



Jerry  
13-3167A  
017-00084

January 5, 2015

Mr. Jerry Williams, 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 – Canton North Compressor Station  
West Virginia Department of Environmental Protection, Division of Air  
Quality, 45CSR13 Air Permit Modification R13-3167**

Dear Mr. Williams,

On behalf of Antero Midstream LLC, please find attached the 45CSR13 Air Permit Modification for permit number R13-3167 for the Monroe Compressor Station (Facility ID 017-00084) located in Doddridge County, West Virginia. A summary of the modifications in this application include:

1. Updated compressor engine emissions to reflect actual operating conditions of the NSCR catalysts,
2. Updated tank emissions to reflect actual production numbers,
3. Updated truck loading emissions to reflect no controls, and
4. Updated fugitive dust emissions to include haul road traffic.

Additionally, Antero is requesting to modify the permit language for the recordkeeping of the hours of operation for the generators. Attachment G and Attachment N explains how the turbine generator systems are configured for optimal performance. Antero's Monroe Compressor Station (R13-3184) is permitted in such a way that any of the units that make up the generator system can be used equally as long as the total does not exceed 9,260 hours and there is no more than 600 kW operating at any time. Antero is requesting that Canton North Compressor Station be permitted the same as Monroe (see condition 5.1.3 in R13-3184).

Lastly, the original permit application was submitted under the parent corporation, Antero Resources Appalachian Corporation; however, the facility should now be permitted under Antero Midstream LLC. This was strictly an administrative change and no money was exchanged in this name change; thus, a permit transfer cover form was not filled out as there was no buyer or seller in this case and the facility itself did go through a name change.

Enclosed are copies of the entire permit application plus the original, including the permit application form and the required attachments. Per 45CSR22, a \$1,000 application fee is also enclosed, which covers the base 45CSR13 application fee.

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

**Antero Midstream LLC**



**Canton North Compressor Station**

**NSR Permit Application R13-3167 Modification  
West Virginia Department of Environmental Protection  
Division of Air Quality  
45CSR13**

**Doddridge County, West Virginia**

**January 2015**

**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

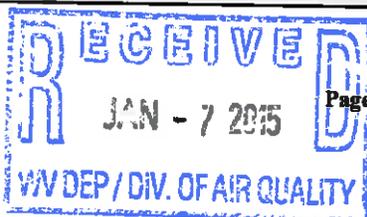
IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS ATTACHMENT S TO THIS APPLICATION

**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): Canton North 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: WV-23W Center Point, WV 26339	
6. West Virginia Business Registration. Is the applicant a resident of the State of West Virginia? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO - If YES, provide a copy of the Certificate of Incorporation/Organization/Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A. - If NO, provide a copy of the Certificate of Authority/Authority of L.L.C./Registration (one page) including any name change amendments or other Business Certificate as Attachment A.			
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 proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO - If YES, please explain:    Antero Midstream LLC owns the land for the proposed site - If NO, you are not eligible for a permit for this source.			
9. Type of plant or facility (stationary source) to be constructed, modified, relocated, administratively updated or temporarily permitted (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): 017-00084		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): R13-3167	

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 **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction or Relocation permits**, please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

From Center Point, WV, drive west on WV-23 approximately 4.3 miles to facility. Facility will be on the south side of WV-23.

12.B. New site address (if applicable): WV-23W Center Point, WV 26339	12C. Nearest city or town: Center Point	12D. County: Doddridge
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12.E. UTM Northing (KM): 4361.686	12F. UTM Easting (KM): 527.254	12G. UTM Zone: 17
-----------------------------------	--------------------------------	-------------------

13. Briefly describe the proposed change(s) at the facility:

The VRU controlling hydrocarbon loading has been removed. The reduction efficiencies for the engine catalysts have been updated based on typical operating conditions. Production numbers have been updated based on actual operations.

14A. Provide the date of anticipated installation or change: Upon Permit Issuance

- If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen:     /     /

14B. Date of anticipated Start-Up if a permit is granted:  
Upon Permit Issuance

14C. Provide a **Schedule** of the planned **Installation of/Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** 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?    YES    NO

17. **Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see [www.epa.gov/ceppo](http://www.epa.gov/ceppo)), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18. **Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process (*if known*). 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 (*if known*). Provide this information as **Attachment D**.

### **Section II. Additional attachments and supporting documents.**

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).
20. Include a **Table of Contents** as the first page of your application package.
21. Provide a **Plot Plan**, 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 **Attachment E** (Refer to **Plot Plan Guidance**).
- Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).
22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F**.
23. Provide a **Process Description** as **Attachment G**.
- Also describe and quantify to the extent possible all changes made to the facility since the last permit review (*if applicable*).

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

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 checked="" type="checkbox"/> Bulk Liquid Transfer Operations | <input checked="" 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 checked="" type="checkbox"/> Storage Tanks                                |
| <input type="checkbox"/> Grey Iron and Steel Foundry                | <input type="checkbox"/> Indirect Heat Exchanger        |  |
- General Emission Unit, specify: Engines, Dehydrator, Generator, Catalytic Heater

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 checked="" 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 |
- Other Collectors, specify : Catalysts, VRU

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 checked="" 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 *Luz Slauter*  
(Please use blue ink)

DATE: 12/30/2014  
(Please use blue ink)

35B. Printed name of signee: Luz C. Slauter

35C. Title: Midstream Environmental Manager

35D. E-mail: lslauter@anteroresources.com

35E. Phone: (303)357-6834

35F. FAX: (303)357-7315

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

36B. Title:

36C. E-mail:

36D. Phone:

36E. FAX:

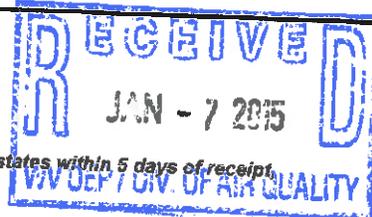
**PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:**

- |  |  |
|--|--|
| <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 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**

## **Canton North Compressor Station – Closest Antero Midstream 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 Canton North Compressor Station will operate under SIC code 4922 (pipeline transportation of natural gas). The closest facility owned by Antero Midstream LLC with this SIC code is a compressor station 9.8 miles west of the facility and a compressor station 8.0 miles south of the facility. All Antero Resources Corporation production facilities operate under the SIC code of 1311 (crude petroleum of natural gas).

3. **Continuous or Adjacent:** The land between the Canton North Compressor Station and its nearest facility operating under the same SIC code is not owned or managed by Antero Midstream LLC. Therefore, the facilities are not considered to be adjacent or continuous.

Based on this three-pronged evaluation, there are no other existing facilities that should aggregate emissions with Canton North Compressor Station.

**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 STATE

Submitted 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 25305



Penney Backer, Manager  
Corporations Division  
Tel: (304)558-8000  
Fax: (304)558-8381  
Website: www.wvssa.com  
E-mail: hbacker@wvssa.com

FILE ONE ORIGINAL.  
(Two if you want a filed  
stamped copy returned to you)  
FEE: \$150

WV APPLICATION FOR  
CERTIFICATE OF AUTHORITY OF  
LIMITED LIABILITY COMPANY

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

Control # 04821

1. The name of the company as registered in its home state is: Antero Midstream LLC

and 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 (If name is not available, check DBA Name box below and follow special instructions in Section 2, attached.)  
 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 25313

6. 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

7. E-mail address where business correspondence may be received: jgiannaula@anteroresources.com

8. 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).

Name	Street Address	City, State, Zip
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?

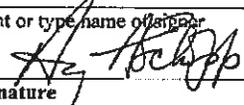
Yes [If "Yes," you must complete the Scrap Metal Dealer Registration Form (Form SMD-1) and proceed to question 14.].

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**





**Attachment C.  
Installation and Startup Schedule**

### **Canton North Compressor Station – Installation and Startup Schedule**

The Canton North Compressor Station is located in Doddridge County, WV, approximately 2.8 miles west northwest of Center Point, WV. Ground clearing and other site preparation activities began in December 2013. Operations began upon permit approval. There will be no new equipment installed onsite. The modifications are strictly for changing operating conditions.

**Attachment D.  
Regulatory Discussion**

## **Canton North 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)). Since all storage tanks at the Canton North Compressor Station are 64 m<sup>3</sup>, Subpart Kb does not apply.

- 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 Canton North 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 does not apply as the Canton North Compressor Station was constructed after that date.

- 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 Canton North Compressor Station was constructed after that date.

- 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 Canton North Compressor Station as the compressor engines were ordered in 2013 and manufactured in July or August 2013.

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 Canton North 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 Canton North Compressor Station as it was constructed after August 23, 2011 and has reciprocating compressors and a settling tank. The pneumatic controllers installed at Canton North 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 Canton North 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 Canton North Compressor Station, and because it is an area source of HAP emissions, the two (2) TEG dehydrators will be applicable sources under Subpart HH (§63.760(b)(2)). However, actual benzene emissions from the dehydrators at the Canton North 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 Canton North Compressor Station as it is not a major source of HAP emissions. Further, the Canton North 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 Canton North 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 Canton North 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 Canton North 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 Canton North 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 Canton North 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 Canton North 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**

### **Canton North Compressor Station – Plot Plan**

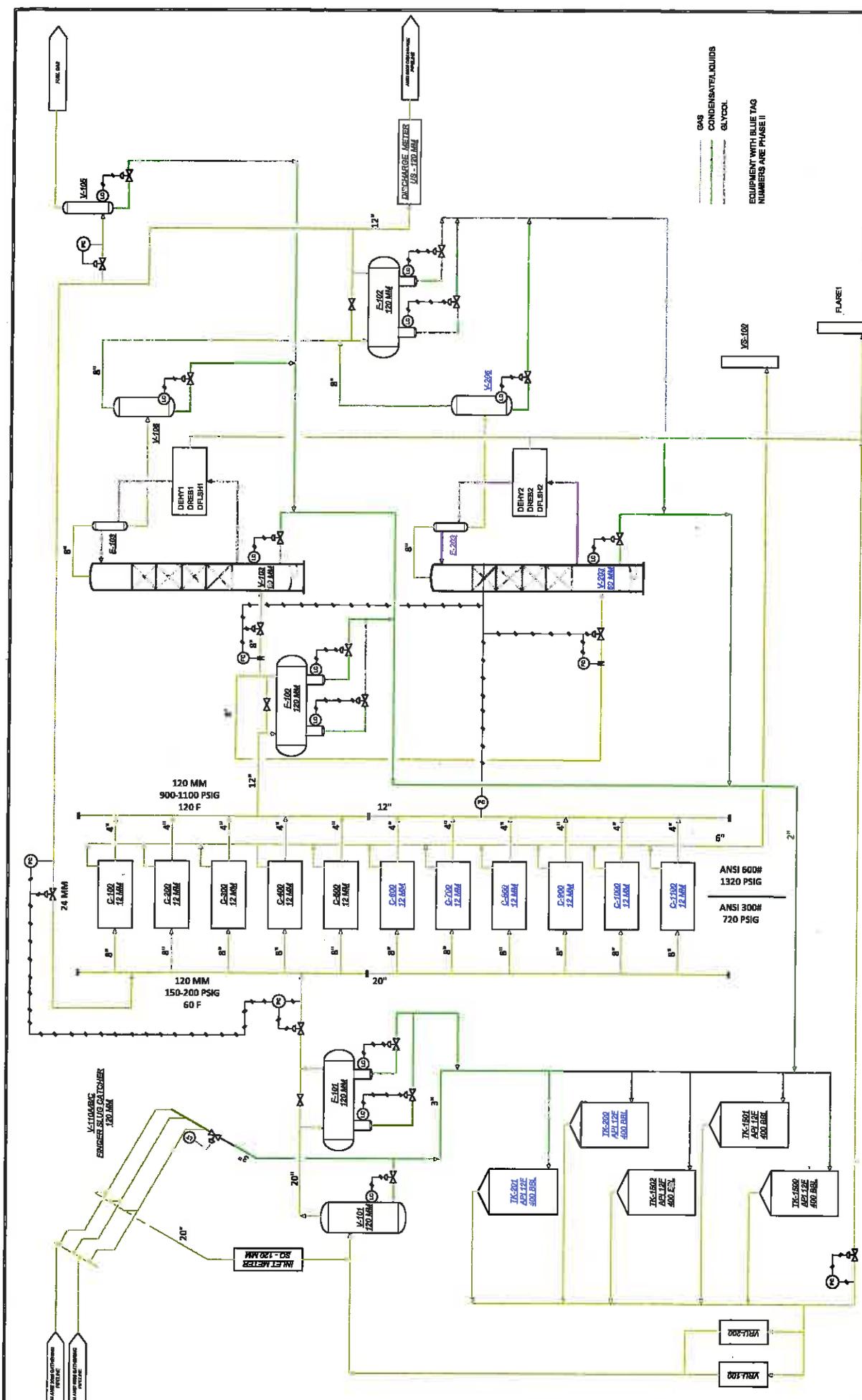
The attached plot plan is for the Mountain Compressor Station. The Canton North Compressor Station has the same layout, just rotated 180 degrees.



**Attachment F.  
Process Flow Diagram**

## **Canton North Compressor Station – Process Flow Diagram**

The attached process flow diagram is for the Mountain Compressor Station. The Canton North Compressor Station has same equipment and process flow.



GAS  
 CONDENSATE/LIQUIDS  
 GLYCOL  
 EQUIPMENT WITH BLUE TAG  
 NUMBERS ARE PHASE II

<b>ANTERO RESOURCES</b>			
<b>MOUNTAIN COMPRESSOR STATION</b>			
PROJECT: 231100	APPR. BY:	APPROVAL DATE:	
PIPE NO.:	SCALE: NONE	CREATED: DM/10/13	
DRAWN BY: BAK			
			1 OF 1

**Attachment G.  
Process Description**

## **Canton North Compressor Station – Process Description**

The Canton North Compressor Station is located in Doddridge 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 scrubber and filter separator. Any produced liquids from the scrubber or separator are sent to the 400 barrel settling tank (TK-1502). Gas from the filter separator is sent to one (1) of eleven (11) 1680 hp Waukesha compressor engines (C-100 – C-1100). The eleven (11) compressor engines are controlled with NSCR catalysts and air-fuel ratio controllers (1C – 11C). Produced fluids are routed to the settling tank and gas going to one of the two (2) TEG dehydrators.

Each TEG dehydrator (DEHY1 – DEHY2) contains a flash gas tank and 1.5 MMBtu/hr reboiler. Each dehydrator has a design rate of 60 MMscf/day. Within the dehydrator unit, vent gas from the flash gas tank (DFLSH1 – DFLSH2) is routed to the reboiler (DREB1 – DREB2) and used as fuel, with an assumed 95% efficiency for combusting the gas. Emissions from each reboiler are routed to the atmosphere. The dehydrator still vents (DEHY1 – DEHY2) are controlled by a flare with at least 98% control efficiency (FLARE1). 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 plant discharge.

All produced fluids enter one (1) 400 barrel settling tank (TK-1502) where the fluids settle out as either condensate or produced water. The produced water goes to two (2) 400 barrel produced water tanks (TK-1500 – TK-1501) and the condensate goes to two (2) 400 barrel condensate tanks (TK-200 – TK-201). 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 vapor recovery unit (VRU-100) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. There is a second vapor recovery unit (VRU-200) that is used as a back-up control for the storage tanks. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The production is 150 barrels per day of condensate and 45 barrels per day of produced water.

Two (2) natural gas microturbine generators, each rated at 600 kWe supply power to the facility (GEN1 – GEN2). Each 600 kWe generator is actually comprised of three smaller units, each rated at 200 kWe. All engines (six 200 kWe) are wired together and operation between individual 200 kWe engines will rotate based on functionality of engines. No more than 600 kwe will be operational at any given time, except when units are being switched. Each individual engine will continuously record hours of operation. Statement from manufacturer on operation: "The system will be set up to ensure that no more than 3 engines out of any one of the 6 is operating at a given time. The engines are individually serial numbered and should be looked at as individual 200 kW engines. The only exception to 3 units operating would be during rotation where a 4<sup>th</sup> unit would be started so that the unit with the highest runtime could be shut down. This would typically be less than 5 minutes. Any engine operating must share the load with other operating units. An engine cannot be run at idle while others are loaded. There if 3 units are in load, they would each be handling 33.3% of the load. A small 24,000 Btu/hr catalytic

heater (CATHT-1) is used to heat the fuel to power the generators. Fugitive emissions from component leaks and emissions from venting or blowdown events also occur.

There will also be six (6) small storage tanks (between 1,000 and 2,000 gallon storage capacity) onsite. A list of the tanks and their capacity is in the table below.

Tag Number	Description	Gallons
TK-300	Compressor Skid Oily Water Tank	1,000
TK-301	Used Oil Tank	1,000
TK-104	TEG Make-Up Tank	1,000
TK-106	Compressor Coolant Tank	2,000
TK-107	Engine Lube Oil Tank	2,000
TK-108	Compressor Lube Oil Tank	2,000

**Attachment H.  
Material Safety Data Sheets**

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

<b>JMN Specialties, Inc.</b> 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
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**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**  
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## 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

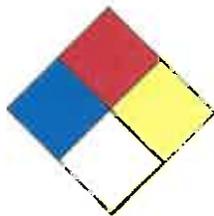
**Material Name:** Produced Water

**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

## \*\*\* Section 6 – ACCIDENTAL RELEASE MEASURES \*\*\*

### Recovery and Neutralization

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

### Materials and Methods for Clean-Up

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

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

### Emergency Measures

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

### Personal Precautions and Protective Equipment

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

### Environmental Precautions

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

### Prevention of Secondary Hazards

None

# SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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

### Handling Procedures

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

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

### Storage Procedures

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

### Incompatibilities

Keep away from excessive heat to prevent rupture of container.

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

### Component Exposure Limits

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

ACGIH: Not listed

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

ACGIH: Not listed

### Engineering Measures

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

### Personal Protective Equipment: Respiratory

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

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

# SAFETY DATA SHEET

**Material Name: Produced Water**

**US GHS**

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

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

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

## **Personal Protective Equipment: Eyes**

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

## **Hygiene Measures**

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

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

<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: (LFL):</b>	ND	<b>Upper Flammability Limit: (UFL):</b>	ND
<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

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

**Waste Disposal Instructions**

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

**Disposal of Contaminated Containers or Packaging**

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

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

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

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

**DOT Information**

**Shipping Description:** Not Regulated

**UN #:** Not Regulated

# SAFETY DATA SHEET

Material Name: Produced Water

US GHS

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

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

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

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

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

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

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

### **State Regulations**

#### **Component Analysis**

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

### **California Proposition 65:**

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

### **National Chemical Inventories:**

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

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

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

### **NFPA® Hazard Rating**

Health 1  
Fire 0  
Reactivity 0

### **HMIS® Hazard Rating**

Health 1 Slight  
Fire 0 Minimal  
Physical 0 Minimal

# **SAFETY DATA SHEET**

**Material Name: Produced Water**

**US GHS**

## **Key/Legend**

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

## **Literature References**

None

## **Other Information**

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

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

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

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

End of Sheet



# Antero SAFETY DATA SHEET

Resources

**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 \*\*\***

<b>PRODUCT NAME:</b> Natural Gas Condensate	<b>EMERGENCY PHONE:</b> (800) 878-1373
<b>PRODUCT CODES:</b> 64741-47-5	<b>AFTER HOURS:</b> (800) 878-1373
<b>PRODUCER:</b> Antero Resources	
<b>ADDRESS:</b> 1615 Wynkoop Street Denver, Colorado 80202	<b>CHEMTREC PHONE:</b> (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

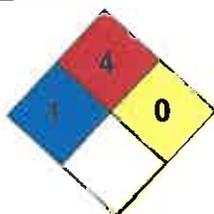
US GHS

Material Name: Natural Gas Condensate

## 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.

## \*\*\* Section 6 – ACCIDENTAL RELEASE MEASURES \*\*\*

### Recovery and Neutralization

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

### Materials and Methods for Clean-Up

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

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

### Emergency Measures

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

### Personal Precautions and Protective Equipment

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

# SAFETY DATA SHEET

**Material Name: Natural Gas Condensate**

**US GHS**

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

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

## **Environmental Precautions**

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

## **Prevention of Secondary Hazards**

None

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

### **Handling Procedures**

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

### **Storage Procedures**

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

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

# SAFETY DATA SHEET

**Material Name: Natural Gas Condensate**

**US GHS**

## **Incompatibilities**

Keep away from strong oxidizers, ignition sources and heat.

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

### **Component Exposure Limits**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ACGIH: 20 ppm TWA (listed under Toluene)

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

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

US GHS

## Engineering Measures

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

## Personal Protective Equipment: Respiratory

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

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

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

## Personal Protective Equipment: Hands

Gloves constructed of nitrile or neoprene are recommended.

## Personal Protective Equipment: Eyes

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

## Personal Protective Equipment: Skin and Body

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

## Hygiene Measures

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

# SAFETY DATA SHEET

**Material Name: Natural Gas Condensate**

**US GHS**

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

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

<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

US GHS

**Potential Health Effects: Eye Critical Damage / Stimulativeness**  
Contact with eyes may cause moderate irritation.

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

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

**Respiratory Organs Sensitization / Skin Sensitization**  
This product is not reported to have any skin sensitization effects.

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

## Carcinogenicity

### A: General Product Information

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

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

### B: Component Carcinogenicity

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

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

US GHS

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

## Reproductive Toxicity

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

## Specified Target Organ General Toxicity: Single Exposure

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

## Specified Target Organ General Toxicity: Repeated Exposure

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

## Aspiration Respiratory Organs Hazard

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

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

## Ecotoxicity

### A: General Product Information

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

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

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

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

US GHS

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

### Test and Species

96 Hr LC50 *Alburnus alburnus*  
96 Hr LC50 *Cyprinodon variegatus*  
72 Hr EC50 *Pseudokirchneriella*  
subcapitata  
24 Hr EC50 *Daphnia magna*

### Conditions

119 mg/L [static]  
82 mg/L [static]  
56 mg/L  
170 mg/L

### Persistence / Degradability

No information available

### Bioaccumulation

No information available

### Mobility in Soil

No information available

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

### Waste Disposal Instructions

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

### Disposal of Contaminated Containers or Packaging

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

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

# SAFETY DATA SHEET

Material Name: Natural Gas Condensate

US GHS

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

### DOT Information

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

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

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

**Placard:**



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

### Regulatory Information

#### Component Analysis

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

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

SARA 313: 0.1% de minimis concentration

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

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

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

#### SARA SECTION 313 – SUPPLIER NOTIFICATION

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

# SAFETY DATA SHEET

**Material Name:** Natural Gas Condensate

**US GHS**

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

## Canadian Regulatory Information

**DSL/NDSL  
Inventory**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

**Workplace  
Hazardous  
Materials  
Information  
System**

B2 - Flammable Liquid  
D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material  
D2A: Material Causing Other Toxic Effects Very Toxic  
D2B - Material Causing Other Toxic Effects - Toxic Material

## European Union Regulatory Information

**Labeling**

Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives.  
Contains: Low Boiling Point Naphtha

**Symbol**

F+ Extremely Flammable  
T Toxic  
N Dangerous for the Environment

**Risk Phrases**

R12-45-38-65-67-51/53  
Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Vapors may cause drowsiness and dizziness. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

**Safety  
Phrases**

S16-53-45-2-23-24-29-43-62  
Keep away from sources of ignition – No smoking. Avoid exposure – obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Keep out of reach of children. Do not breathe vapor. Avoid contact with skin. Do not empty into drains. In case of fire use foam/dry powder/CO2. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

# SAFETY DATA SHEET

**Material Name: Natural Gas Condensate**

**US GHS**

**State Regulations**

**Component Analysis – State**

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

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

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

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

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

**Component Analysis – WHMIS IDL**

The following components are identified under the Canadian Hazardous Products Act

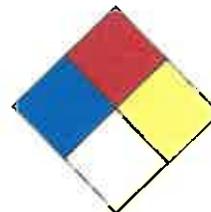
Ingredient Disclosure List:

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

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

**NFPA® Hazard Rating**

Health 1  
Fire 4  
Reactivity 0



**HMIS® Hazard Rating**

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

# **SAFETY DATA SHEET**

**Material Name: Natural Gas Condensate**

**US GHS**

## **Key/Legend**

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

## **Literature References**

None

## **Other Information**

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

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

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

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

End of Sheet

 **Antero SAFETY DATA SHEET**  
Resources

**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

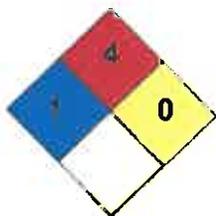
**First Aid: Ingestion**

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.

## \*\*\* Section 6 – ACCIDENTAL RELEASE MEASURES \*\*\*

### **Recovery and Neutralization**

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

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

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

### **Emergency Measures**

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

### **Personal Precautions and Protective Equipment**

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

### **Environmental Precautions**

Do not flush gas vapors toward sewer or drainage systems.

### **Prevention of Secondary Hazards**

None.

# SAFETY DATA SHEET

**Material Name: 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.

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

<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 1minute

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

N/A – Necessary for life

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

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

**Generative Cell Mutagenicity**

This product is not reported to have any mutagenic effects.

**Carcinogenicity**

**A: General Product Information**

This product is not reported to have any carcinogenic effects.

**B: Component Carcinogenicity**

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

**Reproductive Toxicity**

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

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

This product may cause damage to the heart.

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

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

**Aspiration Respiratory Organs Hazard**

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

# 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**

<b>*** Section 15 – REGULATORY INFORMATION ***</b>
--

**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**

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

**SARA Section 313 – Supplier Notification**

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

**State Regulations**

**Component Analysis – State**

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

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

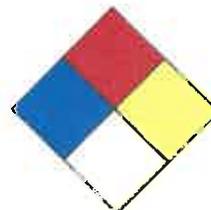
# SAFETY DATA SHEET

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 \*\*\***

<b>PRODUCT NAME:</b>	<b>Dry 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:** Dry Field Natural Gas

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## 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

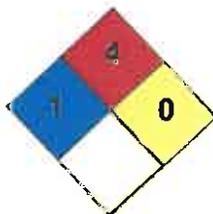
**First Aid: Ingestion**

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.

## \*\*\* Section 6 – ACCIDENTAL RELEASE MEASURES \*\*\*

### **Recovery and Neutralization**

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

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

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

### **Emergency Measures**

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

### **Personal Precautions and Protective Equipment**

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

### **Environmental Precautions**

Do not flush gas vapors toward sewer or drainage systems.

### **Prevention of Secondary Hazards**

None.

# SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

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

### Handling Procedures

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

### Storage Procedures

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

### Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

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

### Component Exposure Limits

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

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

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

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

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

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

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

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

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

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

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

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

# SAFETY DATA SHEET

**Material Name: Dry Field Natural Gas**

**US GHS**

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

Simple Asphyxiant

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

ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

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

N/A – Necessary for life

**Engineering Measures**

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

**Personal Protective Equipment: Respiratory**

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

**Personal Protective Equipment: Hands**

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

**Personal Protective Equipment: Eyes**

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

**Personal Protective Equipment: Skin and Body**

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

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

<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**

**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 1minute

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

N/A – Necessary for life

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

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

**Generative Cell Mutagenicity**

This product is not reported to have any mutagenic effects.

**Carcinogenicity**

**A: General Product Information**

This product is not reported to have any carcinogenic effects.

**B: Component Carcinogenicity**

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

**Reproductive Toxicity**

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

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

This product may cause damage to the heart.

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

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

**Aspiration Respiratory Organs Hazard**

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

# SAFETY DATA SHEET

Material Name: Dry Field Natural Gas

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## \*\*\* 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**

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

**SARA Section 313 – Supplier Notification**

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

**State Regulations**

**Component Analysis – State**

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

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

# SAFETY DATA SHEET

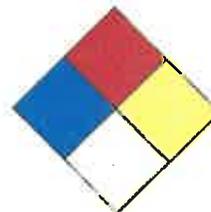
Material Name: Dry Field Natural Gas

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-100	1E	Compressor Engine #1	2013	1680 hp	Modification	NSCR (1C)
C-200	2E	Compressor Engine #2	2013	1680 hp	Modification	NSCR (2C)
C-300	3E	Compressor Engine #3	2013	1680 hp	Modification	NSCR (3C)
C-400	4E	Compressor Engine #4	2013	1680 hp	Modification	NSCR (4C)
C-500	5E	Compressor Engine #5	2013	1680 hp	Modification	NSCR (5C)
C-600	6E	Compressor Engine #6	2013	1680 hp	Modification	NSCR (6C)
C-700	7E	Compressor Engine #7	2013	1680 hp	Modification	NSCR (7C)
C-800	8E	Compressor Engine #8	2013	1680 hp	Modification	NSCR (8C)
C-900	9E	Compressor Engine #9	2013	1680 hp	Modification	NSCR (9C)
C-1000	10E	Compressor Engine #10	2013	1680 hp	Modification	NSCR(10C)
C-1100	11E	Compressor Engine #11	2013	1680 hp	Modification	NSCR(11C)
GEN1	12E	Microturbine Generator #1	2013	600 kWe	Modification	None
GEN2	13E	Microturbine Generator #2	2013	600 kWe	Modification	None
DEHY1	14E	Dehydrator Still Vent #1	2013	60 MMscfd	NA	FLARE1 (12C)
DFLSH1	15E	Dehydrator Flash Tank #1	2013	60 MMscfd	NA	95% control
DREB1	16E	Dehydrator Reboiler #1	2013	1.5 mmbtu/hr	NA	None
DEHY2	17E	Dehydrator Still Vent #2	2013	60 MMscfd	NA	FLARE1 (12C)
DFLSH2	18E	Dehydrator Flash Tank #2	2013	60 MMscfd	NA	95% control
DREB2	19E	Dehydrator Reboiler #2	2013	1.5 mmbtu/hr	NA	None
TK-1502	20E	Settling Tank 1	2013	400 barrel	Modification	VRU-100 & 200 (13C & 14C)
TK-200	21E	Condensate Tank 1	2013	400 barrel	Modification	VRU-100 & 200 (13C & 14C)
TK-201	22E	Condensate Tank 2	2013	400 barrel	Modification	VRU-100 & 200 (13C & 14C)
TK-1500	23E	Produced Water Tank 1	2013	400 barrel	Modification	VRU-100 & 200 (13C & 14C)

TK-1501	24E	Produced Water Tank 2	2013	400 barrel	Modification	VRU-100 & 200 (13C & 14C)
----	----	NSCR Catalyst for Compressor #1	2013	----	Modification	1C
----	----	NSCR Catalyst for Compressor #2	2013	----	Modification	2C
----	----	NSCR Catalyst for Compressor #3	2013	----	Modification	3C
----	----	NSCR Catalyst for Compressor #4	2013	----	Modification	4C
----	----	NSCR Catalyst for Compressor #5	2013	----	Modification	5C
----	----	NSCR Catalyst for Compressor #6	2013	----	Modification	6C
----	----	NSCR Catalyst for Compressor #7	2013	----	Modification	7C
----	----	NSCR Catalyst for Compressor #8	2013	----	Modification	8C
----	----	NSCR Catalyst for Compressor #9	2013	----	Modification	9C
----	----	NSCR Catalyst for Compressor #10	2013	----	Modification	10C
----	----	NSCR Catalyst for Compressor #11	2013	----	Modification	11C
FLARE1	26E	Flare Combustion Device 1	2013	4.8 MMBtu/hr	NA	12C
VRU-100	----	Vapor Recovery Unit 1	2013	TBD	NA	13C
VRU-200	----	Vapor Recovery Unit 2	2013	TBD	Modification	14C
CATHT1	27E	Catalytic Heater	2013	24,000 Bt/hr	NA	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>3</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-100	Com-pressor engine 1	1C	NSCR catalyst	C	8760	NOx	50.37	196.82	2.01	7.87	Gas/Vapor	EE	
								CO	47.41	185.24	1.90	7.41			
								VOC	1.56	6.08	0.78	3.04			
								PM10	0.27	1.06	0.27	1.06			
								SO2	0.01	0.03	0.01	0.03			
								Total HAPs	0.35	1.37	0.21	0.82			
								Formaldehyde	0.19	0.72	0.04	0.17			
CO2e	2088	8159	1993	7789											
2E	Upward Vertical Stack	C-200	Com-pressor engine 2	2C	NSCR catalyst	C	8760	NOx	50.37	196.82	2.01	7.87	Gas/Vapor	EE	
								CO	47.41	185.24	1.90	7.41			
								VOC	1.56	6.08	0.78	3.04			
								PM10	0.27	1.06	0.27	1.06			
								SO2	0.01	0.03	0.01	0.03			
								Total HAPs	0.35	1.37	0.21	0.82			
								Formaldehyde	0.19	0.72	0.04	0.17			
CO2e	2088	8159	1993	7789											
3E	Upward Vertical Stack	C-300	Com-pressor engine 3	3C	NSCR catalyst	C	8760	NOx	50.37	196.82	2.01	7.87	Gas/Vapor	EE	
								CO	47.41	185.24	1.90	7.41			
								VOC	1.56	6.08	0.78	3.04			
								PM10	0.27	1.06	0.27	1.06			
								SO2	0.01	0.03	0.01	0.03			
								Total HAPs	0.35	1.37	0.21	0.82			
								Formaldehyde	0.19	0.72	0.04	0.17			
CO2e	2088	8159	1993	7789											

4E		Upward Vertical Stack	C-400	Com-pressor engine 4	4C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	
5E		Upward Vertical Stack	C-500	Com-pressor engine 5	5C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	
6E		Upward Vertical Stack	C-600	Com-pressor engine 6	6C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	
7E		Upward Vertical Stack	C-700	Com-pressor engine 7	7C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	

8E	Upward Vertical Stack	C-800	Com-pressor engine 8	8C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	
9E	Upward Vertical Stack	C-900	Com-pressor engine 9	9C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	
10E	Upward Vertical Stack	C-1000	Com-pressor engine 10	10C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	
11E	Upward Vertical Stack	C-1100	Com-pressor engine 11	11C	NSCR catalyst	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	50.37 47.41 1.56 0.27 0.01 0.35 0.19 2088	196.82 185.24 6.08 1.06 0.03 1.37 0.72 8159	2.01 1.90 0.78 0.27 0.01 0.21 0.04 1993	7.87 7.41 3.04 1.06 0.03 0.82 0.17 7789	Gas/Vapor	EE	

12E-13E	Upward Vertical Stack	GEN1 & GEN2	Microturbine Generators	---	---	C	9260	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.24 0.66 0.060 0.041 0.021 0.0063 4.4E-3 799	1.11 3.06 0.28 0.19 0.097 0.029 0.020 3698	0.24 0.66 0.060 0.041 0.021 0.0063 4.4E-3 799	1.11 3.06 0.28 0.19 0.097 0.029 0.020 3698	Gas/Vapor	EE	
14E	Upward Vertical Stack	DEHY1	Dehydrator Still Vent 1	Flare-98% Control	12C	C	8760	VOC Total HAPs Benzene Toluene Xylene n-Hexane CO2e	16.21 5.62 1.35 2.12 1.74 0.41 471	71.00 24.60 5.90 9.30 7.62 1.79 2063	0.30 0.11 0.027 0.041 0.033 0.0081 9.63	1.30 0.48 0.12 0.18 0.14 0.036 42.19	Gas/Vapor	EE	
15E	Used for fuel in 16E	DFLSH1	Dehydrator Flash Gas 1	95% Combustion	Used for Fuel in 16E	C	8760	VOC Total HAPs Benzene Toluene Xylene n-Hexane CO2e	46.94 2.25 0.33 0.40 0.15 1.37 1563	205.61 9.87 1.46 1.73 0.67 6.01 6846	2.35 0.11 0.017 0.020 0.0077 0.069 79.34	10.28 0.49 0.073 0.087 0.034 0.30 347.50	Gas/Vapor	EE	
16E	Upward Vertical Stack	DREB1	Dehydrator Reboiler r1	---	---	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.18 0.15 0.010 0.014 0.001 0.004 0.0001 176	0.81 0.68 0.044 0.061 0.005 0.015 0.001 771	0.18 0.15 0.010 0.014 0.001 0.004 0.0001 176	0.81 0.68 0.044 0.061 0.005 0.015 0.001 771	Gas/Vapor	EE	
17E	Upward Vertical Stack	DEHY2	Dehydrator Still Vent 2	Flare-98% Control	12C	C	8760	VOC Total HAPs Benzene Toluene Xylene n-Hexane CO2e	16.21 5.62 1.35 2.12 1.74 0.41 471	71.00 24.60 5.90 9.30 7.62 1.79 2063	0.30 0.11 0.027 0.041 0.033 0.0081 9.63	1.30 0.48 0.12 0.18 0.14 0.036 42.19	Gas/Vapor	EE	

18E	Used for fuel in 19E	DFLSH2	Dehydrator Flash Gas 2	Used for Fuel in 19E	95% Combustion	C	8760	VOC Total HAPs Benzene Toluene Xylene n-Hexane CO2e	46.94 2.25 0.33 0.40 0.15 1.37 1563	205.61 9.87 1.46 1.73 0.67 6.01 6846	2.35 0.11 0.017 0.020 0.0077 0.069 79.34	10.28 0.49 0.073 0.087 0.034 0.30 347.50	Gas/Vapor	EE	
19E	Upward Vertical Stack	DREB2	Dehydrator Reboiler r2	---	---	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.18 0.15 0.010 0.014 0.001 0.004 0.0001 176	0.81 0.68 0.044 0.061 0.005 0.015 0.001 771	0.18 0.15 0.010 0.014 0.001 0.004 0.0001 176	0.81 0.68 0.044 0.061 0.005 0.015 0.001 771	Gas/Vapor	EE	
20E	Upward Vertical Stack	TK-1502	Settler Tank	13C, 14C	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	72.24 1.03 516	316.69 4.52 2260	1.44 0.02 10.32	6.33 0.09 45.2	Gas/Vapor	EE	
21E	Upward Vertical Stack	TK-200	Condensate Tank 1	13C, 14C	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	1.21 0.017 8.62	5.29 0.076 37.77	0.024 0.0003 0.17	0.11 0.0015 0.76	Gas/Vapor	EE	
22E	Upward Vertical Stack	TK-201	Condensate Tank 2	13C, 14C	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	1.21 0.017 8.62	5.29 0.076 37.77	0.024 0.0003 0.17	0.11 0.0015 0.76	Gas/Vapor	EE	
23E	Upward Vertical Stack	TK-1500	Produced Water Tank 1	13C, 14C	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	0.077 0.0011 0.55	0.34 0.005 2.42	0.0016 2.2E-5 0.011	0.0068 9.7E-5 0.048	Gas/Vapor	EE	
24E	Upward Vertical Stack	TK-1501	Produced Water Tank 2	13C, 14C	VRU-Closed Loop System	C	8760	VOC Total HAPs CO2e	0.077 0.0011 0.55	0.067 0.005 2.42	0.0016 2.2E-5 0.011	0.0068 9.7E-5 0.048	Gas/Vapor	EE	

26E	Upward Vertical Stack	FLARE 1	Flare combustion device 1	---	C	8760	NOx CO VOC PM10 Total HAPs CO2e	---	---	0.33 1.78 0.0001 0.0002 4E-5 563	1.44 7.79 0.0005 0.0007 0.0002 2465	Gas/Vapor	EE
27E	Upward Vertical Stack	CATH 1	Catalytic Heater	---	C	8760	NOx CO VOC PM10 SO2 Total HAPs Formaldehyde CO2e	0.003 0.003 0.0002 0.0002 2E-5 6E-5 2E-6 2.82	0.013 0.011 0.0007 0.0010 7.7E-5 0.0002 1E-5 12	0.003 0.003 0.0002 0.0002 2E-5 6E-5 2E-6 2.82	0.013 0.011 0.0007 0.0010 7.7E-5 0.0002 1E-5 12	Gas/Vapor	EE

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.

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

2 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).

3 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.

4 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).

5 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).

6 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).

7 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. (Must match Emission Units Table)	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow <sup>1</sup> (acfm) at operating conditions	Velocity (fps)	Ground Level (Height above mean sea level)	Stack Height <sup>2</sup> (Release height of emissions above ground level)	Northing	Easting
1E/1C	1.1	1225	8886	112	804	25	4361.667	527.2435
2E/2C	1.1	1225	8886	112	804	25	4361.661	527.2348
3E/3C	1.1	1225	8886	112	804	25	4361.654	527.2261
4E/4C	1.1	1225	8886	112	804	25	4361.647	527.2174
5E/5C	1.1	1225	8886	112	804	25	4361.641	527.2087
6E/6C	1.1	1225	8886	112	804	25	4361.634	527.2
7E/7C	1.1	1225	8886	112	804	25	4361.627	527.1913
8E/8C	1.1	1225	8886	112	804	25	4361.621	527.1826
9E/9C	1.1	1225	8886	112	804	25	4361.614	527.1739
10E/10C	1.1	1225	8886	112	804	25	4361.607	527.1652
11E/11C	1.1	1225	8886	112	804	25	4361.601	527.1566
12E	NA	535	3.99 kg/s mass flow	TBD	804	10	4361.586	527.1122
13E	NA	535	3.99 kg/s mass flow	TBD	804	10	4361.589	527.1095
14E/12C/26E	5	1400	TBD	TBD	804	15	4361.736	527.2371
15E	Combusted in 16E		N/A	N/A	804	TBD	4361.72	527.2492
16E	TBD	TBD	TBD	TBD	804	TBD	4361.72	527.2492
17E/12C/26B	5	1400	TBD	TBD	804	15	4361.736	527.2371
18E	Combusted in 19E		N/A	N/A	N/A	N/A	4361.727	527.2436
19E	TBD	TBD	TBD	TBD	804	TBD	4361.727	527.2436
20E-25E/13C-14C	Emissions captured in closed loop system with VRU							
27E	TBD	TBD	TBD	TBD	804	TBD	4361.587	527.1105

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 <sup>1</sup> Chemical Name/CAS	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	0.10 0.01	0.44 0.04	0.10 0.01	0.44 0.04	EE
Storage Pile Emissions							
Loading/Unloading Operations		VOCs Total HAPs CO2e	77.14 1.10 551	8.11 0.12 57.91	77.14 1.10 551	8.11 0.12 57.91	EE
Wastewater Treatment Evaporation & Operations							
Equipment Leaks		VOCs Total HAPs CO2e	1.62 0.005 30.38	7.09 0.020 133	1.62 0.005 30.38	7.09 0.020 133	EE
General Clean-up VOC Emissions							
Other – Venting Episodes		VOCs Total HAPs CO2e	Does not apply	8.35 0.024 709	Does not apply	8.35 0.024 709	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>		March - May 2014		March - May 2014		March - May 2014	
Engine Manufactured/Reconstruction Date <sup>4</sup>		July/August 2013		July/August 2013		July/August 2013	
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	1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8294		8294		8294	
	Fuel throughput (ft <sup>3</sup> /hr)	12360		12360		12360	
	Fuel throughput (MMft <sup>3</sup> /yr)	96.36		96.36		96.36	
	Operation (hrs/yr)	8760		8760		8760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO <sub>x</sub>	2.01	7.87	2.01	7.87	2.01	7.87
OT	CO	1.90	7.41	1.90	7.41	1.90	7.41
MD	VOC	0.78	3.04	0.78	3.04	0.78	3.04
AP	SO <sub>2</sub>	0.0082	0.032	0.0082	0.032	0.0082	0.032
AP	PM <sub>10</sub>	0.27	1.06	0.27	1.06	0.27	1.06
MD	Formaldehyde	0.044	0.17	0.044	0.17	0.044	0.17

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>		March - May 2014		March - May 2014		March - May 2014	
Engine Manufactured/Reconstruction Date <sup>4</sup>		July/August 2013		July/August 2013		July/August 2013	
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	1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8294		8294		8294	
	Fuel throughput (ft <sup>3</sup> /hr)	12360		12360		12360	
	Fuel throughput (MMft <sup>3</sup> /yr)	96.36		96.36		96.36	
	Operation (hrs/yr)	8760		8760		8760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO <sub>x</sub>	2.01	7.87	2.01	7.87	2.01	7.87
OT	CO	1.90	7.41	1.90	7.41	1.90	7.41
MD	VOC	0.78	3.04	0.78	3.04	0.78	3.04
AP	SO <sub>2</sub>	0.0082	0.032	0.0082	0.032	0.0082	0.032
AP	PM <sub>10</sub>	0.27	1.06	0.27	1.06	0.27	1.06
MD	Formaldehyde	0.044	0.17	0.044	0.17	0.044	0.17

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>		March - May 2014		March - May 2014		March - May 2014	
Engine Manufactured/Reconstruction Date <sup>4</sup>		July/August 2013		July/August 2013		July/August 2013	
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	1680 bhp/1200 rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm	
	BSFC (Btu/bhp-hr)	8294		8294		8294	
	Fuel throughput (ft <sup>3</sup> /hr)	12360		12360		12360	
	Fuel throughput (MMft <sup>3</sup> /yr)	96.36		96.36		96.36	
	Operation (hrs/yr)	8760		8760		8760	
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO <sub>x</sub>	2.01	7.87	2.01	7.87	2.01	7.87
OT	CO	1.90	7.41	1.90	7.41	1.90	7.41
MD	VOC	0.78	3.04	0.78	3.04	0.78	3.04
AP	SO <sub>2</sub>	0.0082	0.032	0.0082	0.032	0.0082	0.032
AP	PM <sub>10</sub>	0.27	1.06	0.27	1.06	0.27	1.06
MD	Formaldehyde	0.044	0.17	0.044	0.17	0.044	0.17

Source Identification Number <sup>1</sup>		10E		11E			
Engine Manufacturer and Model		Waukesha, 7044 GSI		Waukesha, 7044 GSI			
Manufacturer's Rated bhp/rpm		1680 bhp/1200 rpm		1680 bhp/1200 rpm			
Source Status <sup>2</sup>		MS		MS			
Date Installed/Modified/Removed <sup>3</sup>		March - May 2014		March - May 2014			
Engine Manufactured/Reconstruction Date <sup>4</sup>		July/August 2013		July/August 2013			
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No		No			
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	RB4S		RB4S			
	APCD Type <sup>7</sup>	NSCR		NSCR			
	Fuel Type <sup>8</sup>	PQ		PQ			
	H <sub>2</sub> S (gr/100 scf)	0		0			
	Operating bhp/rpm	1680 bhp/1200 rpm		1680 bhp/1200 rpm			
	BSFC (Btu/bhp-hr)	8294		8294			
	Fuel throughput (ft <sup>3</sup> /hr)	12360		12360			
	Fuel throughput (MMft <sup>3</sup> /yr)	96.36		96.36			
	Operation (hrs/yr)	8760		8760			
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
OT	NO <sub>x</sub>	2.01	7.87	2.01	7.87		
OT	CO	1.90	7.41	1.90	7.41		
MD	VOC	0.78	3.04	0.78	3.04		
AP	SO <sub>2</sub>	0.0082	0.032	0.0082	0.032		
AP	PM <sub>10</sub>	0.27	1.06	0.27	1.06		
MD	Formaldehyde	0.044	0.17	0.044	0.17		

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 <u>Based on typical operating conditions</u>
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*.



**Canton North Compressor Station - Doddridge County, WV**

**VHP - L7044GSI**

Kleinfelder Michele Steyskal 719-632-3593 msteyskal@kleinfelder.com

Gas Compression - Continuous

ENGINE SPEED (rpm):	1200	COOLING SYSTEM:	JW, IC + OC
DISPLACEMENT (in3):	7040	INTERCOOLER WATER INLET (°F):	130
COMPRESSION RATIO:	8:1	JACKET WATER OUTLET (°F):	180
IGNITION SYSTEM:	ESM	JACKET WATER CAPACITY (gal):	100
EXHAUST MANIFOLD:	Water Cooled	AUXILIARY WATER CAPACITY (gal):	11
COMBUSTION:	Rich Burn, Turbocharged	LUBE OIL CAPACITY (gal):	190
ENGINE DRY WEIGHT (lbs):	21000	MAX. EXHAUST BACKPRESSURE (in. H2O):	18
AIR/FUEL RATIO SETTING:	0.38% CO	MAX. AIR INLET RESTRICTION (in. H2O):	15
ENGINE SOUND LEVEL (dBA)	104	EXHAUST SOUND LEVEL (dBA)	111

**SITE CONDITIONS:**

FUEL:		ALTITUDE (ft):	805
FUEL PRESSURE RANGE (psig):	30 - 60	MAXIMUM INLET AIR TEMPERATURE (°F):	100
FUEL HHV (BTU/lb):	1,249.9	FUEL WKI:	62.5
FUEL LHV (BTU/lb):	1,130.0		

**SITE SPECIFIC TECHNICAL DATA**

POWER RATING	UNITS	MAX RATING AT 103 °F AIR TEMP	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE OF 100 °F		
			100%	75%	50%
CONTINUOUS ENGINE POWER	BHP	1680	1680	1260	843
OVERLOAD	% 2/24 hr	10	10	-	-
MECHANICAL EFFICIENCY (LHV)	%	30.7	30.7	29.6	28.6
CONTINUOUS POWER AT FLYWHEEL	BHP	1680	1680	1260	843

*based on no auxiliary engine driven equipment*

**FUEL CONSUMPTION**

		8294	8294	8612	8914
FUEL CONSUMPTION (LHV)	BTU/BHP-hr	8294	8294	8612	8914
FUEL CONSUMPTION (HHV)	BTU/BHP-hr	9175	9175	9526	9861
FUEL FLOW	SCFM	206	206	160	111

*based on fuel analysis LHV*

**HEAT REJECTION**

		4171	4171	3396	2525
JACKET WATER (JW)	BTU/hr x 1000	4171	4171	3396	2525
LUBE OIL (OC)	BTU/hr x 1000	572	572	519	435
INTERCOOLER (IC)	BTU/hr x 1000	268	268	183	92
EXHAUST	BTU/hr x 1000	4211	4210	3110	1922
RADIATION	BTU/hr x 1000	707	707	646	538

**EMISSIONS**

		13.6	13.6	14.8	16.5
NOx (NO + NO2)	g/bhp-hr	13.6	13.6	14.8	16.5
CO	g/bhp-hr	12.8	12.8	12.5	11.4
THC	g/bhp-hr	2.3	2.3	2.2	1.8
NMHC	g/bhp-hr	0.86	0.86	0.81	0.67
NM, NEHC	g/bhp-hr	0.42	0.42	0.39	0.32
CH4	g/bhp-hr	1.46	1.46	1.36	1.12
CO2	g/bhp-hr	527	527	547	566
CO2e	g/bhp-hr	557	557	575	590
CH2O	g/bhp-hr	0.05	0.05	0.05	0.05

**AIR INTAKE / EXHAUST GAS**

		2552	2552	1987	1376
INDUCTION AIR FLOW	SCFM	2552	2552	1987	1376
EXHAUST GAS MASS FLOW	lb/hr	11866	11866	9240	6397
EXHAUST GAS FLOW	ACFM	8886	8886	6706	4353
EXHAUST TEMPERATURE	°F	1225	1225	1173	1071

*at exhaust temp, 14.5 psia*

**HEAT EXCHANGER SIZING**

TOTAL JACKET WATER CIRCUIT (JW)	BTU/hr x 1000	4730
TOTAL AUXILIARY WATER CIRCUIT (IC + OC)	BTU/hr x 1000	953

**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



**Canton North Compressor Station - Doddridge County, WV**

**VHP - L7044GSI**

Kleinfelder Michele Stayskal 719-632-3593 mstayskal@kleinfelder.com

Gas Compression - Continuous

**FUEL COMPOSITION**

**HYDROCARBONS:**

		<u>Mole or Volume %</u>
Methane	CH4	79.663
Ethane	C2H6	12.999
Propane	C3H8	3.892
Iso-Butane	I-C4H10	0.596
Normal Butane	N-C4H10	1.033
Iso-Pentane	I-C5H12	0.352
Normal Pentane	N-C5H12	0.302
Hexane	C6H14	0.314
Heptane	C7H16	0.275
Ethene	C2H4	0
Propene	C3H6	0

SUM HYDROCARBONS 99.426

**NON-HYDROCARBONS:**

Nitrogen	N2	0.392
Oxygen	O2	0
Helium	He	0
Carbon Dioxide	CO2	0.182
Carbon Monoxide	CO	0
Hydrogen	H2	0
Water Vapor	H2O	0
<b>TOTAL FUEL</b>		<b>100</b>

**FUEL:**

FUEL PRESSURE RANGE (psig):	30 - 60
FUEL WKI:	62.5
FUEL SLHV (BTU/ft3):	1110.29
FUEL SLHV (MJ/Nm3):	43.66
FUEL LHV (BTU/ft3):	1129.95
FUEL LHV (MJ/Nm3):	44.43
FUEL HHV (BTU/ft3):	1249.94
FUEL HHV (MJ/Nm3):	49.15
FUEL DENSITY (SG):	0.71

Standard Conditions per ASTM D3588-91 [80°F and 14.696psia] and ISO 6376:1996-02-01[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.

**Canton North Compressor Station - Doddridge County, WV**

Kleinfelder Michele Steyskal 719-632-3593 msteyskal@kleinfelder.com

**VHP - L7044GSI**

Gas Compression - Continuous

**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 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. 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. Refer to technical data sheets S-5136-34 and S-6543-36 (or latest version) for more information.
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. It is permissible to operate the engine at the indicated overload power, for two hours in every 24 hour period.

**REQUIRED OPTION CODES**

## **Microturbine Generators**

## NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number <sup>1</sup>		12E-13E					
Engine Manufacturer and Model		Capstone C600 Standard					
Manufacturer's Rated bhp/rpm		600 kWe					
Source Status <sup>2</sup>		MS					
Date Installed/Modified/Removed <sup>3</sup>		March-May 2014					
Engine Manufactured/Reconstruction Date <sup>4</sup>		2014					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		N/A					
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	N/A					
	APCD Type <sup>7</sup>	N/A					
	Fuel Type <sup>8</sup>	PQ					
	H <sub>2</sub> S (gr/100 scf)	0					
	Operating kWe	600					
	BSFC (Btu/kWe)	10,300					
	Fuel throughput (ft <sup>3</sup> /hr)	5379					
	Fuel throughput (MMft <sup>3</sup> /yr)	49.8					
	Operation (hrs/yr)	9260					
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>	0.24	1.11				
MD	CO	0.66	3.06				
MD	VOC	0.060	0.28				
AP	SO <sub>2</sub>	0.021	0.097				
AP	PM <sub>10</sub>	0.041	0.19				
AP	Formaldehyde	0.0044	0.020				

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  
LB4S Lean Burn Four Stroke

RB4S Rich Burn Four Stroke

7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F Air/Fuel Ratio  
HEIS High Energy Ignition System  
PSC Prestratified Charge  
NSCR Rich Burn & Non-Selective Catalytic Reduction

IR Ignition Retard  
SIPC Screw-in Precombustion Chambers  
LEC Low Emission Combustion  
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  
GR GRI-HAPCalc™

AP AP-42  
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*.

## C600 600kW Power Package High-pressure Natural Gas



World's largest air-bearing microturbine produces 600kW of clean, green and reliable power.

- High electrical efficiency over a very wide operating range
- Low maintenance air bearings require no lube oil or coolant
- Ultra-low emissions
- High availability – part load redundancy
- Proven technology with tens of millions of operating hours
- Integrated utility synchronization and protection with a modular design
- 5 and 9 year Factory Protection Plans available
- Remote monitoring and diagnostic capabilities
- Upgradable to 800kW or 1MW with field installed Capstone 200kW power modules
- Internal fuel gas compressor available for low fuel pressure Natural Gas applications



C600 600kW Power Package

### Electrical Performance<sup>(1)</sup>

Electrical Power Output	600kW
Voltage	400–480 VAC
Electrical Service	3-Phase, 4 wire
Frequency	50/60 Hz, grid connect operation 10–60 Hz, stand alone operation
Maximum Output Current	870A RMS @ 400V, grid connect operation 720A RMS @ 480V, grid connect operation 930A RMS, stand alone operation <sup>(2)</sup>
Electrical Efficiency LHV	33%

### Fuel/Engine Characteristics<sup>(1)</sup>

Natural Gas HHV	20.7–47.5 MJ/m <sup>3</sup> (825–1,275 BTU/scf)
Inlet Pressure <sup>(3)</sup>	517–552 kPa gauge (75–80 psig)
Fuel Flow HHV	7,200 MJ/hr (6,840,000 BTU/hr)
Net Heat Rate LHV	10.9 MJ/kWh (10,300 BTU/kWh)

### Exhaust Characteristics<sup>(1)</sup>

	Standard	CARB Version
NO <sub>x</sub> Emissions @ 15% O <sub>2</sub> <sup>(4)</sup>	< 9 ppmvd (18 mg/m <sup>3</sup> )	< 4 ppmvd (8 mg/m <sup>3</sup> )
NO <sub>x</sub> / Electrical Output <sup>(4)</sup>	0.14 g/bhp-hr (0.4 lb/MWhe)	0.05 g/bhp-hr (0.14 lb/MWhe)
Exhaust Gas Flow	4.0 kg/s (8.8 lbm/s)	4.0 kg/s (8.8 lbm/s)
Exhaust Gas Temperature	280°C (535°F)	280°C (535°F)
Exhaust Energy	4,260 MJ/hr (4,050,000 BTU/hr)	4,260 MJ/hr (4,050,000 BTU/hr)

*Reliable power when and where you need it. Clean and simple.*

## Dimensions & Weight<sup>(5)</sup>

Width x Depth x Height	2.4 x 9.1 x 2.9 m (96 x 360 x 114 in)
Weight - Grid Connect Model	12565 kg (27,700 lbs)
Weight - Dual Mode Model	15014 kg (33,100 lbs)

## Minimum Clearance Requirements<sup>(6)</sup>

Vertical Clearance	0.6 m (24 in)
Horizontal Clearance	
Left & Right	1.5 m (60 in)
Front	1.5 m (60 in)
Rear	1.8 m (72 in)

## Sound Levels

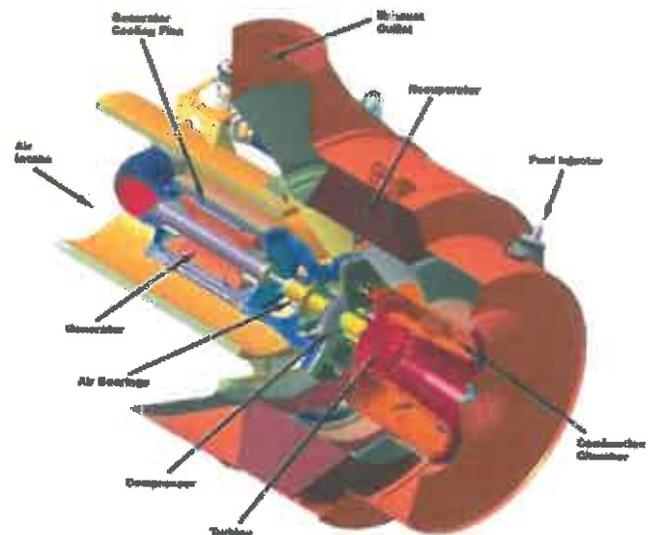
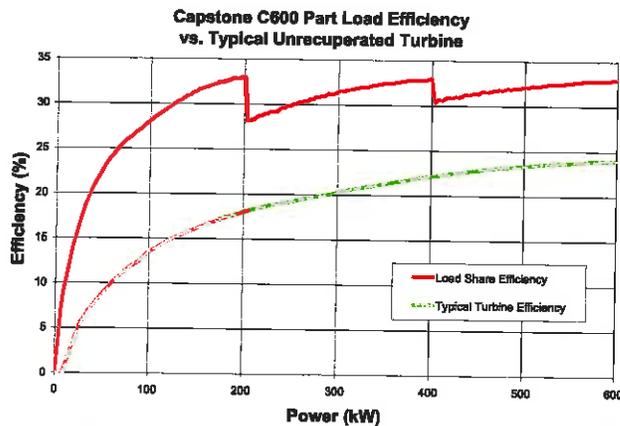
### Acoustic Emissions at Full Load Power

Nominal at 10 m (33 ft)	65 dBA
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## Planned Certifications

UL 2200 and UL 1741 for natural gas operation under existing UL files<sup>(7)</sup>

- Will comply with IEEE 1547 and will meet statewide utility interconnection requirements for California Rule 21 and the New York State Public Service Commission
- Models will be available with optional equipment for CE marking



C200 Engine

- (1) Nominal full power performance at ISO conditions: 59°F, 14.696 psia, 60% RH
  - (2) With linear load
  - (3) Inlet pressure for standard natural gas at 39.4 MJ/Nm<sup>3</sup> (1,000 BTU/scf) (HHV)
  - (4) Emissions for standard natural gas at 39.4 MJ/Nm<sup>3</sup> (1,000 BTU/scf) (HHV)
  - (5) Approximate dimensions and weights
  - (6) Clearance requirements may increase due to local code considerations
  - (7) All models are planned to be UL Listed or available with optional equipment for CE marking
- Specifications are not warranted and are subject to change without notice.





# Technical Reference

## Capstone MicroTurbine™ Systems Emissions

### Summary

Capstone MicroTurbine™ systems are inherently clean and can meet some of the strictest emissions standards in the world. This technical reference is to provide customers with information that may be requested by local air permitting organizations or to compare air quality impacts of different technologies for a specific project. The preferred units of measure are "output based"; meaning that the quantity of a particular exhaust emission is reported relative to the useable output of the microturbine – typically in pounds per megawatt hour for electrical generating equipment. This technical reference also provides volumetric measurements in parts per million and milligrams per normal cubic meter. A conversion between several common units is also provided.

### Maximum Exhaust Emissions at ISO Conditions

Table 1 below summarizes the exhaust emissions at full power and ISO conditions for different Capstone microturbine models. Note that the fuel can have a significant impact on certain emissions. For example landfill and digester gas can be made up of a wide variety of fuel elements and impurities, and typically contains some percentage of carbon dioxide (CO<sub>2</sub>). This CO<sub>2</sub> dilutes the fuel, makes complete combustion more difficult, and results in higher carbon monoxide emissions (CO) than for pipeline-quality natural gas.

**Table 1. Emission for Different Capstone Microturbine Models in [lb/MWhe]**

Model	Fuel	NOx	CO	VOC <sup>(5)</sup>
C30 NG	Natural Gas <sup>(1)</sup>	0.64	1.8	0.23
CR30 MBTU	Landfill Gas <sup>(2)</sup>	0.64	22.0	1.00
CR30 MBTU	Digester Gas <sup>(3)</sup>	0.64	11.0	1.00
C30 Liquid	Diesel #2 <sup>(4)</sup>	2.60	0.41	0.23
C65 NG Standard	Natural Gas <sup>(1)</sup>	0.46	1.25	0.10
C65 NG Low NOx	Natural Gas <sup>(1)</sup>	0.17	1.30	0.10
C65 NG CARB	Natural Gas <sup>(1)</sup>	0.17	0.24	0.05
CR65 Landfill	Landfill Gas <sup>(2)</sup>	0.46	4.0	0.10
CR65 Digester	Digester Gas <sup>(3)</sup>	0.46	4.0	0.10
C200 NG	Natural Gas <sup>(1)</sup>	0.40	1.10	0.10
C200 NG CARB	Natural Gas <sup>(1)</sup>	0.14	0.20	0.04
CR200 Digester	Digester Gas <sup>(3)</sup>	0.40	3.6	0.10

**Notes:**

- (1) Emissions for standard natural gas at 1,000 BTU/scf (HHV) or 39.4 MJ/m<sup>3</sup> (HHV)
- (2) Emissions for surrogate gas containing 42% natural gas, 39% CO<sub>2</sub>, and 19% Nitrogen
- (3) Emissions for surrogate gas containing 63% natural gas and 37% CO<sub>2</sub>
- (4) Emissions for Diesel #2 according to ASTM D975-07b
- (5) Expressed as Methane

Table 2 provides the same output-based information shown in Table 1, but expressed in grams per horsepower hour (g/hp-hr).

**Table 2. Emission for Different Capstone Microturbine Models in [g/hp-hr]**

Model	Fuel	NOx	CO	VOC <sup>(5)</sup>
C30 NG	Natural Gas <sup>(1)</sup>	0.22	0.60	0.078
CR30 MBTU	Landfill Gas <sup>(2)</sup>	0.22	7.4	0.340
CR30 MBTU	Digester Gas <sup>(3)</sup>	0.22	3.7	0.340
C30 Liquid	Diesel #2 <sup>(4)</sup>	0.90	0.14	0.078
C65 NG Standard	Natural Gas <sup>(1)</sup>	0.16	0.42	0.034
C65 NG Low NOx	Natural Gas <sup>(1)</sup>	0.06	0.44	0.034
C65 NG CARB	Natural Gas <sup>(1)</sup>	0.06	0.08	0.017
CR65 Landfill	Landfill Gas <sup>(2)</sup>	0.16	1.4	0.034
CR65 Digester	Digester Gas <sup>(3)</sup>	0.16	1.4	0.034
C200 NG	Natural Gas <sup>(1)</sup>	0.14	0.37	0.034
C200 NG CARB	Natural Gas <sup>(1)</sup>	0.05	0.07	0.014
CR200 Digester	Digester Gas <sup>(3)</sup>	0.14	1.3	0.034

Notes: - same as for Table 1

Emissions may also be reported on a volumetric basis, with the most common unit of measurement being parts per million. This is typically a measurement that is corrected to specific oxygen content in the exhaust and without considering moisture content. The abbreviation for this unit of measurement is "ppmvd" (parts per million by volume, dry) and is corrected to 15% oxygen for electrical generating equipment such as microturbines. The relationship between an output based measurement like pounds per MWh and a volumetric measurement like ppmvd depends on the characteristics of the generating equipment and the molecular weight of the criteria pollutant being measured. Table 3 expresses the emissions in ppmvd at 15% oxygen for the Capstone microturbine models shown in Table 1. Note that raw measurements expressed in ppmv will typically be lower than the corrected values shown in Table 3 because the microturbine exhaust has greater than 15% oxygen.

Another volumetric unit of measurement expresses the mass of a specific criteria pollutant per standard unit of volume. Table 4 expresses the emissions in milligrams per normal cubic meter at 15% oxygen. Normal conditions for this purpose are expressed as one atmosphere of pressure and zero degrees Celsius. Note that both the ppmvd and mg/m3 measurements are for specific oxygen content. A conversion can be made to adjust either unit of measurement to other reference oxygen contents, if required. Use the equation below to convert from one reference oxygen content to another:

$$\text{Emissions at New O}_2 = \frac{(20.9 - \text{New O}_2 \text{ Percent})}{(20.9 - \text{Current O}_2 \text{ Percent})} \times \text{Emissions at Current O}_2$$

For example, to express 9 ppmvd of NOx at 15% oxygen to ppmvd at 3% oxygen:

$$\text{Emissions at 3\% O}_2 = \frac{(20.9 - 3.0)}{(20.9 - 15.0)} \times 9 = 27 \text{ ppmvd}$$

## Greenhouse Gas Emissions

Many gasses are considered "greenhouse gasses", and agencies have ranked them based on their global warming potential (GWP) in the atmosphere compared with carbon dioxide (CO<sub>2</sub>), as well as their ability to maintain this effect over time. For example, methane is a greenhouse gas with a GWP of 21. Criteria pollutants like NO<sub>x</sub> and organic compounds like methane are monitored by local air permitting authorities, and are subject to strong emissions controls. Even though some of these criteria pollutants can be more troublesome for global warming than CO<sub>2</sub>, they are released in small quantities – especially from Capstone microturbines. So the major contributor of concern is carbon dioxide, or CO<sub>2</sub>. Emission of CO<sub>2</sub> depends on two things:

1. Carbon content in the fuel
2. Efficiency of converting fuel to useful energy

It is for these reasons that many local authorities are focused on using clean fuels (for example natural gas compared with diesel fuel), achieving high efficiency using combined heat and power systems, and displacing emissions from traditional power plants using renewable fuels like waste landfill and digester gasses.

Table 5 shows the typical CO<sub>2</sub> emissions due to combustion for different Capstone microturbine models at full power and ISO conditions. The values do not include CO<sub>2</sub> that may already exist in the fuel itself, which is typical for renewable fuels like landfill and digester gas. These values are expressed on an output basis, as is done for criteria pollutants in Table 1. The table shows the pounds per megawatt hour based on electric power output only, as well as considering total useful output in a CHP system with total 70% efficiency (LHV). As for criteria pollutants, the relative quantity of CO<sub>2</sub> released is substantially less when useful thermal output is also considered in the measurement.

**Table 5. CO<sub>2</sub> Emission for Capstone Microturbine Models in [lb/MWh]**

Model	Fuel	CO <sub>2</sub>	
		Electric Only	70% Total CHP
C30 NG	Natural Gas <sup>(1)</sup>	1,690	625
CR30 MBTU	Landfill Gas <sup>(1)</sup>	1,690	625
CR30 MBTU	Digester Gas <sup>(1)</sup>	1,690	625
C30 Liquid	Diesel #2 <sup>(2)</sup>	2,400	855
C65 NG Standard	Natural Gas <sup>(1)</sup>	1,520	625
C65 NG Low NO <sub>x</sub>	Natural Gas <sup>(1)</sup>	1,570	625
C65 NG CARB	Natural Gas <sup>(1)</sup>	1,570	625
CR65 Landfill	Landfill Gas <sup>(1)</sup>	1,520	625
CR65 Digester	Digester Gas <sup>(1)</sup>	1,520	625
C200 NG	Natural Gas <sup>(1)</sup>	1,330	625
C200 NG CARB	Natural Gas <sup>(1)</sup>	1,330	625
CR200 Digester	Digester Gas <sup>(1)</sup>	1,330	625

**Notes:**

- (1) Emissions due to combustion, assuming natural gas with CO<sub>2</sub> content of 117 lb/MMBTU (HHV)
- (2) Emissions due to combustion, assuming diesel fuel with CO<sub>2</sub> content of 160 lb/MMBTU (HHV)

**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*):

<p>1. Name or type and model of proposed affected source: Bruest HotCat Heater. Model 8000 24,000 Btu/hr</p>
<p>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.</p>
<p>3. Name(s) and maximum amount of proposed process material(s) charged per hour: Natural Gas as fuel - 30 scf/hr</p>
<p>4. Name(s) and maximum amount of proposed material(s) produced per hour: Heater is used to increase temperature of fuel gas to generators. Heater will be used to raise the temperature of the fuel gas by approximately 30 F (average from 45F to 75F).</p>
<p>5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: Combustion process</p>

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



8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ 75 °F and 164 psia

a. NO <sub>x</sub>	0.0029 lb/hr	grains/ACF
b. SO <sub>2</sub>	0.000018 lb/hr	grains/ACF
c. CO	0.0025 lb/hr	grains/ACF
d. PM <sub>10</sub>	0.00022 lb/hr	grains/ACF
e. Hydrocarbons	lb/hr	grains/ACF
f. VOCs	0.00016 lb/hr	grains/ACF
g. Pb	lb/hr	grains/ACF
h. Specify other(s)		
Total HAP (including formaldehyde)	0.00006 lb/hr	grains/ACF
CO <sub>2</sub> e	2.82 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

# Infrared Radiant Heaters

## The Safest, Most Efficient Alternative Wherever Flameless Heat is Required

Catalytic heating is the product of intensive research efforts to quantify the effectiveness of catalysts in promoting the reaction of combustible gases with oxygen or air to produce heat. There is no flame to create a hazard, and catalytic heat can operate efficiently on low-cost natural gas, butane or propane.

The use of catalytic heaters has been approved and accepted for dozens of industrial and petrochemical applications.

## How the Catalytic Principle Works

The normal ignition temperature of natural gas (80%) in air (20%) at atmosphere pressure is given as 1260°F. In the presence of the catalyst, the reaction occurs with sufficient velocity to begin a chain reaction at 225°F. Thus, if natural gas is brought into contact with the catalyst at 225°F in the presence of oxygen, it is oxidized to carbon dioxide and water vapor. Sufficient heat is, therefore, evolved to raise the temperature of the bed of the heater and oxidation will continue as long as gas and oxygen are supplied.

No flame is produced under these conditions, since the gases are well below ignition temperature (1260°F). However, approximately the same amount of heat is produced as if the gas had been burned in the normal manner.

**The thermal efficiency of a catalytic heater is substantially higher than a conventional heater.** In the catalytic heating principle, a considerably larger proportion of the heat produced is radiant heat of wavelengths of 2-16 microns, and much less heat is required to heat the evolved gases.

Practically no heat is utilized to heat the large volume of nitrogen associated with the oxygen as in a conventional heater because most of the heat content of the carbon dioxide and water is recovered as radiant heat.

In a catalytic heater, the temperature attained in the catalyst bed is determined by two factors: the flow of the gas to the catalyst bed, and the rate at which oxygen diffuses through the bed to replace what was consumed in the reaction.

If the rate of gas flow is too high, not enough oxygen can enter to completely burn the gas. If the rate is too low, the gas is burned deeper in the bed and the surface cools. Therefore, the temperature of a catalytic heater is self-limiting and the system will

operate stably for long periods of time without intervention as long as gas and air are supplied.

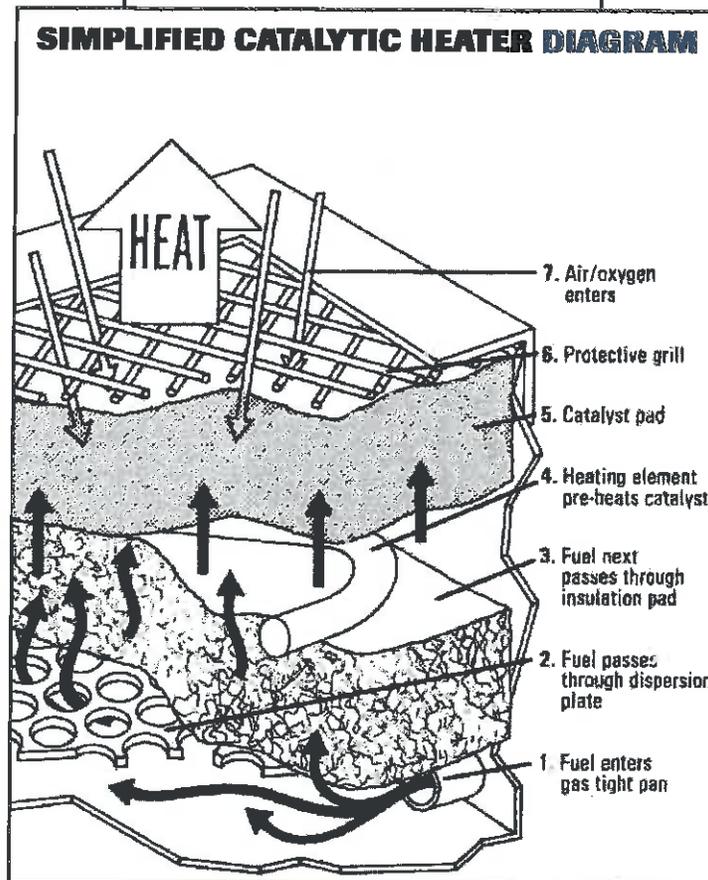
## The Catalytic Principle

Catalytic heat is radiant heat. Radiant heat, like light, is electromagnetic wave energy that travels in straight lines at 186,000 miles per second, casts shadows, may be transmitted, absorbed or reflected by matter, and may be focused or dispersed by lenses or prisms of the proper material.

A source of radiant energy – such as a catalytic heater – floods the area around it with heat energy in the same way that light floods the area around it. The intensity of the heat energy varies with the square of the distance (as does light) and travels any distance without loss as long as it does not contact matter which absorbs it.

The absorption of radiant energy by various materials is a property specific to each material. Certain wavelengths will be absorbed to a considerable extent, others less, and some very little or not at all. Thus, each molecular substance has an infrared absorption spectrum which is a fingerprint of that substance. The absorption data for many substances can be found in an atlas of infrared absorption spectra.

Since the absorption of radiant heat is highly selective, there are many excellent application opportunities. By selecting proper substances to act as a filter between the source and object to be heated, all but the desired wavelengths can be filtered out.



## Sample Applications for Bruest Catalytic Heaters

- Compressor Gas Preheat
- Regulators and Control Valves
- Gas Wellhead Heaters
- Peak Shaving Vaporizer Valves
- Enclosures of all Types
- Oil Production Well Injection, Offshore Platform Approved
- Personnel, Fixed or Portable
- Space Heaters, Compressor Stations
- Pipeline Heaters

Bruest Catalytic Heaters are approved for use by  
THE CANADIAN STANDARDS ASSOCIATION and FACTORY MUTUAL SYSTEM  
for hazardous locations Class 1, Group D, Division 2.



### **FREEZ-FITER PILOT-REGULATOR HEATER PREVENTS FREEZE-UPS**

- Heats gas supply to controllers, pilots and instrument regulators
- Heat source - Bruerst flameless catalytic heater
- Fuel: natural gas, L.P. (propane) or butane gas
- Low fuel consumption
- FM models suitable for use in Class 1, Division 2, Group D locations
- CSA models suitable for use in Class 1, Division 1 and 2, Group D locations
- Single coil standard - dual coil model available (use with 2 regulators)
- Low pressure fuel gas regulator comes with unit (maximum 50 PSI inlet pressure)
- Preheat fuel gas tube

### **FREEZ-FILTER SPECIFICATIONS**

MODEL NO.	EXCHANGER COIL	HEATER	CASE DIMENSION
1800	3/8" OD - Type 304 Stainless Steel • Operating Pressure - 2500 PSI-Max. Test Pressure - 5000 PSI • Exchanger Coil Pipe Fittings - 1/4" NPT	Bruerst-SR-8 Catalytic Heater • Start-up Voltage - 12 Volt or 120 Volt • Stainless Steel Case • 2500 BTU Input • Fuel - Natural Gas at 3 1/2" W.C. • LP Gas at 11" W.C.	Size 12" x 12" x 4" with 1" Fiberglass Insulation • Stainless Steel Case
4000	Same as Above	Bruerst-SR-12 Catalytic Heater • Start-up Voltage 12 Volt or 120 Volt • Stainless Steel Case • 5000 BTU Input • Fuel-Natural Gas at 3 1/2" W.C. • LP Gas at 11" W.C.	Size 16" x 16" x 4" with 1" Fiberglass insulation • Stainless Steel Case

### **ACCESSORY OPTIONS**

- High pressure fuel gas regulator; 6000 PSI max; 10-75 PSI outlet; Fisher 1301F
- Thermostat: 100° - 200°F range (Invensys)
- Explosion-proof junction box is standard on CSA models and optional on FM models
- 16 ft. - 12V electrical pigtail with battery clips for a standard or explosion-proof junction box
- 25 ft. - 12V electrical pigtail with battery clips for a standard or explosion-proof junction box
- Nupro relief valve (set @ 45 PSI) 1/4" npt

## Dehydrators

West Virginia Department of Environmental Protection

DIVISION OF AIR QUALITY : (304) 926-0475  
 WEB PAGE: <http://www.wvdep.org>

Division of Air Quality

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.

Section A: Facility Description			
Affected facility actual annual average natural gas throughput (scf/day):	120,000,000	(60,000,000 per Dehy)	
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		
Section B: Dehydration Unit (if applicable) <sup>1</sup>			
Description: Canton North Compressor Station Dehydrators (DEHY1-DEHY2)			
Date of Installation: March-May 2014	Annual Operating Hours: 8760	Burner rating (MMbtu/hr): 1.5	
Exhaust Stack Height (ft): TBD	Stack Diameter (ft): TBD	Stack Temp. (°F): 200	
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? 0.032	ACFM/gpm	
Condenser installed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Exit Temp. 145 °F	Condenser Pressure 0 psig	
Incinerator/flare installed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Destruction Eff. 98 %		
Other controls installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Describe:		
Wet Gas <sup>2</sup> : Gas Temp.: 120 °F	Gas Pressure 1000 psig		
(Upstream of Contact Tower) Saturated Gas? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If no, water content _____ lb/MMSCF		
Dry Gas: Gas Flowrate(MMSCFD) Actual _____ Design 60			
(Downstream of Contact Tower) Water Content 7.0	lb/MMSCF		
Lean Glycol: Circulation rate (gpm) Actual <sup>3</sup> _____ Maximum <sup>4</sup> 7.5			
	Pump make/model: Kimray 45015PV		
Glycol Flash Tank (if applicable): Temp.: 190 °F	Pressure 35 psig	Vented? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
	If no, describe vapor control: vent gas used in reboiler as fuel		
Stripping Gas (if applicable): Source of gas: dry gas, if used	Rate 9 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>6</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**

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

## NATURAL GAS GLYCOL DEHYDRATION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Exterran, 60 MMscfd	
		Max Dry Gas Flow Rate (mmscf/day)		60	
		Design Heat Input (mmBtu/hr)		1.5	
		Design Type (DEG or TEG)		TEG	
		Source Status <sup>2</sup>		ES	
		Date Installed/Modified/Removed <sup>3</sup>		March-May 2014	
		Regenerator Still Vent APCD <sup>4</sup>		FL	
		Fuel HV (Btu/scf)		1230	
		H <sub>2</sub> S Content (gr/100 scf)		0	
		Operation (hrs/yr)		8760	
Source ID # <sup>1</sup>	Vent	Reference <sup>5</sup>	Potential Emissions <sup>6</sup>	lbs/hr	tons/yr
16E	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
14E	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	0.30	1.30
		GRI-GLYCalc™	Benzene	0.027	0.12
		GRI-GLYCalc™	Ethylbenzene	0.00	0.00
		GRI-GLYCalc™	Toluene	0.041	0.18
		GRI-GLYCalc™	Xylenes	0.033	0.14
		GRI-GLYCalc™	n-Hexane	0.0081	0.036
15E	Flash Gas Tank Vent	GRI-GLYCalc™	VOC	2.35	10.28
		GRI-GLYCalc™	Benzene	0.017	0.073
		GRI-GLYCalc™	Ethylbenzene	0.00	0.00
		GRI-GLYCalc™	Toluene	0.020	0.087
		GRI-GLYCalc™	Xylenes	0.0077	0.034
		GRI-GLYCalc™	n-Hexane	0.069	0.30

**Storage Tanks**  
**(Tanks 4.0.9d Runs Included in Attachment N)**

## Attachment L EMISSIONS UNIT DATA SHEET STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT [www.epa.gov/tnn/tanks.html](http://www.epa.gov/tnn/tanks.html)), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (<http://www.epa.gov/tnn/chieff/>).

### I. GENERAL INFORMATION (required)

<b>1. Bulk Storage Area Name</b> Production Storage Tanks	<b>2. Tank Name</b> Condensate Tank 1
<b>3. Tank Equipment Identification No. (as assigned on Equipment List Form)</b> TK-200	<b>4. Emission Point Identification No. (as assigned on Equipment List Form)</b> 21E
<b>5. Date of Commencement of Construction (for existing tanks)</b>	
<b>6. Type of change</b> <input type="checkbox"/> New Construction <input type="checkbox"/> New Stored Material <input checked="" type="checkbox"/> Other Tank Modification	
<b>7. Description of Tank Modification (if applicable)</b> Updated production throughput into tanks.	
<b>7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?)</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<b>7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).</b>	
<b>7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.):</b> None	

### II. TANK INFORMATION (required)

<b>8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.</b> <p style="text-align: center;">400 barrel</p>	
<b>9A. Tank Internal Diameter (ft)</b> <p style="text-align: center;">12</p>	<b>9B. Tank Internal Height (or Length) (ft)</b> <p style="text-align: center;">20</p>
<b>10A. Maximum Liquid Height (ft)</b> <p style="text-align: center;">19</p>	<b>10B. Average Liquid Height (ft)</b> <p style="text-align: center;">10</p>
<b>11A. Maximum Vapor Space Height (ft)</b> <p style="text-align: center;">1</p>	<b>11B. Average Vapor Space Height (ft)</b> <p style="text-align: center;">10</p>
<b>12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.</b> <p style="text-align: center;">380 barrel</p>	

13A. Maximum annual throughput (gal/yr) 1,149,750	13B. Maximum daily throughput (gal/day) 3,150
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 67.95	
15. Maximum tank fill rate (gal/min) TBD	
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems <input checked="" type="checkbox"/> Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof X vertical ___ horizontal ___ flat roof X cone roof ___ dome roof ___ other (describe) <input type="checkbox"/> External Floating Roof ___ pontoon roof ___ double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof ___ vertical column support ___ self-supporting <input type="checkbox"/> Variable Vapor Space ___ lifter roof ___ diaphragm <input type="checkbox"/> Pressurized ___ spherical ___ cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

### III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: <input type="checkbox"/> Riveted <input type="checkbox"/> Gunite lined <input type="checkbox"/> Epoxy-coated rivets <input type="checkbox"/> Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): <input type="checkbox"/> No Rust <input type="checkbox"/> Light Rust <input type="checkbox"/> Dense Rust <input type="checkbox"/> Not applicable		
22A. Is the tank heated? <input type="checkbox"/> YES <input type="checkbox"/> NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): _____ to _____		
24. Complete the following section for <b>Vertical Fixed Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft) 0.06		
25. Complete the following section for <b>Floating Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: <input type="checkbox"/> Metallic (Mechanical) Shoe Seal <input type="checkbox"/> Liquid Mounted Resilient Seal <input type="checkbox"/> Vapor Mounted Resilient Seal <input type="checkbox"/> Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? <input type="checkbox"/> YES <input type="checkbox"/> NO		
25D. If YES, how is the secondary seal mounted? (check one) <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? <input type="checkbox"/> YES <input type="checkbox"/> NO		

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN - SLIDING COVER, GASKETED:	BUILT-UP COLUMN - SLIDING COVER, UNGASKETED:	PIPE COLUMN - FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN - SLIDING COVER, GASKETED:	PIPE COLUMN - SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		

26. Complete the following section for Internal Floating Roof Tanks <input type="checkbox"/> Does Not Apply	
26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: <input type="checkbox"/> Continuous sheet construction 5 feet wide <input type="checkbox"/> Continuous sheet construction 6 feet wide <input type="checkbox"/> Continuous sheet construction 7 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 7.5 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 12 feet wide <input type="checkbox"/> Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )
For column supported tanks:	26G. Diameter of each column:
26F. Number of columns:	

**IV. SITE INFORMATION** (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> ·day))
33. Atmospheric Pressure (psia)

**V. LIQUID INFORMATION** (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:			
34A. Minimum (°F)	34B. Maximum (°F)		
35. Average operating pressure range of tank:			
35A. Minimum (psig)	35B. Maximum (psig)		
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)		
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)		
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)		
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia)			
39G. Reid (psia)			
Months Storage per Year 39H. From			
39I. To			

**VI. EMISSIONS AND CONTROL DEVICE DATA (required)**

40. Emission Control Devices (check as many as apply):  Does Not Apply

Carbon Adsorption<sup>1</sup>

Condenser<sup>1</sup>

Conservation Vent (psig)

Vacuum Setting Pressure Setting

Emergency Relief Valve (psig)

Inert Gas Blanket of

Insulation of Tank with

Liquid Absorption (scrubber)<sup>1</sup>

Refrigeration of Tank

Rupture Disc (psig)

Vent to Incinerator<sup>1</sup>

Other<sup>1</sup> (describe): Vapor Recovery Unit and vapors recycled back into system

<sup>1</sup> Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method <sup>1</sup>
		Amount	Units		
VOC	0.007	0.02	lb/hr	211.5	EPA - TANKS 4.0.9
Emissions are controlled value					

<sup>1</sup> EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

**Attachment L**  
**EMISSIONS UNIT DATA SHEET**  
**STORAGE TANKS**

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT [www.epa.gov/tnn/tanks.html](http://www.epa.gov/tnn/tanks.html)), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (<http://www.epa.gov/tnn/chieff/>).

**I. GENERAL INFORMATION (required)**

<b>1. Bulk Storage Area Name</b> Production Storage Tanks	<b>2. Tank Name</b> Condensate Tank 2
<b>3. Tank Equipment Identification No. (as assigned on Equipment List Form)</b> TK-201	<b>4. Emission Point Identification No. (as assigned on Equipment List Form)</b> 22E
<b>5. Date of Commencement of Construction (for existing tanks)</b>	
<b>6. Type of change</b> <input type="checkbox"/> New Construction <input type="checkbox"/> New Stored Material <input checked="" type="checkbox"/> Other Tank Modification	
<b>7. Description of Tank Modification (if applicable)</b> Updated production throughput into tanks.	
<b>7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?)</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<b>7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).</b>	
<b>7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.):</b> None	

**II. TANK INFORMATION (required)**

<b>8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.</b> <p style="text-align: center;">400 barrel</p>	
<b>9A. Tank Internal Diameter (ft)</b> <p style="text-align: center;">12</p>	<b>9B. Tank Internal Height (or Length) (ft)</b> <p style="text-align: center;">20</p>
<b>10A. Maximum Liquid Height (ft)</b> <p style="text-align: center;">19</p>	<b>10B. Average Liquid Height (ft)</b> <p style="text-align: center;">10</p>
<b>11A. Maximum Vapor Space Height (ft)</b> <p style="text-align: center;">1</p>	<b>11B. Average Vapor Space Height (ft)</b> <p style="text-align: center;">10</p>
<b>12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.</b> <p style="text-align: center;">380 barrel</p>	

13A. Maximum annual throughput (gal/yr) 1,149,750	13B. Maximum daily throughput (gal/day) 3,150
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 67.95	
15. Maximum tank fill rate (gal/min) TBD	
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems <input checked="" type="checkbox"/> Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical <input type="checkbox"/> horizontal <input type="checkbox"/> flat roof <input checked="" type="checkbox"/> cone roof <input type="checkbox"/> dome roof <input type="checkbox"/> other (describe) <input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input type="checkbox"/> double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting <input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm <input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

### III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: <input type="checkbox"/> Riveted <input type="checkbox"/> Gunite lined <input type="checkbox"/> Epoxy-coated rivets <input type="checkbox"/> Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): <input type="checkbox"/> No Rust <input type="checkbox"/> Light Rust <input type="checkbox"/> Dense Rust <input type="checkbox"/> Not applicable		
22A. Is the tank heated? <input type="checkbox"/> YES <input type="checkbox"/> NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): _____ to _____		
24. Complete the following section for <b>Vertical Fixed Roof Tanks</b>		<input type="checkbox"/> Does Not Apply
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft) 0.06		
25. Complete the following section for <b>Floating Roof Tanks</b>		<input type="checkbox"/> Does Not Apply
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: (check one) <input type="checkbox"/> Metallic (Mechanical) Shoe Seal <input type="checkbox"/> Liquid Mounted Resilient Seal <input type="checkbox"/> Vapor Mounted Resilient Seal <input type="checkbox"/> Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? <input type="checkbox"/> YES <input type="checkbox"/> NO		
25D. If YES, how is the secondary seal mounted? (check one) <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? <input type="checkbox"/> YES <input type="checkbox"/> NO		

<b>25F. Describe deck fittings; indicate the number of each type of fitting:</b>		
<b>ACCESS HATCH</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>AUTOMATIC GAUGE FLOAT WELL</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>COLUMN WELL</b>		
<b>BUILT-UP COLUMN - SLIDING COVER, GASKETED:</b>	<b>BUILT-UP COLUMN - SLIDING COVER, UNGASKETED:</b>	<b>PIPE COLUMN - FLEXIBLE FABRIC SLEEVE SEAL:</b>
<b>LADDER WELL</b>		
<b>PIP COLUMN - SLIDING COVER, GASKETED:</b>	<b>PIPE COLUMN - SLIDING COVER, UNGASKETED:</b>	
<b>GAUGE-HATCH/SAMPLE PORT</b>		
<b>SLIDING COVER, GASKETED:</b>	<b>SLIDING COVER, UNGASKETED:</b>	
<b>ROOF LEG OR HANGER WELL</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	<b>SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)</b>
<b>VACUUM BREAKER</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>RIM VENT</b>		
<b>WEIGHTED MECHANICAL ACTUATION GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>DECK DRAIN (3-INCH DIAMETER)</b>		
<b>OPEN:</b>	<b>90% CLOSED:</b>	
<b>STUB DRAIN</b>		
<b>1-INCH DIAMETER:</b>		
<b>OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)</b>		

26. Complete the following section for Internal Floating Roof Tanks <input type="checkbox"/> Does Not Apply	
26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: <input type="checkbox"/> Continuous sheet construction 5 feet wide <input type="checkbox"/> Continuous sheet construction 6 feet wide <input type="checkbox"/> Continuous sheet construction 7 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 7.5 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 12 feet wide <input type="checkbox"/> Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )
For column supported tanks:	26G. Diameter of each column:
26F. Number of columns:	

**IV. SITE INFORMATION** (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> ·day))
33. Atmospheric Pressure (psia)

**V. LIQUID INFORMATION** (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:			
34A. Minimum (°F)	34B. Maximum (°F)		
35. Average operating pressure range of tank:			
35A. Minimum (psig)	35B. Maximum (psig)		
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)		
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)		
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)		
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia)			
39G. Reid (psia)			
Months Storage per Year 39H. From			
39I. To			

**VI. EMISSIONS AND CONTROL DEVICE DATA (required)**

40. Emission Control Devices (check as many as apply):  Does Not Apply

Carbon Adsorption<sup>1</sup>

Condenser<sup>1</sup>

Conservation Vent (psig)

Vacuum Setting Pressure Setting

Emergency Relief Valve (psig)

Inert Gas Blanket of

Insulation of Tank with

Liquid Absorption (scrubber)<sup>1</sup>

Refrigeration of Tank

Rupture Disc (psig)

Vent to Incinerator<sup>1</sup>

Other<sup>1</sup> (describe): Vapor Recovery Unit and vapors recycled back into system

<sup>1</sup> Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method <sup>1</sup>
		Amount	Units		
VOC	0.007	0.02	lb/hr	211.5	EPA - TANKS 4.0.9
Emissions are controlled value					

<sup>1</sup> EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

**Attachment L**  
**EMISSIONS UNIT DATA SHEET**  
**STORAGE TANKS**

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT [www.epa.gov/ttn/tanks.html](http://www.epa.gov/ttn/tanks.html)), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (<http://www.epa.gov/ttn/chief/>).

**I. GENERAL INFORMATION (required)**

<b>1. Bulk Storage Area Name</b> Production Storage Tanks	<b>2. Tank Name</b> Produced Water Tank 1
<b>3. Tank Equipment Identification No. (as assigned on Equipment List Form)</b> TK-1500	<b>4. Emission Point Identification No. (as assigned on Equipment List Form)</b> 23E
<b>5. Date of Commencement of Construction (for existing tanks)</b>	
<b>6. Type of change</b> <input type="checkbox"/> New Construction <input type="checkbox"/> New Stored Material <input checked="" type="checkbox"/> Other Tank Modification	
<b>7. Description of Tank Modification (if applicable)</b> Updated production throughput into tanks.	
<b>7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?)</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<b>7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).</b>	
<b>7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.):</b> None	

**II. TANK INFORMATION (required)**

<b>8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.</b> <p style="text-align: center;">400 barrel</p>	
<b>9A. Tank Internal Diameter (ft)</b> <p style="text-align: center;">12</p>	<b>9B. Tank Internal Height (or Length) (ft)</b> <p style="text-align: center;">20</p>
<b>10A. Maximum Liquid Height (ft)</b> <p style="text-align: center;">19</p>	<b>10B. Average Liquid Height (ft)</b> <p style="text-align: center;">10</p>
<b>11A. Maximum Vapor Space Height (ft)</b> <p style="text-align: center;">1</p>	<b>11B. Average Vapor Space Height (ft)</b> <p style="text-align: center;">10</p>
<b>12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.</b> <p style="text-align: center;">380 barrel</p>	

13A. Maximum annual throughput (gal/yr) 344,925	13B. Maximum daily throughput (gal/day) 945
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 20.38	
15. Maximum tank fill rate (gal/min) TBD	
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems <input checked="" type="checkbox"/> Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof    X vertical      ___ horizontal      ___ flat roof      X cone roof      ___ dome roof ___ other (describe) <input type="checkbox"/> External Floating Roof      ___ pontoon roof      ___ double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof      ___ vertical column support      ___ self-supporting <input type="checkbox"/> Variable Vapor Space      ___ lifter roof      ___ diaphragm <input type="checkbox"/> Pressurized      ___ spherical      ___ cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

**III. TANK CONSTRUCTION & OPERATION INFORMATION** (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: <input type="checkbox"/> Riveted <input type="checkbox"/> Gunite lined <input type="checkbox"/> Epoxy-coated rivets <input type="checkbox"/> Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): <input type="checkbox"/> No Rust <input type="checkbox"/> Light Rust <input type="checkbox"/> Dense Rust <input type="checkbox"/> Not applicable		
22A. Is the tank heated? <input type="checkbox"/> YES <input type="checkbox"/> NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig):      to		
24. Complete the following section for <b>Vertical Fixed Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft) 0.06		
25. Complete the following section for <b>Floating Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: <input type="checkbox"/> Metallic (Mechanical) Shoe Seal <input type="checkbox"/> Liquid Mounted Resilient Seal (check one) <input type="checkbox"/> Vapor Mounted Resilient Seal <input type="checkbox"/> Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? <input type="checkbox"/> YES <input type="checkbox"/> NO		
25D. If YES, how is the secondary seal mounted? (check one) <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? <input type="checkbox"/> YES <input type="checkbox"/> NO		

<b>25F. Describe deck fittings; indicate the number of each type of fitting:</b>		
<b>ACCESS HATCH</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>AUTOMATIC GAUGE FLOAT WELL</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>COLUMN WELL</b>		
<b>BUILT-UP COLUMN – SLIDING COVER, GASKETED:</b>	<b>BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:</b>	<b>PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:</b>
<b>LADDER WELL</b>		
<b>PIP COLUMN – SLIDING COVER, GASKETED:</b>	<b>PIPE COLUMN – SLIDING COVER, UNGASKETED:</b>	
<b>GAUGE-HATCH/SAMPLE PORT</b>		
<b>SLIDING COVER, GASKETED:</b>	<b>SLIDING COVER, UNGASKETED:</b>	
<b>ROOF LEG OR HANGER WELL</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	<b>SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)</b>
<b>VACUUM BREAKER</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>RIM VENT</b>		
<b>WEIGHTED MECHANICAL ACTUATION GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>DECK DRAIN (3-INCH DIAMETER)</b>		
<b>OPEN:</b>	<b>90% CLOSED:</b>	
<b>STUB DRAIN</b>		
<b>1-INCH DIAMETER:</b>		
<b>OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)</b>		

26. Complete the following section for Internal Floating Roof Tanks <input type="checkbox"/> Does Not Apply	
26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: <input type="checkbox"/> Continuous sheet construction 5 feet wide <input type="checkbox"/> Continuous sheet construction 6 feet wide <input type="checkbox"/> Continuous sheet construction 7 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 7.5 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 12 feet wide <input type="checkbox"/> Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )
For column supported tanks:	26G. Diameter of each column:
26F. Number of columns:	

**IV. SITE INFORMATION** (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> ·day))
33. Atmospheric Pressure (psia)

**V. LIQUID INFORMATION** (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:			
34A. Minimum (°F)	34B. Maximum (°F)		
35. Average operating pressure range of tank:			
35A. Minimum (psig)	35B. Maximum (psig)		
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)		
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)		
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)		
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia)			
39G. Reid (psia)			
Months Storage per Year 39H. From			
39I. To			

**VI. EMISSIONS AND CONTROL DEVICE DATA (required)**

40. Emission Control Devices (check as many as apply):  Does Not Apply

Carbon Adsorption<sup>1</sup>

Condenser<sup>1</sup>

Conservation Vent (psig)

Vacuum Setting Pressure Setting

Emergency Relief Valve (psig)

Inert Gas Blanket of

Insulation of Tank with

Liquid Absorption (scrubber)<sup>1</sup>

Refrigeration of Tank

Rupture Disc (psig)

Vent to Incinerator<sup>1</sup>

Other<sup>1</sup> (describe): Vapor Recovery Unit and vapors recycled back into system

<sup>1</sup> Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method <sup>1</sup>
		Amount	Units		
VOC	0.0007	0.0008	lb/hr	13.57	EPA - TANKS 4.0.9
Emissions are controlled values					

<sup>1</sup> EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

**Attachment L**  
**EMISSIONS UNIT DATA SHEET**  
**STORAGE TANKS**

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT [www.epa.gov/tnn/tanks.html](http://www.epa.gov/tnn/tanks.html)), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (<http://www.epa.gov/tnn/chief/>).

**I. GENERAL INFORMATION (required)**

<b>1. Bulk Storage Area Name</b> Production Storage Tanks	<b>2. Tank Name</b> Produced Water Tank 2
<b>3. Tank Equipment Identification No. (as assigned on Equipment List Form)</b> TK-1501	<b>4. Emission Point Identification No. (as assigned on Equipment List Form)</b> 24E
<b>5. Date of Commencement of Construction (for existing tanks)</b>	
<b>6. Type of change</b> <input type="checkbox"/> New Construction <input type="checkbox"/> New Stored Material <input checked="" type="checkbox"/> Other Tank Modification	
<b>7. Description of Tank Modification (if applicable)</b> Updated production throughput into tanks.	
<b>7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?)</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
<b>7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).</b>	
<b>7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.):</b> None	

**II. TANK INFORMATION (required)**

<b>8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height.</b> <p style="text-align: center;">400 barrel</p>	
<b>9A. Tank Internal Diameter (ft)</b> <p style="text-align: center;">12</p>	<b>9B. Tank Internal Height (or Length) (ft)</b> <p style="text-align: center;">20</p>
<b>10A. Maximum Liquid Height (ft)</b> <p style="text-align: center;">19</p>	<b>10B. Average Liquid Height (ft)</b> <p style="text-align: center;">10</p>
<b>11A. Maximum Vapor Space Height (ft)</b> <p style="text-align: center;">1</p>	<b>11B. Average Vapor Space Height (ft)</b> <p style="text-align: center;">10</p>
<b>12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights.</b> <p style="text-align: center;">380 barrel</p>	

13A. Maximum annual throughput (gal/yr) 344,925	13B. Maximum daily throughput (gal/day) 945
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 20.38	
15. Maximum tank fill rate (gal/min) TBD	
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems <input checked="" type="checkbox"/> Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof <input checked="" type="checkbox"/> vertical <input type="checkbox"/> horizontal <input type="checkbox"/> flat roof <input checked="" type="checkbox"/> cone roof <input type="checkbox"/> dome roof <input type="checkbox"/> other (describe) <input type="checkbox"/> External Floating Roof <input type="checkbox"/> pontoon roof <input type="checkbox"/> double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof <input type="checkbox"/> vertical column support <input type="checkbox"/> self-supporting <input type="checkbox"/> Variable Vapor Space <input type="checkbox"/> lifter roof <input type="checkbox"/> diaphragm <input type="checkbox"/> Pressurized <input type="checkbox"/> spherical <input type="checkbox"/> cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

**III. TANK CONSTRUCTION & OPERATION INFORMATION** (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: <input type="checkbox"/> Riveted <input type="checkbox"/> Gunite lined <input type="checkbox"/> Epoxy-coated rivets <input type="checkbox"/> Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): <input type="checkbox"/> No Rust <input type="checkbox"/> Light Rust <input type="checkbox"/> Dense Rust <input type="checkbox"/> Not applicable		
22A. Is the tank heated? <input type="checkbox"/> YES <input type="checkbox"/> NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): _____ to _____		
24. Complete the following section for <b>Vertical Fixed Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft) 0.06		
25. Complete the following section for <b>Floating Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: <input type="checkbox"/> Metallic (Mechanical) Shoe Seal <input type="checkbox"/> Liquid Mounted Resilient Seal <input type="checkbox"/> Vapor Mounted Resilient Seal <input type="checkbox"/> Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? <input type="checkbox"/> YES <input type="checkbox"/> NO		
25D. If YES, how is the secondary seal mounted? (check one) <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? <input type="checkbox"/> YES <input type="checkbox"/> NO		

<b>25F. Describe deck fittings; indicate the number of each type of fitting:</b>		
<b>ACCESS HATCH</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>AUTOMATIC GAUGE FLOAT WELL</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>COLUMN WELL</b>		
<b>BUILT-UP COLUMN – SLIDING COVER, GASKETED:</b>	<b>BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:</b>	<b>PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:</b>
<b>LADDER WELL</b>		
<b>PIP COLUMN – SLIDING COVER, GASKETED:</b>	<b>PIPE COLUMN – SLIDING COVER, UNGASKETED:</b>	
<b>GAUGE-HATCH/SAMPLE PORT</b>		
<b>SLIDING COVER, GASKETED:</b>	<b>SLIDING COVER, UNGASKETED:</b>	
<b>ROOF LEG OR HANGER WELL</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	<b>SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)</b>
<b>VACUUM BREAKER</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>RIM VENT</b>		
<b>WEIGHTED MECHANICAL ACTUATION GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>DECK DRAIN (3-INCH DIAMETER)</b>		
<b>OPEN:</b>	<b>90% CLOSED:</b>	
<b>STUB DRAIN</b>		
<b>1-INCH DIAMETER:</b>		
<b>OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)</b>		

26. Complete the following section for Internal Floating Roof Tanks <input type="checkbox"/> Does Not Apply	
26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: <input type="checkbox"/> Continuous sheet construction 5 feet wide <input type="checkbox"/> Continuous sheet construction 6 feet wide <input type="checkbox"/> Continuous sheet construction 7 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 7.5 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 12 feet wide <input type="checkbox"/> Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )
For column supported tanks:	26G. Diameter of each column:
26F. Number of columns:	

**IV. SITE INFORMATION** (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> ·day))
33. Atmospheric Pressure (psia)

**V. LIQUID INFORMATION** (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:			
34A. Minimum (°F)	34B. Maximum (°F)		
35. Average operating pressure range of tank:			
35A. Minimum (psig)	35B. Maximum (psig)		
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)		
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)		
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)		
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			



**Attachment L  
EMISSIONS UNIT DATA SHEET  
STORAGE TANKS**

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT [www.epa.gov/tnn/tanks.html](http://www.epa.gov/tnn/tanks.html)), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (<http://www.epa.gov/tnn/chief/>).

**I. GENERAL INFORMATION (required)**

1. Bulk Storage Area Name Production Storage Tanks	2. Tank Name Settling Tank
3. Tank Equipment Identification No. (as assigned on <i>Equipment List Form</i> ) TK-1502	4. Emission Point Identification No. (as assigned on <i>Equipment List Form</i> ) 20E
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change <input type="checkbox"/> New Construction <input type="checkbox"/> New Stored Material <input checked="" type="checkbox"/> Other Tank Modification	
7. Description of Tank Modification (if applicable) Updated production throughput into tanks.	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.): None	

**II. TANK INFORMATION (required)**

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 400 barrel	
9A. Tank Internal Diameter (ft) 12	9B. Tank Internal Height (or Length) (ft) 20
10A. Maximum Liquid Height (ft) 19	10B. Average Liquid Height (ft) 10
11A. Maximum Vapor Space Height (ft) 1	11B. Average Vapor Space Height (ft) 10
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 380 barrel	

13A. Maximum annual throughput (gal/yr) 2,989,350	13B. Maximum daily throughput (gal/day) 8,190
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 176.7	
15. Maximum tank fill rate (gal/min) TBD	
16. Tank fill method <input type="checkbox"/> Submerged <input checked="" type="checkbox"/> Splash <input type="checkbox"/> Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems <input checked="" type="checkbox"/> Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year
18. Type of tank (check all that apply): <input checked="" type="checkbox"/> Fixed Roof X vertical ___ horizontal ___ flat roof X cone roof ___ dome roof ___ other (describe) <input type="checkbox"/> External Floating Roof ___ pontoon roof ___ double deck roof <input type="checkbox"/> Domed External (or Covered) Floating Roof <input type="checkbox"/> Internal Floating Roof ___ vertical column support ___ self-supporting <input type="checkbox"/> Variable Vapor Space ___ lifter roof ___ diaphragm <input type="checkbox"/> Pressurized ___ spherical ___ cylindrical <input type="checkbox"/> Underground <input type="checkbox"/> Other (describe)	

**III. TANK CONSTRUCTION & OPERATION INFORMATION** (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: <input type="checkbox"/> Riveted <input type="checkbox"/> Gunite lined <input type="checkbox"/> Epoxy-coated rivets <input type="checkbox"/> Other (describe)		
20A. Shell Color	20B. Roof Color	20C. Year Last Painted
21. Shell Condition (if metal and unlined): <input type="checkbox"/> No Rust <input type="checkbox"/> Light Rust <input type="checkbox"/> Dense Rust <input type="checkbox"/> Not applicable		
22A. Is the tank heated? <input type="checkbox"/> YES <input type="checkbox"/> NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): _____ to _____		
24. Complete the following section for <b>Vertical Fixed Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
24A. For dome roof, provide roof radius (ft)		
24B. For cone roof, provide slope (ft/ft) 0.06		
25. Complete the following section for <b>Floating Roof Tanks</b> <input type="checkbox"/> Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: <input type="checkbox"/> Metallic (Mechanical) Shoe Seal <input type="checkbox"/> Liquid Mounted Resilient Seal <input type="checkbox"/> Vapor Mounted Resilient Seal <input type="checkbox"/> Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? <input type="checkbox"/> YES <input type="checkbox"/> NO		
25D. If YES, how is the secondary seal mounted? (check one) <input type="checkbox"/> Shoe <input type="checkbox"/> Rim <input type="checkbox"/> Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? <input type="checkbox"/> YES <input type="checkbox"/> NO		

<b>25F. Describe deck fittings; indicate the number of each type of fitting:</b>		
<b>ACCESS HATCH</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>AUTOMATIC GAUGE FLOAT WELL</b>		
<b>BOLT COVER, GASKETED:</b>	<b>UNBOLTED COVER, GASKETED:</b>	<b>UNBOLTED COVER, UNGASKETED:</b>
<b>COLUMN WELL</b>		
<b>BUILT-UP COLUMN - SLIDING COVER, GASKETED:</b>	<b>BUILT-UP COLUMN - SLIDING COVER, UNGASKETED:</b>	<b>PIPE COLUMN - FLEXIBLE FABRIC SLEEVE SEAL:</b>
<b>LADDER WELL</b>		
<b>PIP COLUMN - SLIDING COVER, GASKETED:</b>	<b>PIPE COLUMN - SLIDING COVER, UNGASKETED:</b>	
<b>GAUGE-HATCH/SAMPLE PORT</b>		
<b>SLIDING COVER, GASKETED:</b>	<b>SLIDING COVER, UNGASKETED:</b>	
<b>ROOF LEG OR HANGER WELL</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	<b>SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)</b>
<b>VACUUM BREAKER</b>		
<b>WEIGHTED MECHANICAL ACTUATION, GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>RIM VENT</b>		
<b>WEIGHTED MECHANICAL ACTUATION GASKETED:</b>	<b>WEIGHTED MECHANICAL ACTUATION, UNGASKETED:</b>	
<b>DECK DRAIN (3-INCH DIAMETER)</b>		
<b>OPEN:</b>	<b>90% CLOSED:</b>	
<b>STUB DRAIN</b>		
<b>1-INCH DIAMETER:</b>		
<b>OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)</b>		

26. Complete the following section for Internal Floating Roof Tanks <input type="checkbox"/> Does Not Apply	
26A. Deck Type: <input type="checkbox"/> Bolted <input type="checkbox"/> Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: <input type="checkbox"/> Continuous sheet construction 5 feet wide <input type="checkbox"/> Continuous sheet construction 6 feet wide <input type="checkbox"/> Continuous sheet construction 7 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 7.5 feet wide <input type="checkbox"/> Continuous sheet construction 5 × 12 feet wide <input type="checkbox"/> Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft <sup>2</sup> )
For column supported tanks:	26G. Diameter of each column:
26F. Number of columns:	

**IV. SITE INFORMATION** (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based.
28. Daily Average Ambient Temperature (°F)
29. Annual Average Maximum Temperature (°F)
30. Annual Average Minimum Temperature (°F)
31. Average Wind Speed (miles/hr)
32. Annual Average Solar Insulation Factor (BTU/(ft <sup>2</sup> ·day))
33. Atmospheric Pressure (psia)

**V. LIQUID INFORMATION** (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:			
34A. Minimum (°F)	34B. Maximum (°F)		
35. Average operating pressure range of tank:			
35A. Minimum (psig)	35B. Maximum (psig)		
36A. Minimum Liquid Surface Temperature (°F)	36B. Corresponding Vapor Pressure (psia)		
37A. Average Liquid Surface Temperature (°F)	37B. Corresponding Vapor Pressure (psia)		
38A. Maximum Liquid Surface Temperature (°F)	38B. Corresponding Vapor Pressure (psia)		
39. Provide the following for <u>each</u> liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition			
39B. CAS Number			
39C. Liquid Density (lb/gal)			
39D. Liquid Molecular Weight (lb/lb-mole)			
39E. Vapor Molecular Weight (lb/lb-mole)			

Maximum Vapor Pressure 39F. True (psia)			
39G. Reid (psia)			
Months Storage per Year 39H. From			
39I. To			

**VI. EMISSIONS AND CONTROL DEVICE DATA (required)**

40. Emission Control Devices (check as many as apply):  Does Not Apply

- Carbon Adsorption<sup>1</sup>
- Condenser<sup>1</sup>
- Conservation Vent (psig)
  - Vacuum Setting
  - Pressure Setting
- Emergency Relief Valve (psig)
- Inert Gas Blanket of
- Insulation of Tank with
- Liquid Absorption (scrubber)<sup>1</sup>
- Refrigeration of Tank
- Rupture Disc (psig)
- Vent to Incinerator<sup>1</sup>
- Other<sup>1</sup> (describe): Vapor Recovery Unit and vapors recycled back into system

<sup>1</sup> Complete appropriate Air Pollution Control Device Sheet.

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

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method <sup>1</sup>
		Amount	Units		
VOC	0.007	0.025	lb/hr	12,656	O-flashing emissions by Vasquez-Beggs, EPA – working and breathing by EPA Tanks 4.0.9d
Emissions are controlled values				*Annual Loss includes flash emissions	

<sup>1</sup> EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

## **Bulk Loading and Fugitives**

**Attachment L  
EMISSIONS UNIT DATA SHEET  
BULK LIQUID TRANSFER OPERATIONS**

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on <i>Equipment List Form</i> ): NA – Fugitive (LDOUT1)	
1. Loading Area Name: Produced Fluids Loadout	
2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply): <input type="checkbox"/> Drums <input type="checkbox"/> Marine Vessels <input type="checkbox"/> Rail Tank Cars <input checked="" type="checkbox"/> Tank Trucks	
3. Loading Rack or Transfer Point Data:	
Number of pumps	None – use truck pumps
Number of liquids loaded	Two – Condensate, Produced Water
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	Four as each tank has a connection, but not likely that there will be four at one time. TK-1502 does not have a loading connection.
4. Does ballasting of marine vessels occur at this loading area? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Does not apply	
5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: N/A	
6. Are cargo vessels pressure tested for leaks at this or any other location? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If YES, describe:	

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):				
Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	10	10	10	10
days/week	5	5	5	5
weeks/quarter	all	all	all	all

8. Bulk Liquid Data (add pages as necessary):						
Pump ID No.		N/A	N/A			
Liquid Name		Conden- sate	Produced Water			
Max. daily throughput (1000 gal/day)		6.3	1.89			
Max. annual throughput (1000 gal/yr)		2,300	689.9			
Loading Method <sup>1</sup>		SUB	SUB			
Max. Fill Rate (gal/min)		TBD	TBD			
Average Fill Time (min/loading)		TBD	TBD			
Max. Bulk Liquid Temperature (°F)		64	64			
True Vapor Pressure <sup>2</sup>		8.8	0.48			
Cargo Vessel Condition <sup>3</sup>		U	U			
Control Equipment or Method <sup>4</sup>		None	None			
Minimum control efficiency (%)		NA	NA			
Maximum Emission Rate	Loading (lb/hr)	76.93	0.21			
	Annual (lb/yr)	16,200	13.3			
Estimation Method <sup>5</sup>		EPA	EPA			
<sup>1</sup> BF = Bottom Fill    SP = Splash Fill    SUB = Submerged Fill						
<sup>2</sup> At maximum bulk liquid temperature						



**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

**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

NA

**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)  
1311

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	5 MMscf/hour	43,800 MMscf/year
Condensate	6.3 barrels/hour	54,750 barrels/year
Produced Water	1.88 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.

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

8A. Complete the *Toxicology Data Sheet* 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.

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.).

9. **Waste Products** - Waste products status: (If source is subject to RCRA or 45CSR25, please contact the Hazardous Waste Section of WVDEP, OAQ at (304) 926-3647.)

9A. Types and amounts of wastes to be disposed:

9B. Method of disposal and location of waste disposal facilities:  
 Carrier: \_\_\_\_\_ Phone: \_\_\_\_\_

9C. Check here if approved USEPA/State Hazardous Waste Landfill will be used

10. Maximum and Projected Typical Operating Schedule for process or project as a whole (circle appropriate units).

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

11. Complete a *Reactor Data Sheet* for each reactor in this chemical process.

12. Complete a *Distillation Column Data Sheet* for each distillation column in this chemical process.

13. **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.

<b>MONITORING</b>  <b>See Attachment O</b>	<b>RECORDKEEPING</b>  <b>See Attachment O</b>
<b>REPORTING</b>  <b>See Attachment O</b>	<b>TESTING</b>  <b>See Attachment O</b>

**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 or 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 or air pollution control device.

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

## INFORMATION REQUIRED FOR CHEMICAL PROCESSES

The notes listed below for chemical processes are intended to help the applicant submit a complete application to the OAQ; these notes are not intended to be all inclusive. The requirements for a complete application for a permit issued under 45CSR13 are designed to provide enough information for a permit reviewer to begin a technical review. Additional information beyond that identified may be required to complete the technical review of any individual application.

### Process Description

Please keep these points in mind when completing your process description as part of this permit application.

1. Provide a general process overview. This brief, but complete, process description should include chemical or registered trademark names of chemical products, intermediates, and/or raw materials to be produced or consumed, and the ultimate use(s) of the product(s). A list of the various chemical compounds is helpful.
2. Describe each process step. Include the process chemistry and stoichiometrically balanced reaction equation or material mass balance on all components.
3. Describe the methods and equipment used to receive, store, handle, and charge raw materials.
4. Describe the methods and equipment used to handle, store, or package final products and intermediates.
5. Provide process flow diagrams or equipment layout drawings which clearly show the process flow relationships among all pieces of process and control equipment. Identify all air emission discharge points. Discuss instrumentation and controls for the process.
6. Discuss the possibilities of process upsets, the duration and frequency of upsets, and consequences (including air emissions) of these upsets. Include a description of rupture discs, pressure relief valves, and secondary containment systems.
7. Discuss any fugitive emissions and the methods used to minimize them.
8. Include the following plans for the process if available:
  - a. preventative maintenance and malfunction abatement plan (recommended for all control equipment).
  - b. continuous emissions (in-stack) monitoring plan
  - c. ambient monitoring plan
  - d. emergency response plan

### Regulatory Discussion

The following state and federal air pollution control regulations may be applicable to your chemical process. You should review these regulations carefully to determine if they apply to your process. Please summarize the results of your review in your permit application along with any other regulations you believe are applicable.

- Title 45 Legislative Rule Division of Environmental Protection, Office of Air Quality contains West Virginia's air pollution control regulations, including the following promulgated rules which may require emissions reductions or control technologies for your chemical process:
  - a. 45CSR27 - Best Available Technology (BAT) for Toxic Air Pollutants (TAPs)
  - b. 45CSR21 - VOC emissions controls for ozone maintenance in Kanawha, Cabell, Putnam, Wayne, and Wood counties.
  - c. 45CSR13 (Table 45-13A) - plantwide emission thresholds for permitting for certain pollutants.
- Federal Guidelines for case-by-case MACT determinations under section 112(g) of the 1990 CAAA for individual and total HAPs greater than 10 and 25 tons per year, respectively.
- There are also subparts of the federal Standards of Performance for New Stationary Sources (NSPS), 40CFR60, and the National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40CFR61 and 40CFR63, which apply to various chemical and nonchemical processes. These subparts are too numerous to list here, but these areas of the federal regulations should be consulted carefully to determine applicability to your process.

### Emissions Summary and Calculations

Please keep these points in mind when submitting your emissions calculations as part of this permit application.

1. For each pollutant, provide the basis for the emissions estimate and for all emission reduction(s) or control efficiency(ies) claimed.
2. For all batch processes provide the following
  - a. Emissions of each pollutant in pound(s) per batch, from each process step
  - b. Annual emissions based on number of batches requested per year
  - c. The total time for each process step and the duration of the emissions during the process step
  - d. Total batch time, total emissions per batch (or per day), and annual emissions based on the number of batches requested **per year**.

**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	773	TBD	1	12,385 – EE
	Light Liquid VOC				
	Heavy Liquid VOC				
Safety Relief Valves <sup>11</sup>	Non-VOC				
	Gas VOC				
	Non VOC				
Open-ended Lines <sup>12</sup>	VOC				
	Non-VOC				
	VOC				
Sampling Connections <sup>13</sup>	Non-VOC				
	VOC				
	Non-VOC				
Compressors	VOC	33	TBD	1	1,034 – EE
	Non-VOC				
	VOC				
Flanges	Non-VOC				
	VOC	548	TBD	1	761 – EE
	Non-VOC				
Other	VOC				
	Non-VOC				
	Non-VOC				

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

## Notes for Leak Source Data Sheet

1. For VOC sources include components on streams and equipment that contain greater than 10% w/w VOC, including feed streams, reaction/separation facilities, and product/by-product delivery lines. Do not include certain leakless equipment as defined below by category.
2. By monitoring frequency, give the number of sources routinely monitored for leaks, using a portable detection device that measures concentration in ppm. Do not include monitoring by visual or soap-bubble leak detection methods. "M/Q(M)/Q/SA/A/O" means the time period between inspections as follows:  
  
Monthly/Quarterly, with Monthly follow-up of repaired leakers/Quarterly/Semi-annual/Annually/Other (specify time period)  
  
If source category is not monitored, a single zero in the space will suffice. For example, if 50 gas-service valves are monitored quarterly, with monthly follow-up of those repaired, 75 are monitored semi-annually, and 50 are checked bimonthly (alternate months), with non checked at any other frequency, you would put in the category "valves, gas service:" 0/50/0/75/0/50 (bimonthly).
3. Give the average number of days, after a leak is discovered, that an attempt will be made to repair the leak.
4. Note the method used: MB - material balance; EE - engineering estimate; EPA - emission factors established by EPA (cite document used); O - other method, such as in-house emission factor (specify).
5. Do not include in the equipment count sealless pumps (canned motor or diaphragm) or those with enclosed venting to a control device. (Emissions from vented equipment should be included in the estimates given in the Emission Points Data Sheet.)
6. Volatile organic compounds (VOC) means the term as defined in 40 CFR §51.100 (s).
7. A light liquid is defined as a fluid with vapor pressure equal to or greater than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if 20% w/w or more of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a light liquid.
8. A heavy liquid is defined as a fluid with a vapor pressure less than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if less than 20% w/w of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a heavy liquid.
9. LIST CO, H<sub>2</sub>S, mineral acids, NO, NO<sub>2</sub>, SO<sub>3</sub>, etc. DO NOT LIST CO<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.
10. Include all process valves whether in-line or on an open-ended line such as sample, drain and purge valves. Do not include safety-relief valves, or leakless valves such as check, diaphragm, and bellows seal valves.
11. Do not include a safety-relief valve if there is a rupture disk in place upstream of the valve, or if the valve vents to a control device.
12. Open-ended lines include purge, drain and vent lines. Do not include sampling connections, or lines sealed by plugs, caps, blinds or second valves.
13. Do not include closed-purge sampling connections.

**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

<p>1. Name or type and model of proposed affected source:</p> <p>Fugitive emissions from venting episodes such as plant shutdowns and compressor start/shut downs.</p>
<p>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.</p>
<p>3. Name(s) and maximum amount of proposed process material(s) charged per hour:</p>
<p>4. Name(s) and maximum amount of proposed material(s) produced per hour:</p> <ul style="list-style-type: none"><li>- compressor blowdown - 0.050 tons VOC per event, 4.21 tons CO<sub>2</sub>e per event</li><li>- compressor startup - 0.005 tons VOC per event, 0.44 tons CO<sub>2</sub>e per event</li><li>- plant shutdown - 0.50 tons VOC per event, 42.10 tons CO<sub>2</sub>e per event</li><li>- pigging venting - 0.005 tons VOC per event, 0.42 tons CO<sub>2</sub>e per event</li></ul>
<p>5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:</p> <p>none</p>

\* 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:					× 10 <sup>6</sup> 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		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

**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 L  
FUGITIVE EMISSIONS FROM UNPAVED HAULROADS**

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

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

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Condensate Tank Truck	4	40	--	1.02	1	365	NA	NA
2	Produced Water Tank Truck	4	40	--	1.02	1	365	NA	NA
3									
4									
5									
6									
7									
8									

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

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

Where:

		PM	PM-10
<b>k =</b>	Particle size multiplier	0.80	0.36
<b>s =</b>	Silt content of road surface material (%)	4.8	4.8
<b>S =</b>	Mean vehicle speed (mph)	--	--
<b>W =</b>	Mean vehicle weight (tons)	40	40
<b>w =</b>	Mean number of wheels per vehicle	4	4
<b>p =</b>	Number of days per year with precipitation >0.01 in.	160	160

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

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

**SUMMARY OF UNPAVED HAULROAD EMISSIONS**

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	0.39	1.72	0.39	1.72	0.10	0.44	0.10	0.44
2	0.39	1.72	0.39	1.72	0.10	0.44	0.10	0.44
3								
4								
5								
6								
7								
8								
<b>TOTALS</b>								

### FUGITIVE EMISSIONS FROM PAVED HAULROADS

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

<b>I =</b>	Industrial augmentation factor (dimensionless)	
<b>n =</b>	Number of traffic lanes	
<b>s =</b>	Surface material silt content (%)	
<b>L =</b>	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1							
2							
3							
4							
5							
6							
7							
8							

**Source:** AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads

$$E = 0.077 \times I \times (4 + n) \times (s + 10) \times (L + 1000) \times (W + 3)^{0.7} =$$

lb/Vehicle Mile Traveled (VMT)

Where:

<b>I =</b>	Industrial augmentation factor (dimensionless)	
<b>n =</b>	Number of traffic lanes	
<b>s =</b>	Surface material silt content (%)	
<b>L =</b>	Surface dust loading (lb/mile)	
<b>W =</b>	Average vehicle weight (tons)	

For lb/hr:  $[I \div VMT] \times [VMT \div trip] \times [Trips \div Hour] =$  lb/hr

For TPY:  $[I \div VMT] \times [VMT \div trip] \times [Trips \div Hour] \times [Ton \div 2000 lb] =$  Tons/year

#### SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1				
2				
3				
4				
5				
6				
7				
8				
<b>TOTALS</b>				

**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

**Equipment Information**

1. Manufacturer: EMIT Technologies Model No. ELH-4200-1616F-65CEE-361	2. Control Device Name: 1C-11C – Catalyst for C-100 to C-1100 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:                      8886                      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?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are particulates present?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Are metals present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
15. Inlet Emission stream parameters:	<b>Maximum</b>	<b>Typical</b>	
Pressure (mmHg):	Not specified		
Heat Content (BTU/scf):	1400	1130	
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 checked="" type="checkbox"/> Other NO <sub>x</sub> , CO, VOC, HCHO, CH <sub>4</sub>				
<input type="checkbox"/> Particulate (type):						
17. Inlet gas velocity:	112 f/sec	18. Pollutant specific gravity:				
19. Gas flow into the collector: 8886 ACF @ 1225°F and PSIA		20. Gas stream temperature: Inlet: 1225 °F Outlet: 1225 °F				
21. Gas flow rate: Design Maximum: 8886 ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: N/A Inlet: 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>	50.37		--	2.01		96
B CO	47.41		--	1.90		96
C VOC	1.56		--	0.78		50
D HCHO	0.19		--	0.044		76
E CH <sub>4</sub>	5.41		--	1.62		70
24. Dimensions of stack:				Height 25 ft.	Diameter 1.1 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: Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
	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: 96%, CO: 96%, VOC: 50%, HCHO: 76%, CH4:70%  
Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies listed above are typical based on expected operating conditions.

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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Prepared For:  
Luz Slaughter  
ANTERO RESOURCES

QUOTE: QUO-14216-N6G2

### INFORMATION PROVIDED BY WAUKESHA

Engine: L7044GSI  
Horsepower: 1680  
RPM: 1200  
Compression Ratio: 8.0  
Exhaust Flow Rate: 8886 CFM  
Exhaust Temperature: 1225 °F  
Reference: N/A  
Fuel: Natural Gas  
Annual Operating Hours: 8760

### Uncontrolled Emissions

	<u>g/bhp-hr</u>
NOx:	13.60
CO:	12.80
THC:	2.30
NMHC	0.86
NMNEHC:	0.42
HCHO:	0.05
CH4:	1.46

### POST CATALYST EMISSIONS

	<u>% Reduction</u>	<u>g/bhp-hr</u>
NOx:	>96 %	<0.54
CO:	>96 %	<0.51
VOC:	>50 %	<0.21
HCHO:	>76 %	<0.01
CH4:	>70%	<0.44

### CONTROL EQUIPMENT

#### Catalyst Housing

Model: ELH-4200-1616F-65CEE-361  
 Manufacturer: EMIT Technologies, Inc  
 Element Size: Rectangle 36" x 15" x 3.5"  
 Element Qty: 5 Elements  
 Catalyst Installation: Accessible Housing  
 Construction: 10 gauge Carbon Steel  
 Sample Ports: 9 (0.5" NPT)  
 Inlet Connections: 16" Flat Face Flange  
 Outlet Connections: 16" Flat Face Flange  
 Configuration: End In / End Out  
 Silencer: Integrated  
 Silencer Grade: Hospital  
 Insertion Loss: 35-40 dBA

#### NOTES:

Variable engine operation will impact the minimum achievable post catalyst emissions.



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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 improper 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.

**Flare**

**Attachment M**  
**Air Pollution Control Device Sheet**  
 (FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): 12C

**Equipment Information**

1. Manufacturer: Superior Fabrication, Inc.  Model No. 60", 4.8 MMBtu/hr	2. Method: <input checked="" type="checkbox"/> Elevated flare <input type="checkbox"/> Ground flare <input type="checkbox"/> Other Describe
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. Method of system used: <input type="checkbox"/> Steam-assisted <input type="checkbox"/> Air-assisted <input type="checkbox"/> Pressure-assisted <input checked="" type="checkbox"/> Non-assisted	
5. Maximum capacity of flare: 61 scf/min 3664                      scf/hr	6. Dimensions of stack: Diameter    5                      ft. Height        15                      ft.
7. Estimated combustion efficiency: (Waste gas destruction efficiency) Estimated:                      98                      % Minimum guaranteed:    98                      %	8. Fuel used in burners: <input checked="" type="checkbox"/> Natural Gas <input type="checkbox"/> Fuel Oil, Number <input type="checkbox"/> Other, Specify:
9. Number of burners: Rating:    4,800,000                      BTU/hr	11. Describe method of controlling flame: Enclosed flare
10. Will preheat be used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12. Flare height:                      15                      ft	14. Natural gas flow rate to flare pilot flame per pilot light: 0.27                      scf/min 16.4                      scf/hr
13. Flare tip inside diameter:    5                      ft	
15. Number of pilot lights: 1 Total    21,484                      BTU/hr	16. Will automatic re-ignition be used? TBD <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
17. If automatic re-ignition will be used, describe the method:	
18. Is pilot flame equipped with a monitor? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, what type? <input checked="" type="checkbox"/> Thermocouple <input type="checkbox"/> Infra-Red <input type="checkbox"/> Ultra Violet <input type="checkbox"/> Camera with monitoring control room <input type="checkbox"/> Other, Describe:	
19. Hours of unit operation per year: 8760	

**Steam Injection**

20. Will steam injection be used? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	21. Steam pressure Minimum Expected: _____ PSIG Design Maximum: _____
22. Total Steam flow rate: _____ LB/hr	23. Temperature: _____ °F
24. Velocity _____ ft/sec	25. Number of jet streams _____
26. Diameter of steam jets: _____ in	27. Design basis for steam injected: _____ LB steam/LB hydrocarbon
28. How will steam flow be controlled if steam injection is used?	

**Characteristics of the Waste Gas Stream to be Burned**

29. Name	Quantity Grains of H <sub>2</sub> S/100 ft <sup>3</sup>	Quantity (LB/hr, ft <sup>3</sup> /hr, etc)	Source of Material
DEHY-1	0	1040.5 scfh	Dehy Still Vent
DEHY-2	0	1040.5 scfh	Dehy Still Vent

30. Estimate total combustible to flare: _____ 2081 LB/hr or <u>ACF/hr</u> (Maximum mass flow rate of waste gas) _____ 35 scfm	
31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.: _____ LB/hr or ACF/hr	
32. Give composition of carrier gases:	
33. Temperature of emission stream: _____ °F Heating value of emission stream: _____ BTU/ft <sup>3</sup> Mean molecular weight of emission stream: _____ MW = _____	34. Identify and describe all auxiliary fuels to be burned. BTU/scf _____ BTU/scf _____ BTU/scf _____
35. Temperature of flare gas: > 1200 °F	36. Flare gas flow rate: _____ scf/min
37. Flare gas heat content: 1310 BTU/ft <sup>3</sup>	38. Flare gas exit velocity: _____ scf/min
39. Maximum rate during emergency for one major piece of equipment or process unit: N/A scf/min	
40. Maximum rate during emergency for one major piece of equipment or process unit: N/A BTU/min	
41. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):	
42. Describe the collection material disposal system:	
43. Have you included <b>Flare Control Device</b> in the Emissions Points Data Summary Sheet? YES	

**44. 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.

**45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.**

N/A – no capture efficiency

**46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.**

98% control efficiency for VOCs, HAPs, C1, C2

**47. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.**

# SFI

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**SUPERIOR FABRICATION, INC.**

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**801 S. Eastern Avenue, Elk City, OK 73644  
Phone: (580) 243-5693 Fax: (580) 243-5507**

## VOC Shielded Flare



## SPECIFICATIONS AND TECHNICAL INFO:

- Dimensions

Flare Tip Diameter	Height (Std Model)	Inlet Connection	Min Capacity	Max Capacity	# of Burner Tips
48"	12'-2"	2" FNPT	0	2.1 mm BTU/hr	210
60"	15'-2"	3" FNPT	0	4.8 mm BTU/hr	480
72"	17'-2"	3" FNPT	0	7.0 mm BTU/hr	720

- Pilot

- Constant burning pilot
- 3.5 – 5.0 psig
- Gas consumption is 16.4 scfh at 5.0 psig
- #70 Drill orifice, (0.028" dia.)

- Monitoring System

- SVC True-Lite Igniter. Provides ignition & monitoring via a thermocouple
- 12/24 volt options
- Dry contacts for external communication, (12/24 volt)
- Solar charging, no utility required
- See [www.superiorfab.com](http://www.superiorfab.com) for more information on the True-Lite Igniter

- Flare Tip Velocity, 10 fps max.

- Gas heating value, 200 Btu/ft<sup>3</sup> minimum and 3500 Btu/ft<sup>3</sup> maximum

- Recommended distance from tanks, 75 ft. minimum (see detailed installation instructions)

- Inlet Pressure 2 oz. minimum, 25 oz. maximum

**Superior Fabrication, Inc.**

801 S. Eastern, PO Box 429

Elk City, OK 73644

Phone: (580) 243-5693

Fax: (580) 243-5507

[superiorfab@superiorfab.com](mailto:superiorfab@superiorfab.com)

[www.superiorfab.com](http://www.superiorfab.com)





## SUPERIOR FABRICATION, INC.

801 S Eastern Avenue, Elk City, OK 73644  
(580) 243-5693 Fax: (580) 243-5507

### Shielded Flare Gas Capacity Chart

Gas Heating Value	48" Shielded Flare (2.1 MM BTU/hr)		60" Shielded Flare (4.8 MM BTU/hr)		72" Shielded Flare (7.0 MM BTU/hr)	
	BTU/ft <sup>3</sup>	CFH	MCFD	CFH	MCFD	CFH
600	3,500	84	8,000	192	11,667	280
700	3,000	72	6,857	165	10,000	240
800	2,625	63	6,000	144	8,750	210
900	2,333	56	5,333	128	7,778	187
1,000	2,100	50	4,800	115	7,000	168
1,100	1,909	46	4,364	105	6,364	153
1,200	1,750	42	4,000	96	5,833	140
1,300	1,615	39	3,692	89	5,385	129
1,400	1,500	36	3,429	82	5,000	120
1,500	1,400	34	3,200	77	4,667	112
1,600	1,313	32	3,000	72	4,375	105
1,700	1,235	30	2,824	68	4,118	99
1,800	1,167	28	2,667	64	3,889	93
1,900	1,105	27	2,526	61	3,684	88
2,000	1,050	25	2,400	58	3,500	84
2,100	1,000	24	2,286	55	3,333	80
2,200	955	23	2,182	52	3,182	76
2,300	913	22	2,087	50	3,043	73
2,400	875	21	2,000	48	2,917	70
2,500	840	20	1,920	46	2,800	67
2,600	808	19	1,846	44	2,692	65
2,700	778	19	1,778	43	2,593	62
2,800	750	18	1,714	41	2,500	60

BTU/ft<sup>3</sup> = British Thermal Units per cubic foot

CFH = Cubic Feet per Hour

MCFD = Thousand Cubic Feet per Day

**Example:**

Maximum capacity of a 48" Flare with 1,050 BTU/cu.ft. gas:

$$\frac{2,100,000}{1,050} \times 24 = 48,000 \text{ cu. ft./Day (48 MCFD)}$$



## **Vapor Recovery Unit**

**Attachment M**  
**Air Pollution Control Device Sheet**  
**(OTHER COLLECTORS)**

Control Device ID No. (must match Emission Units Table): 13C (VRU-100)

**Equipment Information**

1. Manufacturer: TBD Model No. N/A	2. Control Device Name: 13C (VRU-100) Type: Vapor Recovery Unit for Storage Tanks
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: closed loop system, however claiming 98% efficiency	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume:                   TBD   ACFM	10. Capacity: TBD
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. Collected materials get recycled back into gas system – closed loop	

**Gas Stream Characteristics**

14. Are halogenated organics present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are particulates present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are metals present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
15. Inlet Emission stream parameters:	<b>Maximum</b>	<b>Typical</b>	
Pressure (mmHg):	TBD		
Heat Content (BTU/scf):	Not specified		
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 checked="" type="checkbox"/> Other VOC, HAPs				
<input type="checkbox"/> Particulate (type):						
17. Inlet gas velocity:	N/A	ft/sec	18. Pollutant specific gravity:			
19. Gas flow into the collector: TBD ACF @ ambient and TBD PSIA		20. Gas stream temperature: Inlet: ambient °F Outlet: ambient °F				
21. Gas flow rate: Design Maximum: ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: N/A Inlet: 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 VOC	74.81		98	1.49		N/A
B HAPs	1.07		98	0.021		N/A
C CO <sub>2e</sub>	534		98	10.68		N/A
D						
E						
24. Dimensions of stack: Height TBD ft. Diameter TBD 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: Closed loop system – vapors get recycled back into system

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.  
100% - Closed loop system; 98% claimed to be conservative

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.  
None – system has automatic monitoring, shutdown and alerts systems for malfunctions.

**Attachment M**  
**Air Pollution Control Device Sheet**  
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): 14C (VRU-200)

**Equipment Information**

1. Manufacturer: TBD Model No. N/A	2. Control Device Name: 14C (VRU-200) Type: Back-up Vapor Recovery Unit for Storage Tanks
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: closed loop system, however claiming 98% efficiency	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume:                    TBD    ACFM	10. Capacity: TBD
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. Collected materials get recycled back into gas system – closed loop	

**Gas Stream Characteristics**

14. Are halogenated organics present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are particulates present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
Are metals present?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
15. Inlet Emission stream parameters:	<b>Maximum</b>	<b>Typical</b>	
Pressure (mmHg):	TBD		
Heat Content (BTU/scf):	Not specified		
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 checked="" type="checkbox"/> Other VOC, HAPs					
17. Inlet gas velocity: N/A ft/sec		18. Pollutant specific gravity:					
19. Gas flow into the collector: TBD ACF @ ambient and TBD PSIA		20. Gas stream temperature: Inlet: ambient °F Outlet: ambient °F					
21. Gas flow rate: Design Maximum: ACFM Average Expected: ACFM		22. Particulate Grain Loading in grains/scf: N/A Inlet: 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 VOC	74.81		98	1.49		N/A	
B HAPs	1.07		98	0.021		N/A	
C CO <sub>2e</sub>	534		98	10.68		N/A	
D							
E							
24. Dimensions of stack: Height TBD ft.				Diameter TBD 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: Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
	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: Closed loop system – vapors get recycled back into system	
29. Have you included <b>Other Collectores Control Device</b> in the Emissions Points Data Summary Sheet? yes	
<b>30. 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.	
MONITORING:  <b>See Attachment O</b>	RECORDKEEPING:  <b>See Attachment O</b>
REPORTING:  <b>See Attachment O</b>	TESTING:  <b>See Attachment O</b>
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. 100% - Closed loop system; 98% claimed to be conservative	
32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.	
33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty. None – system has automatic monitoring, shutdown and alerts systems for malfunctions.	

**Attachment N.  
Supporting Emissions Calculations**

## Emission Calculations

# EMISSIONS SUMMARY TOTAL

Company:	Antero Midstream LLC
Facility Name:	Carbon North Compressor Station
Facility Location:	Doddridge County, West Virginia

## UNCONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO <sub>x</sub>		PM <sub>10</sub>		HAPs		Formaldehyde		CO <sub>2</sub> e tpy
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
<b>Engines</b>															
Compressor Engine 1	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 2	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 3	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 4	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 5	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 6	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 7	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 8	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 9	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 10	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
Compressor Engine 11	50.37	198.82	47.41	185.24	1.56	6.08	0.008	0.03	0.27	1.06	0.35	1.37	0.19	0.72	8,159
<b>Turbines</b>															
Microturbine Generators	0.24	1.11	0.66	3.06	0.06	0.28	0.02	0.10	0.04	0.19	0.006	0.03	0.004	0.02	3,698
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
<b>Dehydrator</b>															
TEG Dehydrator 1															
TEG Dehydrator 2															
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
<b>Combustors</b>															
Flare and Pilot															
<b>Hydrocarbon Leaking</b>															
Truck Loadout															
<b>Fugitive Emissions</b>															
Component Leak Emissions															
Venting Emissions															
Fugitive Dust Emissions															
<b>Storage Tanks</b>															
Produced Water Tanks															
Settler Tank															
Condensate Tanks															
<b>Total Facility PTE =</b>	<b>554.68</b>	<b>2,167.77</b>	<b>522.45</b>	<b>2,042.10</b>	<b>297.07</b>	<b>971.85</b>	<b>0.11</b>	<b>0.46</b>	<b>3.14</b>	<b>12.38</b>	<b>21.78</b>	<b>68.92</b>	<b>2.04</b>	<b>7.98</b>	<b>110,056</b>

# EMISSIONS SUMMARY TOTAL

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Dodderidge County, West Virginia

## CONTROLLED POTENTIAL EMISSION SUMMARY

Source	NOx		CO		VOC		SO <sub>2</sub>		PM-10		HAPs		Formaldehyde		CO <sub>2e</sub> tpy
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
<b>Engines</b>															
Compressor Engine 1	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 2	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 3	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 4	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 5	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 6	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 7	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 8	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 9	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 10	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
Compressor Engine 11	2.01	7.87	1.90	7.41	0.78	3.04	0.008	0.03	0.27	1.06	0.21	0.82	0.04	0.17	7,789
<b>Turbines</b>															
Microturbine Generators	0.24	1.11	0.66	3.06	0.06	0.26	0.02	0.10	0.04	0.19	0.006	0.03	0.004	0.02	3,698
Catalytic Heater for Generator Fuel	0.003	0.01	0.002	0.01	0.002	0.007	0.00002	0.00008	0.0002	0.001	0.00006	0.0002	0.00002	0.00001	12
<b>Dehydrator</b>															
TEG Dehydrator 1	---	---	---	---	2.64	11.58	---	---	---	---	0.22	0.97	---	---	380
TEG Dehydrator 2	---	---	---	---	2.64	11.58	---	---	---	---	0.22	0.97	---	---	380
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	0.0008	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	0.0008	771
<b>Combustion</b>															
Flare and Pilot	0.33	1.44	1.76	7.79	0.001	0.006	0.0001	0.00008	0.0002	0.007	0.00004	0.0002	---	---	2,465
<b>Hydrocarbon Loading</b>															
Truck Loadout	---	---	---	---	77.14	8.11	---	---	---	---	1.10	0.12	---	---	57.91
<b>Fugitive Emissions</b>															
Component Leak Emissions	---	---	---	---	1.62	7.09	---	---	---	---	0.005	0.02	---	---	133
Venting Emissions	---	---	---	---	---	8.35	---	---	---	---	---	0.02	---	---	709
<b>Fugitive Dust Emissions Storage Tanks</b>															
Produced Water Tanks	---	---	---	---	0.003	0.01	---	---	---	---	0.00004	0.0002	---	---	0.10
Settler Tank	---	---	---	---	1.44	6.33	---	---	---	---	0.02	0.09	---	---	45.2
Condensate Tanks	---	---	---	---	0.05	0.21	---	---	---	---	0.0007	0.003	---	---	1.5
<b>Total Facility PTE =</b>	<b>23.10</b>	<b>90.77</b>	<b>23.61</b>	<b>93.71</b>	<b>94.18</b>	<b>87.05</b>	<b>0.11</b>	<b>0.46</b>	<b>3.14</b>	<b>12.38</b>	<b>3.89</b>	<b>11.27</b>	<b>0.49</b>	<b>1.93</b>	<b>95,122</b>

# Compressor Engine Emission Calculations

Company:	Antaro Midstream LLC
Facility Name:	Carson North Compressor Station
Facility Location:	Dorchester County, West Virginia
Source Description:	Compressor Engines

### Source Information-Per Engine

Emission Unit ID:	C-100 - C-1100
Engine Make/Model:	Waukesha 7044 GSI
Service:	Compression
Control:	Y
Control - Y or N / Type:	NSCR/AFRC
Site Horsepower Rating:	1,680 hp
Fuel Consumption (BSFC):	6,284 Btu/(hp-hr)
Heat Rating:	13.83 MM/Btu/hr
Fuel Consumption:	96.36 MMBtu/hr
Fuel Consumption:	12,360 scf/hr
Fuel Heating Value:	1,130 Btu/scf
Operating Hours:	8,760 hrs/yr

- Notes:
1. Values from Waukesha specification sheet.
  2. Calculated values.
  3. Annual fuel consumption is 85% of maximum fuel consumption at 100% load.

### Potential Emissions per Engine

Pollutant	Uncontrolled			Controlled			Source of Emissions Factors
	Emission Factor (lb/MMBtu)	Estimated Emissions (lb/yr)	(tpy) <sup>4</sup>	Emission Factor (g/bhp-hr)	Estimated Emissions (lb/yr)	(tpy) <sup>4</sup>	
NOx <sup>1,5</sup>	13.6	50.37	196.82	0.64	2.01	7.87	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
CO <sup>1,5</sup>	12.8	47.41	185.24	0.51	1.90	7.41	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
VOC <sup>1</sup>	0.42	1.56	6.06	0.21	0.78	3.04	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
SO <sub>2</sub>	5.89E-04	0.0062	0.032	5.89E-04	0.0062	0.032	AP-42, Chapter 3.2, Table 3.2-3
PM <sub>2.5</sub> /PM <sub>10</sub>	1.94E-02	0.27	1.06	1.94E-02	0.27	1.06	AP-42, Chapter 3.2, Table 3.2-3
Total PM	1.94E-02	0.27	1.06	1.94E-02	0.27	1.06	AP-42, Chapter 3.2, Table 3.2-3
1,1,2,2-Tetrafluoroethane	2.53E-05	0.00035	2.75	2.53E-05	0.00035	2.75	AP-42, Chapter 3.2, Table 3.2-3
1,3-Butadiene	6.63E-04	0.0062	72.19	6.63E-04	0.0062	72.19	AP-42, Chapter 3.2, Table 3.2-3
Acetaldehyde	2.79E-03	0.038	303.81	0.038	303.81	0.15	AP-42, Chapter 3.2, Table 3.2-3
Acrolein	2.63E-03	0.037	286.38	0.037	286.38	0.14	AP-42, Chapter 3.2, Table 3.2-3
Benzene	1.58E-03	0.022	172.05	0.022	172.05	0.086	AP-42, Chapter 3.2, Table 3.2-3
Ethylbenzene	2.48E-05	0.00035	2.70	2.48E-05	0.00035	2.70	AP-42, Chapter 3.2, Table 3.2-3
Formaldehyde <sup>1</sup>	0.05	0.19	1.447	0.01	0.44	0.17	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
Methanol	3.06E-03	0.043	333.21	0.043	333.21	0.17	AP-42, Chapter 3.2, Table 3.2-3
Methylene Chloride	4.12E-05	0.00057	4.49	4.12E-05	0.00057	4.49	AP-42, Chapter 3.2, Table 3.2-3
PAH	1.41E-04	0.0020	15.35	0.0020	16.35	0.0077	AP-42, Chapter 3.2, Table 3.2-3
Toluene	5.58E-04	0.0078	60.78	0.0078	60.78	0.030	AP-42, Chapter 3.2, Table 3.2-3
Xylenes	1.85E-04	0.0027	21.23	0.0027	21.23	0.011	AP-42, Chapter 3.2, Table 3.2-3
Other HAPs <sup>2</sup>	2.10E-04	0.0028	22.84	0.0028	22.84	0.011	AP-42, Chapter 3.2, Table 3.2-3
Total HAPs	0.35	2745	1.37	0.21	1645	0.82	
Pollutant	Emission Factor (lb/MMBtu)	Estimated Emissions (lb/yr)	(tpy) <sup>4</sup>	Emission Factor (g/bhp-hr)	Estimated Emissions (lb/yr)	(tpy) <sup>4</sup>	Source of Emissions Factors
CO <sup>1</sup>	527	1,952	7,627	527	1,952	7,627	Manufacturer's Specs
CH <sub>4</sub> <sup>1,5</sup>	1.46	5.41	21.13	0.44	1.62	6.34	Manufacturer's Specs - uncontrolled, Catalyst Specs - controlled
N <sub>2</sub> O	0.0001	0.0031	0.012	0.0001	0.0031	0.012	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> <sup>2</sup>	2,098	8,159	31,659	2,098	8,159	31,659	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

Notes:

4. Annual Emissions are based on engine<sup>3</sup> operating with 85% fuel of total fuel usage.
5. Due to variable load conditions, the catalyst efficiency may vary. The catalyst efficiencies used in the emissions are typical based on expected operating conditions.

### Example Calculations

$$\text{lb/yr} = (\text{g/bhp-hr}) \cdot (\text{hp}) \cdot (1 \text{ lb/MMBtu}) \cdot (\text{MMBtu/hr})$$

$$\text{tpy} = (\text{MMBtu/yr}) \cdot (\text{Btu/lb}) \cdot (\text{g/bhp-hr}) \cdot (\text{Btu/hp-hr}) \cdot (1 \text{ lb}/2000 \text{ lb}) \cdot (\text{MMBtu/yr}) \cdot (1 \text{ ton}/2000 \text{ lb})$$

# Microturbine Generator Emission Calculations

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddridge County, West Virginia
Source Description:	Microturbine Generators

## Source Information

Emission Unit ID:	GEN1 & GEN2
Make/Model:	Capstone C300 Standard
Microturbine Rating:	600 kW/e
Net Heat Rate:	10,300 Btu/kWh
Heat Input <sup>1</sup> :	6.18 MMBtu/hr
Operating Hours <sup>4</sup> :	8,280 hrs/yr

### Notes:

- 1) Calculated
- 2) The C300 is sold as three (3) C200 units in operation together. Thus emission factors for the C300 are the same as the C200 (just three times the kW). There will be two C200 units (six C200 units) on location.
- 3) No more than 600 kW will be operational at one time, except when C200 units are being switched. All units are wired together and operation between individual C200 units will rotate based on functionality of units (e.g., during repairs). During unit switching the load will go down to 75%.
- 4) Annual operation for 600 kW will be for a maximum of 8,760 hours. It is expected no more than 600 hours of back up power will be utilized during repairs or during unit switches. Each C200 has an hour meter, so it will be known how much each C200 unit is operating.

## Potential Emissions

Pollutant	Uncontrolled			Controlled			Source of Emissions Factors
	Emission Factor (lb/MMBtu)	Estimated Emissions (lb/yr)	(tpy)	Emission Factor (lb/MMBtu)	Estimated Emissions (lb/yr)	(tpy)	
NOx	0.40	0.24	1.11	0.40	0.24	1.11	Manufacturer Specifications
CO	1.10	0.66	3.06	1.10	0.66	3.06	Manufacturer Specifications
VOC	0.10	0.060	0.28	0.10	0.060	0.28	Manufacturer Specifications
SO <sub>2</sub>	3.40E-03	0.021	0.097	3.40E-03	0.021	0.097	AP-42, Chapter 3.1, Table 3.1-2a
PM <sub>2.5</sub> /PM <sub>10</sub>	6.80E-03	0.041	0.19	6.80E-03	0.041	0.19	AP-42, Chapter 3.1, Table 3.1-2a
1,3-Butadiene	4.30E-07	0.025	0.00012	4.30E-07	0.025	0.00012	AP-42, Chapter 3.1, Table 3.1-3
Acetaldehyde	4.00E-05	2.47E-04	0.0011	4.00E-05	2.47E-04	0.0011	AP-42, Chapter 3.1, Table 3.1-3
Acrolein	6.40E-06	3.98E-05	0.00018	6.40E-06	3.98E-05	0.00018	AP-42, Chapter 3.1, Table 3.1-3
Benzene	1.20E-05	7.42E-05	0.00034	1.20E-05	7.42E-05	0.00034	AP-42, Chapter 3.1, Table 3.1-3
Ethylbenzene	3.20E-05	1.98E-04	0.00092	3.20E-05	1.98E-04	0.00092	AP-42, Chapter 3.1, Table 3.1-3
Formaldehyde	7.10E-04	4.39E-03	0.020	7.10E-04	4.39E-03	0.020	AP-42, Chapter 3.1, Table 3.1-3
Naphthalene	1.30E-06	8.03E-06	0.00037	1.30E-06	8.03E-06	0.00037	AP-42, Chapter 3.1, Table 3.1-3
PAH	2.20E-06	1.36E-05	0.13	2.20E-06	1.36E-05	0.13	AP-42, Chapter 3.1, Table 3.1-3
Propylene Oxide	2.90E-05	1.79E-04	1.66	2.90E-05	1.79E-04	1.66	AP-42, Chapter 3.1, Table 3.1-3
Toluene	1.30E-04	8.03E-04	7.44	1.30E-04	8.03E-04	7.44	AP-42, Chapter 3.1, Table 3.1-3
Xylenes	6.40E-05	3.98E-04	3.66	6.40E-05	3.98E-04	3.66	AP-42, Chapter 3.1, Table 3.1-3
<b>Total HAPS</b>		0.0063	58.79	0.0063	58.79	0.029	
Pollutant	Emission Factor (lb/MMBtu)	Estimated Emissions (lb/yr)	(tpy)	Emission Factor (lb/MMBtu)	Estimated Emissions (lb/yr)	(tpy)	Source of Emissions Factors
CO <sub>2</sub>	1,330	798.0	3684.7	1,330	798.0	3684.7	Manufacturer Specifications
CH <sub>4</sub>	0.001	0.014	0.063	0.001	0.014	0.063	40 CFR Part 98, Subpart C, Table C-2
N <sub>2</sub> O	0.0001	0.0014	0.0063	0.0001	0.0014	0.0063	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	—	798	3,688	—	798	3,688	40 CFR Part 98, Subpart A, Table A-1, effective January 2014

## Example Calculations

$$\text{lb/yr} = (\text{lb/MMBtu}) \cdot \text{kW/e} \cdot (1 \text{ MWh}/1000 \text{ kWh}) \text{ or } (\text{lb/MMBtu}) \cdot (\text{MMBtu/hr}) \cdot (\text{MMBtu/yr}) \cdot (2.21 \text{ lb/kg})$$

$$\text{tpy} = (\text{lb/yr}) \cdot (\text{hr/yr}) \cdot (\text{ton}/2000 \text{ lb})$$

# Natural Gas Fueled Catalytic Heater Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Location:	Doddridge County, West Virginia
Source Description:	Catalytic Heater for Generator Fuel

### Source Information

Emission Unit ID:	CATH1
Source Description:	Generator Fuel Heater
Hours of Operation	8,760 hr/yr
Design Heat Rate	0.024 MMBtu/hr
Heater Efficiency	0.8
Fuel Heat Value	1,020 Btu/scf
Fuel Use	0.26 MMscf/yr

### Emission Calculations per Reboiler

Pollutant	Emission Factor (lb/MMscf)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
NO <sub>x</sub>	100	0.0029	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	0.00098	AP-42 Ch. 1.4 Table 1.4-2
SO <sub>2</sub>	0.6	0.00018	0.00077	AP-42 Ch. 1.4 Table 1.4-2
Formaldehyde	0.075	0.00002	0.00010	AP-42 Ch. 1.4 Table 1.4-3
Total HAPs (including HCHO)	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>2e</sub>	---	2.82	12	40 CFR Part 98, Subpart A, Table A-1

### Sample Calculations:

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

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

## Dehydrator Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddridge County, West Virginia
Source Description:	Dehydrator Units

### Potential Emissions per Dehydrator

Pollutant	Emission Unit ID: DEHY1/DEHY2 Dehydrator Still Vent		Emission Unit ID: DFLSH1/DFLSH2 Flash Tank Gas	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
<b>Uncontrolled Emissions</b> <sup>1</sup>				
VOC	16.21	71.00	46.94	205.61
Total HAPs	5.62	24.60	2.25	9.87
Benzene	1.35	5.90	0.33	1.46
Toluene	2.12	9.30	0.40	1.73
Xylenes	1.74	7.62	0.15	0.67
n-Hexane	0.41	1.79	1.37	6.01
Methane	18.83	82.48	62.47	273.62
Carbon Dioxide	0.22	0.96	1.25	5.48
CO <sub>2</sub> e	471	2,063	1,563	6,846
<b>Controlled Emissions</b> <sup>2,3</sup>				
VOC	0.30	1.30	2.35	10.28
Total HAPs	0.11	0.48	0.11	0.49
Benzene	0.027	0.12	0.017	0.073
Toluene	0.041	0.18	0.020	0.087
Xylenes	0.033	0.14	0.0077	0.034
n-Hexane	0.0081	0.036	0.069	0.30
Methane	0.38	1.65	3.12	13.68
Carbon Dioxide	0.22	0.96	1.25	5.48
CO <sub>2</sub> e	9.63	42.19	79.34	347.50

Pollutant	Unit ID: DEHY + DFLSH Dehydrator Emission Totals	
	(lb/hr)	(tpy)
<b>Uncontrolled Emissions</b> <sup>1</sup>		
VOC	63.15	276.62
Total HAPs	7.87	34.48
Benzene	1.68	7.36
Toluene	2.52	11.03
Xylenes	1.89	8.29
n-Hexane	1.78	7.80
Methane	81.30	356.10
Carbon Dioxide	1.47	6.43
CO <sub>2</sub> e	2,034	8,909
<b>Controlled Emissions</b> <sup>2,3</sup>		
VOC	2.64	11.58
Total HAPs	0.22	0.97
Benzene	0.04	0.19
Toluene	0.06	0.27
Xylenes	0.04	0.18
n-Hexane	0.077	0.34
Methane	3.50	15.33
Carbon Dioxide	1.47	6.43
CO <sub>2</sub> e	89.0	389.7

<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 98% control efficiency.

<sup>3</sup> Flash tank gas is used in the reboiler as the primary fuel source. Assumed 95% combustion of flash tank gas.

# Natural Gas Fueled Dehydrator Reboiler Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Location:	Doddridge County, West Virginia
Source Description:	Dehydrator Reboilers

**Source Information**

Emission Unit ID:	DREB1 - DREB2
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	0.0006	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	0.0033	0.015	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.0001	0.00033	0.0015	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2e</sub>	---	176.1	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 Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddridge County, West Virginia
Source Description:	Flare for Dehydrator Still Vent Gas
Emission Unit ID:	FLARE1

### Combusted Gas Emissions

Flare Heat Input :	4.80	MMBtu/hr
Vent Gas to Flare Rate:	3664	scf/hr
Gas Heating Value:	1,310	Btu/scf
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	0.33	1.43
Carbon Monoxide (CO)	0.37	1.78	7.78

<sup>1</sup> Emission Factors from Table 13.5-1 of AP-42 Section 13.5 (Sept 1991)

### Pilot Emissions

Pilot Heating Value:	1,310	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	1.60E-04	7.01E-04
Nitrogen Oxides (NO <sub>x</sub> ) <sup>2</sup>	100	2.11E-03	9.23E-03
Sulfur Dioxide (SO <sub>2</sub> ) <sup>2</sup>	0.6	1.26E-05	5.54E-05
Carbon Monoxide (CO) <sup>2</sup>	84	1.77E-03	7.75E-03
Volatile Organic Compounds (VOC) <sup>2</sup>	5.5	1.16E-04	5.07E-04
Total HAPs <sup>2,3</sup>	1.88	3.96E-05	1.73E-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	Total Potential Emission Rate (tons/year)
Particulate Matter (PM/PM <sub>10</sub> /PM <sub>2.5</sub> )	7.01E-04
Nitrogen Oxides (NO <sub>x</sub> )	1.44
Sulfur Dioxide (SO <sub>2</sub> )	5.54E-05
Carbon Monoxide (CO)	7.79
Volatile Organic Compounds (VOC)	5.07E-04
Total HAPs	1.73E-04

### Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	562.86	2465	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.011	0.046	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.0011	0.0046	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	---	562.86	2465	40 CFR Part 98, Subpart A, Table A-1

# Storage Tank Flashing Emissions Calculated by Vasquez-Beggs Correlation

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddridge County, West Virginia
Source Description:	Settling Tank Flashing Emissions
Emission Unit ID:	TK-1502

### Calculation Parameters

Parameter	Settling Tank Value
Oil Gravity (API) <sup>1</sup>	38
Production Rate (bbl/day) <sup>2</sup>	195
Separator Pressure (psig) <sup>3</sup>	300
Separator Temperature (F) <sup>4</sup>	120
Atmospheric Pressure (psia)	14.70
Mole wt. of Flash Gas <sup>5</sup>	60.0
Gas Spec. Gravity @ separator conditions <sup>5</sup>	0.9
VOC % of Flash Gas <sup>5</sup>	70
Methane % of Flash Gas <sup>5</sup>	20
Total HAP % of Flash Gas <sup>5</sup>	1

### Vasquez - Beggs Correlation Constants

Constant	API < 30	API > 30
C1	0.0362	0.0178
C2	1.0937	1.1870
C3	25.724	23.9310

**Notes:**

1. Anticipated API gravity based on similar compressor stations
2. Estimated production of condensate and produced water entering the settling tank. Flashing will only occur in the settling tank as the fluids will settle and stabilize in the settling tank at atmospheric pressure.
3. Most of the produced fluids will come into the settling tank at lower pressure than 300 psig; however, some equipment is at higher pressure, so 300 psig was used.
4. Typical design temperature of facility.
5. Typical/upper end bound values for the parameters.

### Calculations Results

Parameter	Settling Tank Value	
	Uncontrolled	Controlled <sup>6</sup>
Calculated Gas Specific gravity @ 100 psig	1.01	---
Calculated Solution Gas Ratio (scf/bbl)	78.57	---
Calculated Rate of Flash Loss (scf/day)	15,322	---
Calculated THC Emissions (tons/yr)	442.09	8.84
Calculated CH <sub>4</sub> Emissions (tons/yr)	88.42	1.77
Calculated CO <sub>2</sub> e Emissions (tons/yr)	2,210.5	44.21
Calculated VOC Emissions (tons/yr)	309.46	6.19
Calculated HAP Emissions (tons/yr)	4.42	0.088

**Notes:**

6. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system
- Gas Spec. Grav. @ 100 psig = Gas Spec. Grav. @ Sep. Cond. \* [1.0+5.912E-5 \* Oil Grav. \* Sep. Temp. \* log[(Sep. Press.+ Atmos. Press.)/114.7]]
- Gas Ratio(sc/fbbl) = C1 \* Gas Spec. Grav. @ 100 psig \* Separator Press.^C2 \* Exp[C3 \* Oil Gravity/(Separator Temp. +460)]
- Flash Losses(sc/fday) = Solution Gas Ratio(sc/fbbl) \* Oil Production Rate(bbl/day)
- THC Emissions(ton/yr) = Flash Losses(sc/fday) \* Mole Wt. of Flash Gas(lb/lb-mole) \* 365 days/yr / [379.5 scf/lb-mol \* 2000 lb/ton]
- CH<sub>4</sub> Emissions (tons/yr) = THC Emissions (tons/yr) \* Methane % / 100
- VOC Emissions (tons/yr) = THC Emissions (tons/yr) \* VOC % / 100
- HAP Emissions (tons/yr) = THC Emissions (tons/yr) \* HAP % / 100

# Storage Tank Working and Breathing Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddrige County, West Virginia
Source Description:	W&B Storage Tank Emissions
Emission Unit ID:	TK-1500, TK-1501, TK-1502, TK-200, TK-201

TANK DESCRIPTION	Uncontrolled VOC Emissions <sup>1</sup> (tons/yr)	Uncontrolled CH <sub>4</sub> Emissions <sup>3</sup> (tons/yr)	Uncontrolled CO <sub>2</sub> e Emissions (tons/yr)	Uncontrolled HAP Emissions <sup>4</sup> (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-200)	5.29	1.51	37.77	0.076
400 bbl Hydrocarbon Storage Tank (TK-201)	5.29	1.51	37.77	0.076
400 bbl Settling Tank (TK-1502)	6.93	1.98	49.48	0.099
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-1500)	0.34	0.097	2.42	0.0048
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-1501)	0.34	0.097	2.42	0.0048
<b>TOTAL</b>	<b>18.18</b>	<b>5.19</b>	<b>129.86</b>	<b>0.26</b>

TANK DESCRIPTION	Controlled VOC Emissions <sup>5</sup> (tons/yr)	Controlled CH <sub>4</sub> Emissions <sup>5</sup> (tons/yr)	Controlled CO <sub>2</sub> e Emissions <sup>5</sup> (tons/yr)	Controlled HAP Emissions <sup>5</sup> (tons/yr)
400 bbl Hydrocarbon Storage Tank (TK-200)	0.11	0.030	0.76	0.0015
400 bbl Hydrocarbon Storage Tank (TK-201)	0.11	0.030	0.76	0.0015
400 bbl Settling Tank (TK-1502)	0.14	0.040	0.99	0.0020
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-1500)	0.0068	0.0019	0.048	0.000097
400 bbl Produced Water Storage Tank <sup>2</sup> (TK-1501)	0.0068	0.0019	0.048	0.000097
<b>TOTAL</b>	<b>0.36</b>	<b>0.10</b>	<b>2.60</b>	<b>0.0052</b>

Notes:

1. Tanks 4.0.9d used to calculate standing, working, and breathing (S,W,B) emissions
2. Produced water assumed to have no more than 10% hydrocarbon liquid
3. Methane emissions estimated assuming 70% VOC and 20% CH<sub>4</sub> in tank vent gas
4. HAP emissions estimated assuming 1% HAPs in the tank vent gas
5. Tanks are controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system.

# Truck Loading Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddridge 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)

VOC Emissions (tpy) =  $L_L$  (lbs VOC/1000 gal) \* 42 gal/bbl \* 365 days/year \* production (bbl/day)  
 1000 gal \* 2000 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)	Uncontrolled		
								VOC (tpy)	HAP <sup>7</sup> (tpy)	CO2e <sup>8</sup> (tpy)
Condensate	0.6	8.2	60	60	519.67	7.05	150	8.10	0.12	57.86
Produced Water <sup>5</sup>	0.6	0.37	36	60	519.67	0.19	45	0.007	0.0001	0.047

- Notes:
- Saturation factor from AP-42, Table 5.2-1 (Submerged loading (bottom loading): dedicated normal service)
  - True vapor pressure is estimated from AP-42, Table 7.1-2 assuming an average daily temperature of 60 deg F and an RVP of 15.
  - Molecular weight liquid vapor is estimated from AP-42, Table 7.1-2 assuming an RVP of 15.
  - Temperature based on the annual average temperature for Elkins, West Virginia.
  - Produced water assumed to have no more than 10% hydrocarbon liquid
  - Loading is controlled by a VRU with assumed 98% capture efficiency; but will likely be higher as vapors are recycled back into the system
  - HAP emissions estimated from % HAP/%VOC from condensate vent gas
  - CO2e emissions estimated from % CH4/%VOC from condensate vent gas

Assume 1 truck loaded per hour, 260 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)	Uncontrolled		
								VOC (lb/hr)	HAP <sup>7</sup> (lb/hr)	CO2e <sup>8</sup> (lb/hr)
Condensate	0.6	8.2	60	60	519.67	7.05	260	76.93	1.10	549.5
Produced Water <sup>5</sup>	0.6	0.37	36	60	519.67	0.19	260	0.21	0.003	1.50

# Component Fugitive Emissions

Company:	Antero Midstream LLC
Facility Name:	Canton North Compressor Station
Facility Location:	Doddridge 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	548	8,760	3.90E-04	0.18	2.07	0.38
Valves - Gas Service	773	8,760	4.50E-03	0.18	33.67	6.19
Compressor Seals Gas Service	33	8,760	8.80E-03	0.18	2.81	0.52
<b>Total Emissions (tons/yr)</b>					<b>38.55</b>	<b>7.09</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)
Flanges - Gas Service	0.00019	0.00039	0.00023	0.00047	---	---	0.00010	0.00021
Valves - Gas Service	0.00019	0.0064	0.00023	0.0076	---	---	0.00010	0.0035
Compressor Seals Gas Service	0.00019	0.00053	0.00023	0.00063	---	---	0.00010	0.00029
<b>Total Emissions (tons/yr)</b>		<b>0.0073</b>		<b>0.0087</b>				<b>0.0040</b>

1) Component counts from Engineering Lists.

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

3) VOC and HAP Weight Fractions are from a gas analysis that will be typical for the facility

GHG Fugitive Emissions						
Equipment Type	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>	CO <sub>2</sub> e Emissions (tpy)
Flanges	548	8,760	0.003	0.98	0.011	6.75
Valves	773	8,760	0.027	0.98	0.011	85.67
Compressor Seals	33	8,760	0.300	0.98	0.011	40.64
<b>Total Emissions (tons/yr)</b>						<b>133.06</b>

1) Component counts from Engineering Lists.

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:	Canton North Compressor Station
Facility Location:	Doddridge 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>	132	10,000	20.64	35.89	0.18	6.54
Compressor Startup <sup>3</sup>	132	1,050	20.64	3.77	0.18	0.69
Plant Shutdown	2	100,000	20.64	5.44	0.18	0.99
Pigging Venting	26	1,000	20.64	0.71	0.18	0.13
<b>Total Emissions (tons/yr)</b>						<b>8.35</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)	Total Emissions (tons/yr)
Compressor Blowdown <sup>2</sup>	0.00019	0.0068	0.00022	0.0080	---	---	0.00010	0.0037	
Compressor Startup <sup>3</sup>	0.00019	0.00071	0.00022	0.00084	---	---	0.00010	0.00039	
Plant Shutdown	0.00019	0.0010	0.00022	0.0012	---	---	0.00010	0.00056	
Pigging Venting	0.00019	0.00013	0.00022	0.00016	---	---	0.00010	0.00073	
<b>Total Emissions (tons/yr)</b>		<b>0.0087</b>		<b>0.010</b>				<b>0.0047</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>	CH <sub>4</sub> Emissions (ton/yr)	CO <sub>2</sub> Weight Fraction <sup>4</sup>	CO <sub>2</sub> Emissions (ton/yr)	CH <sub>4</sub> Emissions (ton/yr)	CO <sub>2</sub> Emissions (ton/yr)	Total Emissions (tons/yr)
Compressor Blowdown <sup>2</sup>	132	10,000	20.64	0.62	22.22	0.0039	0.14	22.22	0.14	555.72
Compressor Startup <sup>3</sup>	132	1,050	20.64	0.62	2.33	0.0039	0.015	2.33	0.015	58.35
Plant Shutdown	2	100,000	20.64	0.62	3.37	0.0039	0.021	3.37	0.021	84.20
Pigging Venting	26	1,000	20.64	0.62	0.44	0.0039	0.0027	0.44	0.0027	10.95
<b>Total Emissions (tons/yr)</b>					<b>28.36</b>		<b>0.18</b>			<b>709.21</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:	Mountain 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	5,366	1.02	371
Produced Water Tank Truck	40.00	365	1.0	5,366	1.02	371

Equation Parameter	PM-10/PM2.5	PM-Total
E, 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
k, 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
k, Particle size multiplier for particle size range (PM <sub>2.5</sub> ), (lb/VMT) (Source: AP-42 Table 13.2.2-2)	0.15	
s, surface material silt content, (%) (Source: AP-42 Table 13.2.2-1)	4.8	4.8
W, mean weight (tons) of the vehicles traveling the road	40.00	40.00
a, 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, 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
P, number of "wet" days with at least 0.254 mm (0.01 in) of precipitation during the averaging period, based on AP-42 Figure 13.2.2-1.	160	160

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

Source of Equation: AP-42 Section 13.2.2

### PM<sub>10</sub> Emissions

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr) <sup>4</sup>	Annual Uncontrolled PM <sub>10</sub> Emissions (tpy)
1.18	741.89	0.44

### PM<sub>2.5</sub> Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr) <sup>4</sup>	Annual Uncontrolled PM <sub>2.5</sub> Emissions (tpy)
0.118	741.89	0.044

### PM- Total Emissions (tons/yr)

Emission Factor (lb/VMT)	Vehicle miles traveled (VMT/yr) <sup>4</sup>	Annual Uncontrolled PM-Total Emissions (tpy)
4.65	741.89	1.72

#### 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 (200 bbl truck) and one produced water truck (200 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 2,683 feet for the gravel access road.
4. VMT/yr = Trips/yr x Roundtrip Distance
5. Hourly emissions determined from tons per year calculation using 2,000 lb/ton and 8,760 hours per year.

# Facility Gas Analysis

	Ed Arnold 1H MOL %	MW lb/lb-mol	Component Weight lb/lb-mol	Wt. Fraction
Methane	79.663	16.04	12.78	0.619
Ethane	12.999	30.07	3.91	0.189
Propane	3.892	44.10	1.72	0.083
i-Butane	0.596	58.12	0.35	0.017
n-Butane	1.033	58.12	0.60	0.029
i-Pentane	0.352	72.15	0.25	0.012
n-Pentane	0.302	72.15	0.22	0.011
Hexanes	0.205	106.72	0.22	0.011
Heptanes	0.115	100.20	0.12	0.006
Octanes	0.055	114.23	0.06	0.003
Nonanes	0.007	128.26	0.01	0.000
Decanes	0.073	142.29	0.10	0.005
n-Hexane	0.122	86.18	0.11	0.005
Benzene	0.005	78.11	0.00	0.0002
Toluene	0.005	92.14	0.00	0.0002
Ethylbenzene	---	106.17	---	---
Xylenes	0.002	106.16	0.00	0.0001
Nitrogen	0.392	28.01	0.11	0.005
Carbon Dioxide	0.182	44.01	0.08	0.004
Totals	100.00		20.64	1.00

Heating Value (Btu/scf)            1,230.40  
Molecular weight                        20.64

VOC weight fraction                    0.1822  
Methane weight fraction                0.6192  
THC weight fraction                    0.9908  
VOC of THC wt fraction                0.1839  
CH4 of THC wt fraction                0.6249  
Benzene of THC wt fraction            0.0002  
Toluene of THC wt fraction            0.0002  
E-benzene of THC wt fraction         ---  
Xylene of THC wt fraction              0.0001  
n-Hexane of THC wt fraction         0.0051

**GlyCalc**

## GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Canton North Compressor Station

File Name: W:\Antero\134318 - Canton North CS\Air Permit - Task 13\Emissions\Gly Calc  
Canton North CS.ddf

Date: January 02, 2014

## DESCRIPTION:

-----  
Description: Kimray 45015PV pump  
60 MMscfd

Annual Hours of Operation: 8760.0 hours/yr

## WET GAS:

-----  
Temperature: 120.00 deg. F  
Pressure: 1000.00 psig  
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1820
Nitrogen	0.3920
Methane	79.6630
Ethane	12.9990
Propane	3.8920
Isobutane	0.5960
n-Butane	1.0330
Isopentane	0.3520
n-Pentane	0.3020
Cyclopentane	0.0130
n-Hexane	0.1220
Cyclohexane	0.0130
Other Hexanes	0.1920
Heptanes	0.1150
Methylcyclohexane	0.0210
Benzene	0.0050
Toluene	0.0050
Xylenes	0.0020
C8+ Heavies	0.1350

## DRY GAS:

-----  
Flow Rate: 60.0 MMSCF/day  
Water Content: 7.0 lbs. H2O/MMSCF

## LEAN GLYCOL:

-----  
Glycol Type: TEG  
Water Content: 1.5 wt% H2O  
Recirculation Ratio: 2.5 gal/lb H2O

## 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: 95.00 %  
Temperature: 190.0 deg. F  
Pressure: 35.0 psig

STRIPPING GAS:  
-----

Source of Gas: Dry Gas  
Gas Flow Rate: 9.000 scfm

REGENERATOR OVERHEADS CONTROL DEVICE:  
-----

Control Device: Condenser  
Temperature: 145.0 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: Canton North Compressor Station

File Name: W:\Antero\134318 - Canton North CS\Air Permit - Task 13\Emissions\Gly Calc  
Canton North CS.ddf

Date: January 02, 2014

## DESCRIPTION:

Description: Kimray 45015PV pump  
60 MMscfd

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.3766	9.038	1.6494
Ethane	0.1266	3.038	0.5545
Propane	0.0657	1.577	0.2879
Isobutane	0.0148	0.355	0.0648
n-Butane	0.0291	0.699	0.1276
Isopentane	0.0120	0.289	0.0527
n-Pentane	0.0118	0.284	0.0518
Cyclopentane	0.0024	0.057	0.0105
n-Hexane	0.0081	0.195	0.0355
Cyclohexane	0.0052	0.124	0.0226
Other Hexanes	0.0102	0.244	0.0446
Heptanes	0.0159	0.381	0.0696
Methylcyclohexane	0.0103	0.248	0.0453
Benzene	0.0266	0.638	0.1164
Toluene	0.0413	0.992	0.1810
Xylenes	0.0327	0.785	0.1433
C8+ Heavies	0.0098	0.236	0.0430
<b>Total Emissions</b>	<b>0.7992</b>	<b>19.180</b>	<b>3.5003</b>
<b>Total Hydrocarbon Emissions</b>	<b>0.7992</b>	<b>19.180</b>	<b>3.5003</b>
<b>Total VOC Emissions</b>	<b>0.2960</b>	<b>7.104</b>	<b>1.2964</b>
<b>Total HAP Emissions</b>	<b>0.1087</b>	<b>2.609</b>	<b>0.4762</b>
<b>Total BTEX Emissions</b>	<b>0.1006</b>	<b>2.414</b>	<b>0.4406</b>

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	18.8310	451.943	82.4797
Ethane	6.3309	151.941	27.7293
Propane	3.2878	78.907	14.4006
Isobutane	0.7404	17.769	3.2429
n-Butane	1.4580	34.992	6.3860
Isopentane	0.6033	14.479	2.6424
n-Pentane	0.5922	14.214	2.5940
Cyclopentane	0.1202	2.884	0.5264
n-Hexane	0.4078	9.787	1.7860

Cyclohexane	0.2599	6.237	1.1383
Other Hexanes	0.5113	12.271	2.2394
Heptanes	0.8054	19.329	3.5275
Methylcyclohexane	0.5244	12.585	2.2968
Benzene	1.3471	32.331	5.9004
Toluene	2.1229	50.948	9.2981
Xylenes	1.7396	41.751	7.6196
C8+ Heavies	1.6907	40.576	7.4051
-----			
Total Emissions	41.3727	992.946	181.2126
Total Hydrocarbon Emissions	41.3727	992.946	181.2126
Total VOC Emissions	16.2109	389.061	71.0036
Total HAP Emissions	5.6174	134.818	24.6042
Total BTEX Emissions	5.2096	125.031	22.8182

## FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	3.1235	74.964	13.6809
Ethane	1.3148	31.554	5.7586
Propane	0.6774	16.258	2.9671
Isobutane	0.1515	3.637	0.6638
n-Butane	0.3001	7.203	1.3146
Isopentane	0.1195	2.867	0.5232
n-Pentane	0.1168	2.802	0.5114
Cyclopentane	0.0121	0.291	0.0531
n-Hexane	0.0686	1.647	0.3007
Cyclohexane	0.0182	0.437	0.0797
Other Hexanes	0.0944	2.266	0.4135
Heptanes	0.0982	2.357	0.4301
Methylcyclohexane	0.0319	0.765	0.1396
Benzene	0.0166	0.399	0.0729
Toluene	0.0198	0.474	0.0865
Xylenes	0.0077	0.184	0.0335
C8+ Heavies	0.6144	14.746	2.6911
-----			
Total Emissions	6.7855	162.851	29.7203
Total Hydrocarbon Emissions	6.7855	162.851	29.7203
Total VOC Emissions	2.3472	56.333	10.2807
Total HAP Emissions	0.1127	2.705	0.4936
Total BTEX Emissions	0.0441	1.057	0.1930

## FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	62.4701	1499.282	273.6189
Ethane	26.2952	631.084	115.1729
Propane	13.5485	325.165	59.3426
Isobutane	3.0309	72.741	13.2753
n-Butane	6.0027	144.064	26.2917
Isopentane	2.3890	57.336	10.4639
n-Pentane	2.3350	56.041	10.2275
Cyclopentane	0.2423	5.814	1.0611
n-Hexane	1.3728	32.948	6.0131
Cyclohexane	0.3638	8.731	1.5934

Other Hexanes	1.8881	45.315	8.2701
Heptanes	1.9641	47.139	8.6028
Methylcyclohexane	0.6372	15.294	2.7911
Benzene	0.3329	7.990	1.4581
Toluene	0.3952	9.484	1.7308
Xylenes	0.1531	3.676	0.6708
C8+ Heavies	12.2883	294.918	53.8226
-----			
Total Emissions	135.7093	3257.023	594.4067
-----			
Total Hydrocarbon Emissions	135.7093	3257.023	594.4067
Total VOC Emissions	46.9440	1126.657	205.6149
Total HAP Emissions	2.2541	54.097	9.8728
Total BTEX Emissions	0.8812	21.149	3.8597

## COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	3.5001	84.002	15.3303
Ethane	1.4414	34.592	6.3131
Propane	0.7431	17.836	3.2550
Isobutane	0.1663	3.992	0.7286
n-Butane	0.3293	7.902	1.4422
Isopentane	0.1315	3.156	0.5759
n-Pentane	0.1286	3.086	0.5631
Cyclopentane	0.0145	0.348	0.0635
n-Hexane	0.0768	1.842	0.3362
Cyclohexane	0.0233	0.560	0.1022
Other Hexanes	0.1046	2.510	0.4581
Heptanes	0.1141	2.738	0.4997
Methylcyclohexane	0.0422	1.013	0.1848
Benzene	0.0432	1.037	0.1893
Toluene	0.0611	1.466	0.2675
Xylenes	0.0404	0.969	0.1768
C8+ Heavies	0.6242	14.982	2.7342
-----			
Total Emissions	7.5846	182.031	33.2206
-----			
Total Hydrocarbon Emissions	7.5846	182.031	33.2206
Total VOC Emissions	2.6432	63.437	11.5772
Total HAP Emissions	0.2214	5.314	0.9698
Total BTEX Emissions	0.1447	3.472	0.6336

## COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	356.0986	15.3303	95.69
Ethane	142.9022	6.3131	95.58
Propane	73.7432	3.2550	95.59
Isobutane	16.5182	0.7286	95.59
n-Butane	32.6777	1.4422	95.59
Isopentane	13.1063	0.5759	95.61
n-Pentane	12.8215	0.5631	95.61
Cyclopentane	1.5875	0.0635	96.00
n-Hexane	7.7991	0.3362	95.69
Cyclohexane	2.7317	0.1022	96.26

Other Hexanes	10.5095	0.4581	95.64
Heptanes	12.1303	0.4997	95.88
Methylcyclohexane	5.0879	0.1848	96.37
Benzene	7.3586	0.1893	97.43
Toluene	11.0289	0.2675	97.57
Xylenes	8.2904	0.1768	97.87
C8+ Heavies	61.2277	2.7342	95.53
-----			
Total Emissions	775.6193	33.2206	95.72
Total Hydrocarbon Emissions	775.6193	33.2206	95.72
Total VOC Emissions	276.6185	11.5772	95.81
Total HAP Emissions	34.4770	0.9698	97.19
Total BTEX Emissions	26.6779	0.6336	97.62

## EQUIPMENT REPORTS:

## CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature: 145.00 deg. F  
 Condenser Pressure: 14.70 psia  
 Condenser Duty: 1.84e-001 MM BTU/hr  
 Hydrocarbon Recovery: 0.11 bbls/day  
 Produced Water: 15.52 bbls/day  
 Ambient Temperature: 0.00 deg. F  
 Excess Oxygen: 0.00 %  
 Combustion Efficiency: 98.00 %  
 Supplemental Fuel Requirement: 1.84e-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	1.99%	98.01%
Cyclopentane	1.99%	98.01%
n-Hexane	1.99%	98.01%
Cyclohexane	1.98%	98.02%
Other Hexanes	1.99%	98.01%
Heptanes	1.97%	98.03%
Methylcyclohexane	1.97%	98.03%
Benzene	1.97%	98.03%
Toluene	1.95%	98.05%
Xylenes	1.88%	98.12%
C8+ Heavies	0.58%	99.42%

## ABSORBER

Calculated Absorber Stages: 1.44  
 Specified Dry Gas Dew Point: 7.00 lbs. H2O/MMSCF  
 Temperature: 120.0 deg. F  
 Pressure: 1000.0 psig

Dry Gas Flow Rate: 60.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 3.0503 lb/hr  
 Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 101.75 lbs. H<sub>2</sub>O/MMSCF  
 Specified Lean Glycol Recirc. Ratio: 2.50 gal/lb H<sub>2</sub>O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	6.86%	93.14%
Carbon Dioxide	99.80%	0.20%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.95%	0.05%
Propane	99.93%	0.07%
Isobutane	99.91%	0.09%
n-Butane	99.89%	0.11%
Isopentane	99.90%	0.10%
n-Pentane	99.87%	0.13%
Cyclopentane	99.48%	0.52%
n-Hexane	99.82%	0.18%
Cyclohexane	99.21%	0.79%
Other Hexanes	99.86%	0.14%
Heptanes	99.71%	0.29%
Methylcyclohexane	99.22%	0.78%
Benzene	93.55%	6.45%
Toluene	91.78%	8.22%
Xylenes	86.54%	13.46%
C8+ Heavies	99.16%	0.84%

## FLASH TANK

Flash Control: Combustion device  
 Flash Control Efficiency: 95.00 %  
 Flash Temperature: 190.0 deg. F  
 Flash Pressure: 35.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.14%	0.86%
Carbon Dioxide	7.80%	92.20%
Nitrogen	0.99%	99.01%
Methane	1.03%	98.97%
Ethane	2.85%	97.15%
Propane	5.89%	94.11%
Isobutane	7.56%	92.44%
n-Butane	9.15%	90.85%
Isopentane	9.50%	90.50%
n-Pentane	11.10%	88.90%
Cyclopentane	31.00%	69.00%
n-Hexane	16.16%	83.84%
Cyclohexane	41.98%	58.02%
Other Hexanes	13.38%	86.62%
Heptanes	24.95%	75.05%
Methylcyclohexane	45.84%	54.16%
Benzene	81.11%	18.89%
Toluene	85.51%	14.49%
Xylenes	92.94%	7.06%
C8+ Heavies	20.23%	79.77%

REGENERATOR

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Regenerator Stripping Gas:  
 Dry Product Gas Stripping Gas Flow Rate: 9.0000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	26.19%	73.81%
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	3.35%	96.65%
n-Pentane	3.09%	96.91%
Cyclopentane	1.45%	98.55%
n-Hexane	2.34%	97.66%
Cyclohexane	7.12%	92.88%
Other Hexanes	5.33%	94.67%
Heptanes	1.67%	98.33%
Methylcyclohexane	8.15%	91.85%
Benzene	6.11%	93.89%
Toluene	9.19%	90.81%
Xylenes	13.88%	86.12%
C8+ Heavies	56.15%	43.85%

STREAM REPORTS:

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WET GAS STREAM

-----

Temperature: 120.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 2.51e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.14e-001	2.55e+002
Carbon Dioxide	1.82e-001	5.28e+002
Nitrogen	3.91e-001	7.23e+002
Methane	7.95e+001	8.42e+004
Ethane	1.30e+001	2.58e+004
Propane	3.88e+000	1.13e+004
Isobutane	5.95e-001	2.28e+003
n-Butane	1.03e+000	3.96e+003
Isopentane	3.51e-001	1.67e+003
n-Pentane	3.01e-001	1.44e+003
Cyclopentane	1.30e-002	6.01e+001
n-Hexane	1.22e-001	6.93e+002
Cyclohexane	1.30e-002	7.21e+001
Other Hexanes	1.92e-001	1.09e+003
Heptanes	1.15e-001	7.59e+002

Methylcyclohexane	2.09e-002	1.36e+002
Benzene	4.99e-003	2.57e+001
Toluene	4.99e-003	3.04e+001
Xylenes	2.00e-003	1.40e+001
C8+ Heavies	1.35e-001	1.52e+003
-----		
Total Components	100.00	1.36e+005

DRY GAS STREAM

-----

Temperature: 120.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 2.50e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	1.47e-002	1.75e+001
Carbon Dioxide	1.82e-001	5.27e+002
Nitrogen	3.92e-001	7.23e+002
Methane	7.96e+001	8.42e+004
Ethane	1.30e+001	2.57e+004
Propane	3.89e+000	1.13e+004
Isobutane	5.95e-001	2.28e+003
n-Butane	1.03e+000	3.95e+003
Isopentane	3.52e-001	1.67e+003
n-Pentane	3.02e-001	1.43e+003
Cyclopentane	1.29e-002	5.98e+001
n-Hexane	1.22e-001	6.91e+002
Cyclohexane	1.29e-002	7.15e+001
Other Hexanes	1.92e-001	1.09e+003
Heptanes	1.15e-001	7.57e+002
Methylcyclohexane	2.08e-002	1.35e+002
Benzene	4.68e-003	2.41e+001
Toluene	4.59e-003	2.79e+001
Xylenes	1.73e-003	1.21e+001
C8+ Heavies	1.34e-001	1.50e+003
-----		
Total Components	100.00	1.36e+005

LEAN GLYCOL STREAM

-----

Temperature: 120.00 deg. F  
 Flow Rate: 9.87e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.85e+001	5.47e+003
Water	1.50e+000	8.34e+001
Carbon Dioxide	1.89e-012	1.05e-010
Nitrogen	2.63e-013	1.46e-011
Methane	9.00e-018	5.00e-016
Ethane	1.05e-007	5.81e-006
Propane	5.80e-009	3.22e-007
Isobutane	1.06e-009	5.91e-008
n-Butane	1.94e-009	1.08e-007
Isopentane	1.51e-004	8.40e-003
n-Pentane	1.62e-004	9.02e-003
Cyclopentane	2.85e-005	1.58e-003

n-Hexane	1.12e-004	6.20e-003
Cyclohexane	3.37e-004	1.87e-002
Other Hexanes	2.80e-004	1.56e-002

Heptanes	1.96e-004	1.09e-002
Methylcyclohexane	7.91e-004	4.39e-002
Benzene	1.57e-003	8.74e-002
Toluene	3.85e-003	2.14e-001
Xylenes	5.04e-003	2.80e-001

C8+ Heavies	3.15e-002	1.75e+000
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Total Components	100.00	5.56e+003
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#### RICH GLYCOL AND PUMP GAS STREAM

Temperature: 120.00 deg. F  
 Pressure: 1014.70 psia  
 Flow Rate: 1.07e+001 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.20e+001	5.47e+003
Water	5.40e+000	3.21e+002
Carbon Dioxide	2.28e-002	1.35e+000
Nitrogen	9.44e-003	5.60e-001
Methane	1.06e+000	6.31e+001
Ethane	4.56e-001	2.71e+001
Propane	2.42e-001	1.44e+001
Isobutane	5.52e-002	3.28e+000
n-Butane	1.11e-001	6.61e+000
Isopentane	4.44e-002	2.64e+000
n-Pentane	4.42e-002	2.63e+000
Cyclopentane	5.91e-003	3.51e-001
n-Hexane	2.76e-002	1.64e+000
Cyclohexane	1.06e-002	6.27e-001
Other Hexanes	3.67e-002	2.18e+000
Heptanes	4.41e-002	2.62e+000
Methylcyclohexane	1.98e-002	1.18e+000
Benzene	2.97e-002	1.76e+000
Toluene	4.59e-002	2.73e+000
Xylenes	3.65e-002	2.17e+000
C8+ Heavies	2.59e-001	1.54e+001
Total Components	100.00	5.94e+003

#### FLASH TANK OFF GAS STREAM

Temperature: 190.00 deg. F  
 Pressure: 49.70 psia  
 Flow Rate: 2.14e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.71e+000	2.76e+000
Carbon Dioxide	5.02e-001	1.25e+000
Nitrogen	3.51e-001	5.55e-001
Methane	6.89e+001	6.25e+001
Ethane	1.55e+001	2.63e+001

Propane	5.44e+000	1.35e+001
Isobutane	9.23e-001	3.03e+000
n-Butane	1.83e+000	6.00e+000
Isopentane	5.86e-001	2.39e+000
n-Pentane	5.73e-001	2.34e+000
Cyclopentane	6.11e-002	2.42e-001
n-Hexane	2.82e-001	1.37e+000
Cyclohexane	7.65e-002	3.64e-001
Other Hexanes	3.88e-001	1.89e+000
Heptanes	3.47e-001	1.96e+000
Methylcyclohexane	1.15e-001	6.37e-001
Benzene	7.54e-002	3.33e-001
Toluene	7.59e-002	3.95e-001
Xylenes	2.55e-002	1.53e-001
C8+ Heavies	1.28e+000	1.23e+001
-----		
Total Components	100.00	1.40e+002

## FLASH TANK GLYCOL STREAM

-----  
 Temperature: 190.00 deg. F  
 Flow Rate: 1.04e+001 gpm

Component	Conc. (wt%)	Loading (lb/hr)
-----		
TEG	9.43e+001	5.47e+003
Water	5.49e+000	3.18e+002
Carbon Dioxide	1.82e-003	1.06e-001
Nitrogen	9.53e-005	5.53e-003
Methane	1.13e-002	6.53e-001
Ethane	1.33e-002	7.72e-001
Propane	1.46e-002	8.47e-001
Isobutane	4.28e-003	2.48e-001
n-Butane	1.04e-002	6.05e-001
Isopentane	4.32e-003	2.51e-001
n-Pentane	5.03e-003	2.92e-001
Cyclopentane	1.88e-003	1.09e-001
n-Hexane	4.56e-003	2.65e-001
Cyclohexane	4.54e-003	2.63e-001
Other Hexanes	5.03e-003	2.92e-001
Heptanes	1.13e-002	6.53e-001
Methylcyclohexane	9.30e-003	5.39e-001
Benzene	2.46e-002	1.43e+000
Toluene	4.02e-002	2.33e+000
Xylenes	3.48e-002	2.02e+000
C8+ Heavies	5.37e-002	3.12e+000
-----		
Total Components	100.00	5.80e+003

## FLASH GAS EMISSIONS

-----  
 Flow Rate: 8.54e+003 scfh  
 Control Method: Combustion Device  
 Control Efficiency: 95.00

Component	Conc. (vol%)	Loading (lb/hr)
-----		

Water	6.10e+001	2.47e+002
Carbon Dioxide	3.77e+001	3.73e+002
Nitrogen	8.80e-002	5.55e-001
Methane	8.65e-001	3.12e+000
Ethane	1.94e-001	1.31e+000
Propane	6.82e-002	6.77e-001
Isobutane	1.16e-002	1.52e-001
n-Butane	2.29e-002	3.00e-001
Isopentane	7.35e-003	1.19e-001
n-Pentane	7.19e-003	1.17e-001
Cyclopentane	7.67e-004	1.21e-002
n-Hexane	3.54e-003	6.86e-002
Cyclohexane	9.60e-004	1.82e-002
Other Hexanes	4.87e-003	9.44e-002
Heptanes	4.35e-003	9.82e-002
Methylcyclohexane	1.44e-003	3.19e-002
Benzene	9.47e-004	1.66e-002
Toluene	9.53e-004	1.98e-002
Xylenes	3.20e-004	7.66e-003
C8+ Heavies	1.60e-002	6.14e-001
-----		
Total Components	100.00	6.28e+002

REGENERATOR OVERHEADS STREAM

-----

Temperature: 212.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 5.56e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----		
Water	8.90e+001	2.35e+002
Carbon Dioxide	3.40e-002	2.19e-001
Nitrogen	3.94e-002	1.62e-001
Methane	8.01e+000	1.88e+001
Ethane	1.44e+000	6.33e+000
Propane	5.09e-001	3.29e+000
Isobutane	8.69e-002	7.40e-001
n-Butane	1.71e-001	1.46e+000
Isopentane	5.70e-002	6.03e-001
n-Pentane	5.60e-002	5.92e-001
Cyclopentane	1.17e-002	1.20e-001
n-Hexane	3.23e-002	4.08e-001
Cyclohexane	2.11e-002	2.60e-001
Other Hexanes	4.05e-002	5.11e-001
Heptanes	5.48e-002	8.05e-001
Methylcyclohexane	3.64e-002	5.24e-001
Benzene	1.18e-001	1.35e+000
Toluene	1.57e-001	2.12e+000
Xylenes	1.12e-001	1.74e+000
C8+ Heavies	6.77e-002	1.69e+000
-----		
Total Components	100.00	2.77e+002

CONDENSER PRODUCED WATER STREAM

-----

Temperature: 145.00 deg. F  
 Flow Rate: 4.53e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	2.26e+002	999864.
Carbon Dioxide	1.67e-004	3.79e-004	2.
Nitrogen	3.80e-006	8.61e-006	0.
Methane	8.06e-004	1.83e-003	8.
Ethane	2.95e-004	6.67e-004	3.
Propane	1.82e-004	4.13e-004	2.
Isobutane	2.18e-005	4.93e-005	0.
n-Butane	5.53e-005	1.25e-004	1.
Isopentane	1.56e-005	3.53e-005	0.
n-Pentane	1.62e-005	3.67e-005	0.
Cyclopentane	2.13e-005	4.81e-005	0.
n-Hexane	8.81e-006	2.00e-005	0.
Cyclohexane	2.92e-005	6.61e-005	0.
Other Hexanes	9.07e-006	2.05e-005	0.
Heptanes	9.29e-006	2.10e-005	0.
Methylcyclohexane	2.74e-005	6.21e-005	0.
Benzene	3.76e-003	8.51e-003	38.
Toluene	4.62e-003	1.05e-002	46.
Xylenes	3.59e-003	8.13e-003	36.
C8+ Heavies	2.63e-006	5.96e-006	0.
Total Components	100.00	2.27e+002	1000000.

## CONDENSER RECOVERED OIL STREAM

Temperature: 145.00 deg. F  
Flow Rate: 3.25e-003 gpm

Component	Conc. (wt%)	Loading (lb/hr)
Water	2.94e-002	4.07e-004
Carbon Dioxide	6.16e-004	8.52e-006
Nitrogen	4.62e-005	6.40e-007
Methane	2.49e-002	3.45e-004
Ethane	4.37e-002	6.05e-004
Propane	9.99e-002	1.38e-003
Isobutane	4.07e-002	5.64e-004
n-Butane	1.04e-001	1.44e-003
Isopentane	8.90e-002	1.23e-003
n-Pentane	1.04e-001	1.45e-003
Cyclopentane	3.35e-002	4.64e-004
n-Hexane	1.60e-001	2.22e-003
Cyclohexane	1.51e-001	2.09e-003
Other Hexanes	1.69e-001	2.33e-003
Heptanes	7.85e-001	1.09e-002
Methylcyclohexane	5.38e-001	7.45e-003
Benzene	7.41e-001	1.03e-002
Toluene	3.33e+000	4.61e-002
Xylenes	6.94e+000	9.61e-002
C8+ Heavies	8.66e+001	1.20e+000
Total Components	100.00	1.38e+000

## CONDENSER VENT STREAM

Temperature: 145.00 deg. F

Pressure: 14.70 psia  
 Flow Rate: 7.88e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----	-----	-----
Water	2.25e+001	8.41e+000
Carbon Dioxide	2.39e-001	2.19e-001
Nitrogen	2.78e-001	1.62e-001
Methane	5.65e+001	1.88e+001
Ethane	1.01e+001	6.33e+000
Propane	3.59e+000	3.29e+000
Isobutane	6.13e-001	7.40e-001
n-Butane	1.21e+000	1.46e+000
Isopentane	4.02e-001	6.02e-001
n-Pentane	3.94e-001	5.91e-001
Cyclopentane	8.22e-002	1.20e-001
n-Hexane	2.27e-001	4.06e-001
Cyclohexane	1.47e-001	2.58e-001
Other Hexanes	2.84e-001	5.09e-001
Heptanes	3.82e-001	7.94e-001
Methylcyclohexane	2.53e-001	5.17e-001
Benzene	8.19e-001	1.33e+000
Toluene	1.08e+000	2.07e+000
Xylenes	7.42e-001	1.64e+000
C8+ Heavies	1.39e-001	4.91e-001
-----	-----	-----
Total Components	100.00	4.87e+001

COMBUSTION DEVICE OFF GAS STREAM

-----  
 Temperature: 1000.00 deg. F  
 Pressure: 14.70 psia  
 Flow Rate: 1.21e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
-----	-----	-----
Methane	7.34e+001	3.77e-001
Ethane	1.32e+001	1.27e-001
Propane	4.66e+000	6.57e-002
Isobutane	7.96e-001	1.48e-002
n-Butane	1.57e+000	2.91e-002
Isopentane	5.22e-001	1.20e-002
n-Pentane	5.12e-001	1.18e-002
Cyclopentane	1.07e-001	2.39e-003
n-Hexane	2.94e-001	8.11e-003
Cyclohexane	1.91e-001	5.15e-003
Other Hexanes	3.69e-001	1.02e-002
Heptanes	4.96e-001	1.59e-002
Methylcyclohexane	3.29e-001	1.03e-002
Benzene	1.06e+000	2.66e-002
Toluene	1.40e+000	4.13e-002
Xylenes	9.63e-001	3.27e-002
C8+ Heavies	1.80e-001	9.83e-003
-----	-----	-----
Total Components	100.00	7.99e-001

**Tanks 4.0.9d**  
**Condensate Tanks (TK-200 and TK-201)**

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Tank Identification and Physical Characteristics**

**Identification**

User Identification:	Canton North Compressor Station
City:	
State:	West Virginia
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	One (1) 400 bbl Condensate Tank

**Tank Dimensions**

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	20.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,920.59
Turnovers:	67.95
Net Throughput(gal/yr):	1,149,750.00
Is Tank Heated (y/n):	N

**Paint Characteristics**

Shell Color/Shade:	Gray/Light
Shell Condition:	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

**Roof Characteristics**

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.06

**Breather Vent Settings**

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

**TANKS 4.0.9d  
Emissions Report - Detail Format  
Liquid Contents of Storage Tank**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 15.0)	All	55.41	48.54	64.27	51.30	7.4863	6.3292	8.8048	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Detail Calculations (AP-42)**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

**Annual Emission Calculations**

<b>Standing Losses (lb):</b>	<b>3,067.1002</b>
Vapor Space Volume (cu ft):	1,163.6725
Vapor Density (lb/cu ft):	0.0613
Vapor Space Expansion Factor:	0.4667
Vented Vapor Saturation Factor:	0.1961
<b>Tank Vapor Space Volume:</b>	
Vapor Space Volume (cu ft):	1,163.6725
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.3333
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.3333
<b>Roof Outage (Cone Roof)</b>	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.0600
Shell Radius (ft):	6.0000
<b>Vapor Density</b>	
Vapor Density (lb/cu ft):	0.0613
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Daily Avg. Liquid Surface Temp. (deg. R):	515.0759
Daily Average Ambient Temp. (deg. F):	49.0683
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.9633
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insolation Factor (Btu/eq ft day):	1,183.6370
<b>Vapor Space Expansion Factor</b>	
Vapor Space Expansion Factor:	0.4667
Daily Vapor Temperature Range (deg. R):	35.4636
Daily Vapor Pressure Range (psia):	2.4758
Breaker Vent Press. Setting Range (psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.3292
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	8.6048
Daily Avg. Liquid Surface Temp. (deg. R):	515.0759
Daily Min. Liquid Surface Temp. (deg. R):	506.2100
Daily Max. Liquid Surface Temp. (deg. R):	523.9417
Daily Ambient Temp. Range (deg. R):	24.1833
<b>Vented Vapor Saturation Factor</b>	
Vented Vapor Saturation Factor:	0.1961
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Vapor Space Outage (ft):	10.3333
<b>Working Losses (lb):</b>	<b>7,478.2057</b>
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Annual Net Throughput (gal/yr.):	1,149,750.0000
Annual Turnovers:	67.9497
Turnover Factor:	0.6082
Maximum Liquid Volume (gal):	16,820.5825
Maximum Liquid Height (ft):	20.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
<b>Total Losses (lb):</b>	<b>10,575.3059</b>

**TANKS 4.0.9d  
Emissions Report - Detail Format  
Individual Tank Emission Totals**

**Emissions Report for: Annual**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 15.0)	7,478.21	3,097.10	10,575.31

**Tanks 4.0.9d**  
**Produced Water Tanks (TK-1500 and TK-1501)**

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Tank Identification and Physical Characteristics**

**Identification**

User Identification:	Canton North Compressor Station
City:	
State:	West Virginia
Company:	
Type of Tank:	Vertical Fixed Roof Tank
Description:	One (1) 400 bbl Produced Water Tank

**Tank Dimensions**

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	20.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,920.59
Turnovers:	20.38
Net Throughput(gal/yr):	344,925.00
Is Tank Heated (y/n):	N

**Paint Characteristics**

Shell Color/Shade:	Gray/Light
Shell Condition:	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good

**Roof Characteristics**

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.06

**Breather Vent Settings**

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Liquid Contents of Storage Tank**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 15.0)	All	55.41	48.54	64.27	51.30	7.4863	6.3292	8.8048	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Detail Calculations (AP-42)**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Annual Emission Calculations

<b>Standing Losses (lb):</b>	<b>3,097.1002</b>
Vapor Space Volume (cu ft):	1,163.8725
Vapor Density (lb/cu ft):	0.0819
Vapor Space Expansion Factor:	0.4557
Vented Vapor Saturation Factor:	0.1961
<b>Tank Vapor Space Volume:</b>	
Vapor Space Volume (cu ft):	1,169.8725
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.3333
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.3333
<b>Roof Outage (Cona Roof)</b>	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (W/P):	0.0600
Shell Radius (ft):	6.0000
<b>Vapor Density</b>	
Vapor Density (lb/cu ft):	0.0819
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Daily Avg. Liquid Surface Temp. (deg. R):	515.0759
Daily Average Ambient Temp. (deg. F):	49.0583
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.9633
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insolation Factor (Btu/sqft day):	1,193.6370
<b>Vapor Space Expansion Factor</b>	
Vapor Space Expansion Factor:	0.4557
Daily Vapor Temperature Range (deg. R):	35.4636
Daily Vapor Pressure Range (psia):	2.4756
Breather Vent Press. Setting Range (psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.3282
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	8.8048
Daily Avg. Liquid Surface Temp. (deg R):	515.0759
Daily Min. Liquid Surface Temp. (deg R):	506.2100
Daily Max. Liquid Surface Temp. (deg R):	523.9417
Daily Ambient Temp. Range (deg. R):	24.1833
<b>Vented Vapor Saturation Factor</b>	
Vented Vapor Saturation Factor:	0.1961
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Vapor Space Outage (ft):	10.3333
<b>Working Losses (lb):</b>	<b>3,888.8783</b>
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Annual Net Throughput (gal/yr.):	344,825.0000
Annual Turnovers:	20.3849
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	16,920.5825
Maximum Liquid Height (ft):	20.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
<b>Total Losses (lb):</b>	<b>6,785.9785</b>

**TANKS 4.0.9d  
Emissions Report - Detail Format  
Individual Tank Emission Totals**

**Emissions Report for: Annual**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 15.0)	3,688.88	3,097.10	6,785.98

**Tanks 4.0.9d**  
**Settling Tank (TK-1502)**

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Tank Identification and Physical Characteristics**

**Identification**  
 User Identification: Canton North Compressor Station  
 City: West Virginia  
 State: West Virginia  
 Company: Vertical Fixed Roof Tank  
 Type of Tank: One (1) 400 bbl Settling Tank  
 Description:

**Tank Dimensions**  
 Shell Height (ft): 20.00  
 Diameter (ft): 12.00  
 Liquid Height (ft) : 20.00  
 Avg. Liquid Height (ft): 10.00  
 Volume (gallons): 16,920.59  
 Turnovers: 176.67  
 Net Throughput(gal/yr): 2,989,350.00  
 Is Tank Heated (y/n): N

**Paint Characteristics**  
 Shell Color/Shade: Gray/Light  
 Shell Condition: Good  
 Roof Color/Shade: Gray/Light  
 Roof Condition: Good

**Roof Characteristics**  
 Type: Cone  
 Height (ft) 1.00  
 Slope (ft/ft) (Cone Roof) 0.06

**Breather Vent Settings**  
 Vacuum Settings (psig): -0.03  
 Pressure Settings (psig) 0.03

Meteorological Data used in Emissions Calculations: Elkins, West Virginia (Avg Atmospheric Pressure = 13.73 psia)

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Liquid Contents of Storage Tank**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 15.0)	All	55.41	48.54	64.27	61.30	7.4863	6.3292	8.8048	60.0000			92.00	Option 4: RVP=15, ASTM Slope=3

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Detail Calculations (AP-42)**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

**Annual Emission Calculations**

<b>Standing Losses (lb):</b>	<b>3,097.1002</b>
Vapor Space Volume (cu ft):	1,163.8725
Vapor Density (lb/cu ft):	0.0813
Vapor Space Expansion Factor:	0.4567
Vented Vapor Saturation Factor:	0.1961
<b>Tank Vapor Space Volume:</b>	
Vapor Space Volume (cu ft):	1,166.6725
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.3333
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.3333
<b>Roof Outage (Cone Roof)</b>	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.0800
Shell Radius (ft):	6.0000
<b>Vapor Density</b>	
Vapor Density (lb/cu ft):	0.0813
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Daily Avg. Liquid Surface Temp. (deg. R):	615.0759
Daily Average Ambient Temp. (deg. F):	49.0683
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	610.8683
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insolation Factor (Btu/sq ft day):	1,193.6370
<b>Vapor Space Expansion Factor</b>	
Vapor Space Expansion Factor:	0.4567
Daily Vapor Temperature Range (deg. R):	35.4636
Daily Vapor Pressure Range (psia):	2.4756
Breather Vent Press. Setting Range (psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4633
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	6.3292
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	8.8048
Daily Avg. Liquid Surface Temp. (deg R):	615.0759
Daily Min. Liquid Surface Temp. (deg R):	598.2100
Daily Max. Liquid Surface Temp. (deg R):	623.9417
Daily Ambient Temp. Range (deg. R):	24.1833
<b>Vented Vapor Saturation Factor</b>	
Vented Vapor Saturation Factor:	0.1961
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4633
Vapor Space Outage (ft):	10.3333
<b>Working Losses (lb):</b>	<b>10,767.2069</b>
Vapor Molecular Weight (lb/lb-mole):	60.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	7.4863
Annual Net Throughput (gal/yr.):	2,888,350.0000
Annual Turnovers:	176.6633
Turnover Factor:	0.3366
Maximum Liquid Volume (gal):	16,920.5825
Maximum Liquid Height (ft):	20.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
<b>Total Losses (lb):</b>	<b>13,854.3071</b>

**TANKS 4.0.9d  
Emissions Report - Detail Format  
Individual Tank Emission Totals**

**Emissions Report for: Annual**

**Canton North Compressor Station - Vertical Fixed Roof Tank**

Components	Losses(lbs)		Total Emissions
	Working Loss	Breathing Loss	
Gasoline (RVP 15.0)	10,767.21	3,087.10	13,854.31

**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 Canton North Compressor Station, including federal and state regulatory requirements.

## 1. Summary of Key Operational Throughput Limits

- a. Maximum wet gas throughput into each Dehy: 60 MMscf/day or 21,900 MMscf/year.
- b. Maximum liquids loaded out: 2,989,350 gallons per year.
- c. Maximum fuel use of all compressor engines is 1,060.00 MMscf/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. Replace reciprocating compressor rod packing within 36 months of last packing/startup or within 26,000 operating hours, whichever comes first.
- d. Microturbines must be fueled by natural gas only.
- e. Operate each Dehy Reboiler at no more than 1.5 MMBtu/hr and fuel 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 4.80 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 shall be routed to the VRU with recovery greater than 98 percent at all times.
- j. Storage tanks must be covered and routed to a closed vent system with no detectable emissions.
- k. Liquid loadout trucks must use the submerged-fill method.
- l. Dehydrator still vents must be controlled by the flare.

## 3. Monitoring

- a. Non-certified engines must be stack tested within 1 year of startup and every 8,760 hours of operation thereafter.
- b. Monitor catalyst inlet temperature.
- c. Monitor compressor run time or track number of months since compressor rod repacking.

- d. Monitor daily, monthly, and rolling 12-month average wet gas throughput for the Dehy.
- e. Conduct an initial Method 22 observation of the Reboiler exhaust and flare for a minimum of 2 hours.
- f. Monthly conduct Method 22 observations of the Reboiler exhaust and flare for a minimum of 10 minutes each.
- g. Monthly conduct olfactory, visual, and auditory inspections of the tanks closed vent and control system (flare) for leaks or defects that could result in emissions. Repair leaks as soon as practicable (no later than 5 days for first attempt).
- h. Continuously monitor presence of flare flame.
- i. Monitor monthly and rolling twelve-month average amount of liquids loaded out.

#### **4. Recordkeeping**

- a. Keep records on-site for a minimum of 2 years, and in company records (on or off-site) for a minimum of 5 years.
- b. Keep records of inspection, observations, preventive maintenance, malfunctions, and shutdowns of all onsite equipment.
- c. Keep 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.
- d. Keep records of engine maintenance and engine run time.
- e. Keep records of catalyst inlet temperature.
- f. Keep records of the actual annual average natural gas throughput in the dehy.

#### **5. Notifications and Reports**

- a. Notify WVDAQ within 30 calendar days of commencement of construction.
- b. Notify WVDAQ within 30 calendar days of startup.
- c. Upon startup, file a Certificate to Operate (CTO) application and pay fees to WVDAQ for the period from startup to the following June 30 and then annually renew the CTO and pay fees. Maintain CTO on-site.
- d. File an annual report of compliance with 40 CFR 60 Subpart OOOO for the compressors and storage tanks (for settling tank only) within 90 days after one year of operation (i.e., within 90 days after 12 months after initial startup).
- e. For stack testing, file protocol at least 30 days prior to test and notify WVDAQ and EPA of the test at least 15 days prior to test. Report results within 60 days of test.
- f. If operations are suspended for 60 days or more, notify WVDAQ within 2 weeks after the 60<sup>th</sup> day.

**Attachment P.  
Public Notice**

**AIR QUALITY PERMIT NOTICE**  
**Notice of Application**

Notice is given that Antero Midstream LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a modification to the existing 45CSR13 Construction Permit R13-3167 for a Natural Gas Compressor Station located south of US-23 near Center Point, and north of US-50, in Doddridge County, West Virginia. The latitude and longitude coordinates are: 39.4042N, 80.6834W.

The applicant estimates the potential to discharge the following Regulated Air Pollutants will be: Nitrogen Oxides (NO<sub>x</sub>) – 90.77 tons per year (tpy); Carbon Monoxide (CO) – 93.71 tpy; Volatile Organic Compounds (VOC) – 87.05; Particulate Matter less than 10 µm (PM<sub>10</sub>) – 12.38 tpy; Particulate Matter less than 2.5 µm (PM<sub>2.5</sub>) – 11.98 tpy; Sulfur Dioxide (SO<sub>2</sub>) – 0.46 tpy; Formaldehyde – 1.93 tpy; Benzene – 1.34 tpy; Toluene – 0.89 tpy; Ethylbenzene – 0.02 tpy; Xylenes – 0.48 tpy; and Carbon Dioxide equivalent (CO<sub>2e</sub>) – 95,122 tpy.

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 1227, during normal business hours.

Dated the 5th day of January 2015.

By: Antero Midstream LLC  
Luz C. Slauter  
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: January 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.

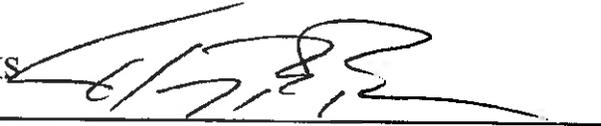
Further, the corporation or the business entity certifies as follows:

(1) Luz Slauter and Lou Ann Lee (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.

Troy Roach, Vice President - EHS



**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