure: 14.7 psia  
  
Control Device: Combustion Device  
Destruction Efficiency: 98.0 %  
Excess Oxygen: 0.0 %  
Ambient Air Temperature: 0.0 deg. F

## GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Underwood Compressor Station

File Name: W:\20163815 Antero WV 2016 Comp Air Mods\2.0 Technical Information\Underwood CS\Attachment N\Dehy Runs\Underwood Dehy.ddf

Date: February 08, 2016

## DESCRIPTION:

Description: One (1) 88 MMscf/day TEG dehydration unit  
Kimray 45015 PV glycol pump

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.3486	8.368	1.5271
Ethane	0.1409	3.382	0.6172
Propane	0.0778	1.867	0.3408
Isobutane	0.0151	0.362	0.0661
n-Butane	0.0376	0.903	0.1648
Isopentane	0.0114	0.273	0.0499
n-Pentane	0.0137	0.329	0.0600
n-Hexane	0.0048	0.114	0.0209
Other Hexanes	0.0189	0.454	0.0828
Benzene	0.0053	0.127	0.0232
Toluene	0.0234	0.561	0.1025
Ethylbenzene	0.0206	0.494	0.0902
Xylenes	0.0894	2.146	0.3916
Total Emissions	0.8075	19.380	3.5368
Total Hydrocarbon Emissions	0.8075	19.380	3.5368
Total VOC Emissions	0.3179	7.630	1.3926
Total HAP Emissions	0.1434	3.442	0.6282
Total BTEX Emissions	0.1387	3.328	0.6074

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	17.4329	418.390	76.3562
Ethane	7.0454	169.091	30.8591
Propane	3.8904	93.370	17.0401
Isobutane	0.7544	18.106	3.3043
n-Butane	1.8813	45.150	8.2400
Isopentane	0.5696	13.670	2.4948
n-Pentane	0.6845	16.428	2.9981
n-Hexane	0.2383	5.720	1.0440
Other Hexanes	0.9453	22.688	4.1405
Benzene	0.2647	6.354	1.1596
Toluene	1.1703	28.088	5.1261
Ethylbenzene	1.0297	24.712	4.5100
Xylenes	4.4727	107.345	19.5905

			Page: 2
Total Emissions	40.3797	969.113	176.8631
Total Hydrocarbon Emissions	40.3797	969.113	176.8631
Total VOC Emissions	15.9013	381.632	69.6478
Total HAP Emissions	7.1758	172.220	31.4301
Total BTEX Emissions	6.9375	166.500	30.3862

#### FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	1.0930	26.231	4.7871
Ethane	0.5539	13.294	2.4262
Propane	0.3113	7.472	1.3637
Isobutane	0.0568	1.363	0.2488
n-Butane	0.1382	3.316	0.6051
Isopentane	0.0367	0.880	0.1605
n-Pentane	0.0416	0.997	0.1820
n-Hexane	0.0101	0.242	0.0441
Other Hexanes	0.0476	1.142	0.2085
Benzene	0.0004	0.010	0.0019
Toluene	0.0011	0.027	0.0049
Ethylbenzene	0.0005	0.012	0.0022
Xylenes	0.0014	0.033	0.0061
Total Emissions	2.2925	55.020	10.0411
Total Hydrocarbon Emissions	2.2925	55.020	10.0411
Total VOC Emissions	0.6456	15.495	2.8278
Total HAP Emissions	0.0135	0.324	0.0592
Total BTEX Emissions	0.0034	0.083	0.0151

#### FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	54.6477	1311.544	239.3568
Ethane	27.6962	664.709	121.3094
Propane	15.5668	373.603	68.1826
Isobutane	2.8399	68.157	12.4387
n-Butane	6.9076	165.783	30.2554
Isopentane	1.8326	43.983	8.0268
n-Pentane	2.0779	49.869	9.1010
n-Hexane	0.5038	12.091	2.2067
Other Hexanes	2.3802	57.124	10.4251
Benzene	0.0216	0.518	0.0945
Toluene	0.0558	1.340	0.2445
Ethylbenzene	0.0255	0.612	0.1117
Xylenes	0.0691	1.658	0.3025
Total Emissions	114.6246	2750.990	502.0556
Total Hydrocarbon Emissions	114.6246	2750.990	502.0556
Total VOC Emissions	32.2807	774.737	141.3894
Total HAP Emissions	0.6758	16.219	2.9599
Total BTEX Emissions	0.1720	4.127	0.7532

#### COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
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Methane	1.4416	34.598	6.3142
Ethane	0.6948	16.676	3.0434
Propane	0.3891	9.339	1.7044
Isobutane	0.0719	1.725	0.3149
n-Butane	0.1758	4.219	0.7699
Isopentane	0.0480	1.153	0.2104
n-Pentane	0.0552	1.326	0.2420
n-Hexane	0.0148	0.356	0.0650
Other Hexanes	0.0665	1.596	0.2913
Benzene	0.0057	0.137	0.0251
Toluene	0.0245	0.588	0.1073
Ethylbenzene	0.0211	0.506	0.0924
Xylenes	0.0908	2.179	0.3976
<hr/>			
Total Emissions	3.1000	74.400	13.5779
<hr/>			
Total Hydrocarbon Emissions	3.1000	74.400	13.5779
Total VOC Emissions	0.9636	23.125	4.2204
Total HAP Emissions	0.1569	3.767	0.6874
Total BTEX Emissions	0.1421	3.411	0.6224

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

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Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
<hr/>			
Methane	315.7129	6.3142	98.00
Ethane	152.1685	3.0434	98.00
Propane	85.2226	1.7044	98.00
Isobutane	15.7429	0.3149	98.00
n-Butane	38.4953	0.7699	98.00
Isopentane	10.5216	0.2104	98.00
n-Pentane	12.0991	0.2420	98.00
n-Hexane	3.2507	0.0650	98.00
Other Hexanes	14.5656	0.2913	98.00
Benzene	1.2540	0.0251	98.00
Toluene	5.3706	0.1073	98.00
Ethylbenzene	4.6217	0.0924	98.00
Xylenes	19.8930	0.3976	98.00
<hr/>			
Total Emissions	678.9187	13.5779	98.00
<hr/>			
Total Hydrocarbon Emissions	678.9187	13.5779	98.00
Total VOC Emissions	211.0373	4.2204	98.00
Total HAP Emissions	34.3900	0.6874	98.00
Total BTEX Emissions	31.1394	0.6224	98.00

EQUIPMENT REPORTS:

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CONDENSER AND COMBUSTION DEVICE

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Condenser Outlet Temperature: 200.00 deg. F  
 Condenser Pressure: 14.70 psia  
 Condenser Duty: 2.20e-001 MM BTU/hr  
 Produced Water: 15.64 bbls/day  
 Ambient Temperature: 0.00 deg. F

Excess Oxygen: 0.00 %  
 Combustion Efficiency: 98.00 %  
 Supplemental Fuel Requirement: 2.20e-001 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%

#### ABSORBER

Calculated Absorber Stages: 2.19  
 Specified Dry Gas Dew Point: 5.00 lbs. H2O/MMSCF  
 Temperature: 120.0 deg. F  
 Pressure: 1100.0 psig  
 Dry Gas Flow Rate: 88.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 6.3613 lb/hr  
 Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 95.10 lbs. H2O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 1.44 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	5.25%	94.75%
Carbon Dioxide	99.88%	0.12%
Nitrogen	99.99%	0.01%
Methane	99.99%	0.01%
Ethane	99.97%	0.03%
Propane	99.96%	0.04%
Isobutane	99.96%	0.04%
n-Butane	99.95%	0.05%
Isopentane	99.95%	0.05%
n-Pentane	99.94%	0.06%
n-Hexane	99.92%	0.08%
Other Hexanes	99.94%	0.06%
Benzene	96.89%	3.11%
Toluene	96.23%	3.77%
Ethylbenzene	95.76%	4.24%
Xylenes	93.98%	6.02%

#### FLASH TANK

Flash Control: Combustion device  
 Flash Control Efficiency: 98.00 %  
 Flash Temperature: 80.0 deg. F  
 Flash Pressure: 5.0 psig

Left in      Removed in



Component	Glycol	Flash Gas
Water	99.89%	0.11%
Carbon Dioxide	6.38%	93.62%
Nitrogen	0.34%	99.66%
Methane	0.38%	99.62%
Ethane	1.41%	98.59%
Propane	3.96%	96.04%
Isobutane	6.44%	93.56%
n-Butane	8.74%	91.26%
Isopentane	10.64%	89.36%
n-Pentane	13.51%	86.49%
n-Hexane	23.79%	76.21%
Other Hexanes	18.45%	81.55%
Benzene	92.81%	7.19%
Toluene	95.79%	4.21%
Ethylbenzene	97.83%	2.17%
Xylenes	98.67%	1.33%

# REGENERATOR

Regenerator Stripping Gas:  
 Dry Product Gas Stripping Gas Flow Rate: 9.0000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	16.82%	83.18%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	2.65%	97.35%
n-Pentane	2.28%	97.72%
n-Hexane	1.44%	98.56%
Other Hexanes	3.44%	96.56%
Benzene	5.33%	94.67%
Toluene	8.18%	91.82%
Ethylbenzene	10.58%	89.42%
Xylenes	13.09%	86.91%

# STREAM REPORTS:

## WET GAS STREAM

Temperature: 120.00 deg. F  
 Pressure: 1114.70 psia  
 Flow Rate: 3.67e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
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Water	2.00e-001	3.49e+002
Carbon Dioxide	1.62e-001	6.89e+002
Nitrogen	3.62e-001	9.83e+002
Methane	7.53e+001	1.17e+005
Ethane	1.55e+001	4.52e+004
Propane	5.17e+000	2.21e+004
Isobutane	6.75e-001	3.80e+003
n-Butane	1.47e+000	8.29e+003
Isopentane	3.47e-001	2.43e+003
n-Pentane	3.57e-001	2.50e+003
n-Hexane	6.79e-002	5.66e+002
Other Hexanes	3.46e-001	2.89e+003
Benzene	1.20e-003	9.06e+000
Toluene	3.59e-003	3.21e+001
Ethylbenzene	2.40e-003	2.46e+001
Xylenes	7.29e-003	7.49e+001
-----		
Total Components	100.00	2.07e+005

#### DRY GAS STREAM

Temperature: 120.00 deg. F  
 Pressure: 1114.70 psia  
 Flow Rate: 3.67e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	1.05e-002	1.83e+001
Carbon Dioxide	1.62e-001	6.88e+002
Nitrogen	3.63e-001	9.83e+002
Methane	7.55e+001	1.17e+005
Ethane	1.55e+001	4.52e+004
Propane	5.18e+000	2.21e+004
Isobutane	6.76e-001	3.80e+003
n-Butane	1.47e+000	8.28e+003
Isopentane	3.48e-001	2.43e+003
n-Pentane	3.58e-001	2.49e+003
n-Hexane	6.79e-002	5.66e+002
Other Hexanes	3.47e-001	2.89e+003
Benzene	1.16e-003	8.78e+000
Toluene	3.46e-003	3.08e+001
Ethylbenzene	2.30e-003	2.36e+001
Xylenes	6.86e-003	7.04e+001
-----		
Total Components	100.00	2.06e+005

#### LEAN GLYCOL STREAM

Temperature: 120.00 deg. F  
 Flow Rate: 7.92e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.85e+001	4.39e+003
Water	1.50e+000	6.69e+001
Carbon Dioxide	1.78e-012	7.93e-011
Nitrogen	2.58e-013	1.15e-011
Methane	8.81e-018	3.93e-016

Ethane	1.21e-007	5.39e-006
Propane	7.37e-009	3.29e-007
Isobutane	1.10e-009	4.91e-008
n-Butane	2.51e-009	1.12e-007
Isopentane	1.30e-004	5.78e-003
n-Pentane	1.66e-004	7.41e-003
n-Hexane	5.07e-005	2.26e-003
Other Hexanes	4.16e-004	1.85e-002
Benzene	3.33e-004	1.48e-002
Toluene	2.33e-003	1.04e-001
Ethylbenzene	2.72e-003	1.21e-001
Xylenes	1.51e-002	6.72e-001
-----		
Total Components	100.00	4.46e+003

#### RICH GLYCOL AND PUMP GAS STREAM

Temperature: 120.00 deg. F  
 Pressure: 1114.70 psia  
 Flow Rate: 8.84e+000 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	8.93e+001	4.38e+003
Water	8.11e+000	3.98e+002
Carbon Dioxide	2.13e-002	1.05e+000
Nitrogen	9.72e-003	4.77e-001
Methane	1.12e+000	5.49e+001
Ethane	5.72e-001	2.81e+001
Propane	3.30e-001	1.62e+001
Isobutane	6.18e-002	3.04e+000
n-Butane	1.54e-001	7.57e+000
Isopentane	4.18e-002	2.05e+000
n-Pentane	4.89e-002	2.40e+000
n-Hexane	1.35e-002	6.61e-001
Other Hexanes	5.95e-002	2.92e+000
Benzene	6.11e-003	3.00e-001
Toluene	2.70e-002	1.33e+000
Ethylbenzene	2.39e-002	1.17e+000
Xylenes	1.06e-001	5.20e+000
-----		
Total Components	100.00	4.91e+003

#### FLASH TANK OFF GAS STREAM

Temperature: 80.00 deg. F  
 Pressure: 19.70 psia  
 Flow Rate: 1.90e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	4.98e-001	4.49e-001
Carbon Dioxide	4.45e-001	9.80e-001
Nitrogen	3.39e-001	4.75e-001
Methane	6.81e+001	5.46e+001
Ethane	1.84e+001	2.77e+001
Propane	7.06e+000	1.56e+001
Isobutane	9.77e-001	2.84e+000

n-Butane	2.38e+000	6.91e+000
Isopentane	5.08e-001	1.83e+000
n-Pentane	5.76e-001	2.08e+000
n-Hexane	1.17e-001	5.04e-001
Other Hexanes	5.52e-001	2.38e+000
Benzene	5.52e-003	2.16e-002
Toluene	1.21e-002	5.58e-002
Ethylbenzene	4.80e-003	2.55e-002
Xylenes	1.30e-002	6.91e-002
-----		
Total Components	100.00	1.17e+002

## FLASH TANK GLYCOL STREAM

Temperature: 80.00 deg. F  
Flow Rate: 8.58e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.15e+001	4.38e+003
Water	8.30e+000	3.98e+002
Carbon Dioxide	1.39e-003	6.68e-002
Nitrogen	3.34e-005	1.60e-003
Methane	4.30e-003	2.06e-001
Ethane	8.25e-003	3.95e-001
Propane	1.34e-002	6.42e-001
Isobutane	4.08e-003	1.95e-001
n-Butane	1.38e-002	6.62e-001
Isopentane	4.55e-003	2.18e-001
n-Pentane	6.77e-003	3.25e-001
n-Hexane	3.28e-003	1.57e-001
Other Hexanes	1.12e-002	5.39e-001
Benzene	5.81e-003	2.78e-001
Toluene	2.65e-002	1.27e+000
Ethylbenzene	2.39e-002	1.15e+000
Xylenes	1.07e-001	5.13e+000
-----		
Total Components	100.00	4.79e+003

## FLASH GAS EMISSIONS

Flow Rate: 7.45e+003 scfh  
Control Method: Combustion Device  
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	6.20e+001	2.19e+002
Carbon Dioxide	3.74e+001	3.23e+002
Nitrogen	8.65e-002	4.75e-001
Methane	3.47e-001	1.09e+000
Ethane	9.39e-002	5.54e-001
Propane	3.60e-002	3.11e-001
Isobutane	4.98e-003	5.68e-002
n-Butane	1.21e-002	1.38e-001
Isopentane	2.59e-003	3.67e-002
n-Pentane	2.94e-003	4.16e-002
n-Hexane	5.96e-004	1.01e-002

Other Hexanes	2.81e-003	4.76e-002
Benzene	2.81e-005	4.31e-004
Toluene	6.18e-005	1.12e-003
Ethylbenzene	2.45e-005	5.10e-004

Xylenes	6.63e-005	1.38e-003
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Total Components	100.00	5.45e+002
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# REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 7.56e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.22e+001	3.31e+002
Carbon Dioxide	1.92e-002	1.68e-001
Nitrogen	2.62e-002	1.46e-001
Methane	5.45e+000	1.74e+001
Ethane	1.18e+000	7.05e+000
Propane	4.43e-001	3.89e+000
Isobutane	6.51e-002	7.54e-001
n-Butane	1.62e-001	1.88e+000
Isopentane	3.96e-002	5.70e-001
n-Pentane	4.76e-002	6.85e-001
n-Hexane	1.39e-002	2.38e-001
Other Hexanes	5.50e-002	9.45e-001
Benzene	1.70e-002	2.65e-001
Toluene	6.37e-002	1.17e+000
Ethylbenzene	4.87e-002	1.03e+000
Xylenes	2.11e-001	4.47e+000
Total Components	100.00	3.71e+002

# CONDENSER PRODUCED WATER STREAM

Temperature: 200.00 deg. F  
 Flow Rate: 4.56e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	2.28e+002	999977.
Carbon Dioxide	2.69e-005	6.14e-005	0.
Nitrogen	1.03e-006	2.35e-006	0.
Methane	1.97e-004	4.49e-004	2.
Ethane	8.37e-005	1.91e-004	1.
Propane	6.24e-005	1.42e-004	1.
Isobutane	6.11e-006	1.39e-005	0.
n-Butane	1.86e-005	4.25e-005	0.
Isopentane	3.59e-006	8.20e-006	0.
n-Pentane	4.45e-006	1.02e-005	0.
n-Hexane	1.13e-006	2.57e-006	0.
Other Hexanes	3.78e-006	8.62e-006	0.
Benzene	1.10e-004	2.50e-004	1.
Toluene	3.54e-004	8.07e-004	4.
Ethylbenzene	2.12e-004	4.84e-004	2.
Xylenes	1.18e-003	2.69e-003	12.

Total Components	100.00	2.28e+002	1000000.
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## CONDENSER RECOVERED OIL STREAM

Temperature: 200.00 deg. F

The calculated flow rate is less than 0.000001 #mol/hr.  
The stream flow rate and composition are not reported.

## CONDENSER VENT STREAM

Temperature: 200.00 deg. F

Pressure: 14.70 psia

Flow Rate: 2.75e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	7.85e+001	1.03e+002
Carbon Dioxide	5.26e-002	1.68e-001
Nitrogen	7.20e-002	1.46e-001
Methane	1.50e+001	1.74e+001
Ethane	3.23e+000	7.05e+000
Propane	1.22e+000	3.89e+000
Isobutane	1.79e-001	7.54e-001
n-Butane	4.46e-001	1.88e+000
Isopentane	1.09e-001	5.70e-001
n-Pentane	1.31e-001	6.84e-001
n-Hexane	3.81e-002	2.38e-001
Other Hexanes	1.51e-001	9.45e-001
Benzene	4.67e-002	2.64e-001
Toluene	1.75e-001	1.17e+000
Ethylbenzene	1.34e-001	1.03e+000
Xylenes	5.80e-001	4.47e+000
Total Components	100.00	1.43e+002

## COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F

Pressure: 14.70 psia

Flow Rate: 1.18e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	7.00e+001	3.49e-001
Ethane	1.51e+001	1.41e-001
Propane	5.68e+000	7.78e-002
Isobutane	8.35e-001	1.51e-002
n-Butane	2.08e+000	3.76e-002
Isopentane	5.08e-001	1.14e-002
n-Pentane	6.11e-001	1.37e-002
n-Hexane	1.78e-001	4.77e-003
Other Hexanes	7.06e-001	1.89e-002
Benzene	2.18e-001	5.29e-003
Toluene	8.17e-001	2.34e-002
Ethylbenzene	6.24e-001	2.06e-002
Xylenes	2.71e+000	8.94e-002

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Total Components	100.00	8.07e-001

**Attachment O.**  
**Monitoring, Recordkeeping, Reporting, and Testing Plans**



# **Monitoring, Recordkeeping, Reporting, and Testing Plans**

The following is a summary of the methods to comply with the requirements of West Virginia Division of Air Quality (WVDAQ) 45CSR13 rules and regulations for the Underwood Compressor Station, including federal and state regulatory requirements.

## **1. Summary of Key Operational Throughput Limits**

- a. Maximum wet gas throughput into each Dehy: 88 MMscf/day or 32,120 MMscf/year.
- b. Maximum liquids loaded out: 2,989,350 gallons per year.
- c. Maximum fuel use of all compressor engines is 1,346,061,600 scf/year

## **2. Operational Requirements**

- a. Compressor engines will operate with the catalytic converter in place at all times and will be fueled by natural gas only.
- b. Catalysts installed on all compressor engines will be operated per manufacturer instructions.
- c. Reciprocating compressor rod packing will be replaced within 36 months of last packing/startup or within 26,000 operating hours, whichever comes first.
- d. Microturbines will be fueled by natural gas only.
- e. Each Dehy Reboiler will operate at no more than 1.5 MMBtu/hr and fueled only by natural gas or off-gases from the Dehydrator flash tanks.
- f. No fuel-burning unit of any kind will have opacity greater than 10 percent based on a six minute block average observation.
- g. The Dehy Flare capacity will not exceed 9.2 MMBtu/hr, will achieve 98 percent destruction efficiency, will operate at all times that gas is vented to it, will have a flame present at all times, and will have no visible emissions other than for periods not to exceed a total of 5 minutes during any 2 consecutive hours.
- h. The flare will be operated per manufacturer instructions.
- i. Produced water, Condensate, and Settling storage tanks potential emissions will be routed to the VRUs with recovery greater than 98 percent at all times.
- j. Storage tanks will be covered and routed to a closed vent system with no detectable emissions.
- k. Liquid loadout trucks will use the submerged-fill method.
- l. Dehydrator still vents will be controlled by the flare.
- m. Dehydrator flash tank vent gas is to be used in the reboiler as fuel or routed to the VRU system.

## **3. Monitoring**

- a. Non-certified engines will be stack tested within 1 year of startup and every 8,760 hours of operation thereafter.
- b. Catalyst inlet temperature will be monitored.

- c. Compressor run time or number of months since compressor rod repacking will be monitored or tracked.
- d. Daily, monthly, and rolling 12-month average wet gas throughput for the Dehy will be monitored.
- e. Initial Method 22 observation of the Reboiler exhaust and flare will be conducted for a minimum of 2 hours.
- f. Monthly Method 22 observations of the Reboiler exhaust and flare will be conducted for a minimum of 10 minutes each.
- g. Monthly olfactory, visual, and auditory inspections will be conducted of the tanks closed vent and control system (flare) for leaks or defects that could result in emissions. Leaks will be repaired as soon as practicable (no later than 5 days for first attempt).
- h. The presence of flare flame will continuously be monitored.
- i. Monthly and rolling twelve-month average amount of liquids loaded out will be monitored.

#### **4. Recordkeeping**

- a. Records will be kept for a minimum of 5 years.
- b. Records of inspection, observations, preventive maintenance, malfunctions, and shutdowns of all onsite equipment will be kept.
- c. Records of the date, time, duration of each time that a flame is not present at the flare and startup, shutdown, malfunctions of the flare will be kept.
- d. Records of engine maintenance and engine run time will be kept.
- e. Records of catalyst inlet temperature will be kept.
- f. Records of the actual annual average natural gas throughput in the dehy will be kept.

#### **5. Notifications and Reports**

- a. WVDAQ will be notified within 30 calendar days of commencement of construction.
- b. WVDAQ will be notified within 30 calendar days of startup.
- c. Upon startup, a Certificate to Operate (CTO) application will be filed and fees to WVDAQ will be paid for the period from startup to the following June 30 and then annually renew the CTO and pay fees. CTO will be maintained on-site.
- d. An annual report of compliance with 40 CFR 60 Subpart OOOO for the compressors and storage tanks (for settling tank only) will be submitted within 90 days after one year of operation (i.e., within 90 days after 12 months after initial startup).
- e. For stack testing, a protocol will be filed at least 30 days prior to test and WVDAQ and EPA will be notified of the test at least 15 days prior to test. Results will be reported within 60 days of the test.
- f. If operations are suspended for 60 days or more, WVDAQ will be notified within 2 weeks after the 60<sup>th</sup> day.

**Attachment P.  
Public Notice**

**AIR QUALITY PERMIT NOTICE**  
**Notice of Application – Underwood Compressor Station**

Notice is given that Antero Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a 45CSR13 Construction Permit Modification for a Natural Gas Compressor Station located west of Centerville and south of WV Route 18, in Tyler County, West Virginia. The latitude and longitude coordinates are: 39.432520N, 80.871581W.

The applicant estimates the increased potential to discharge of the following Regulated Air Pollutants will be: Sulfur Dioxide (SO<sub>2</sub>): 0.12 tpy; Particulate Matter less than 10 µm (PM<sub>10</sub>): 3.70 tpy; Particulate Matter less than 2.5 µm (PM<sub>2.5</sub>): 3.70 tpy; Benzene: 0.30 tpy; Toluene: 0.084 tpy; Xylenes: 0.010 tpy; and Carbon Dioxide equivalent (CO<sub>2e</sub>): 27,140 tpy.

The applicant estimates the decreased potential to discharge of the following Regulated Air Pollutants will be: Nitrogen Oxides (NO<sub>x</sub>): 4.54 tons per year (tpy); Carbon Monoxide (CO): 4.21 tpy; Volatile Organic Compounds (VOC): 28.63 tpy; Ethylbenzene – 0.011 tpy; n-Hexane: 0.12 tpy; and Formaldehyde: 0.87 tpy.

Startup of modified operation is planned to begin on or about the 1<sup>st</sup> day of June 2016. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57<sup>th</sup> 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 15th day of February 2016.

By: Antero Midstream LLC  
Barry Schatz  
Midstream Environmental Supervisor  
1615 Wynkoop Street  
Denver, CO 80202

**Attachment R.**  
**Authority/Delegation of Authority**

**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: August 5, 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 46-5517375

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) Luz Slauter and 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.

  
Ward McNeilly, Vice President - Vice President Reserves Planning & Midstream

\_\_\_\_\_  
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

Antero Midstream LLC  
Name of Corporation or business entity